

ACTION MEMORANDUM

**RILEY PASS URANIUM MINES SITE
REMOVAL ACTION**

within the
NORTH CAVE HILLS LAND UNIT

**Custer National Forest – Sioux Ranger District
Harding County, South Dakota**

February, 2007

ACTION MEMORANDUM

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I. PURPOSE

The purpose of this Action Memorandum is to request and document approval of the selected non-time critical removal action, as authorized by section 104 (42 U.S.C. 9604) of the Comprehensive, Environmental, Response, Compensation, and Liability Act (CERCLA), to address Bluffs B, C, D, E, G, and H, as well as associated retention ponds within the Riley Pass Uranium Mines site, located on the Custer National Forest, in Harding County, South Dakota. These areas (subsequently referred to as the Project area), which comprises a portion of the larger Riley Pass Uranium Mines site, are defined in the Riley Pass Abandoned Uranium Mines Final Engineering Evaluation and Cost Analysis (EE/CA) (the Final EE/CA). A map showing these areas is provided as Attachment 1.

A release, or a significant threat of a release, has or is occurring at the Project area that poses a threat to public health or welfare or the environment, on and/or from lands under the jurisdiction, custody, or control of the USDA Forest Service, Custer National Forest (National Forest System Lands or NFS lands). Conditions at the Riley Pass Uranium Mines site (including the Project area) present an imminent and substantial endangerment to human health and the environment, due to the high concentrations of arsenic, molybdenum, thorium, uranium, and radium²²⁶ metals found in the soils and sediment from the mining area. These conditions meet the criteria for initiating a Removal Action under 40 CFR Section 300.415 (b)(2) of the National Contingency Plan (NCP). Executive Order 12580 and 7 CFR 2.60(a)(39) delegates Removal Action authority to the USDA Forest Service, when the source of the release or potential release of hazardous substances is on or from National Forest System lands. The scope of this proposed action is to control and contain the release of and exposures to specific contaminants that are impacting human health and the environment at the Project area. This action alone will not address all contaminant sources or the impacts from these sources in the encompassing Riley Pass Uranium Mines site. Additional actions will need to take place to address these other sources and impacts within the site as documented in the Engineering Evaluation and Cost Analysis (EE/CA). This proposed action addresses only those Bluffs and features (identified above) for which a responsible party has been identified [Tronox Worldwide, LLC (Tronox), a corporate successor to Kermac Nuclear Fuels]. As described in Section VIII of this Action Memorandum, Tronox will conduct the proposed actions set forth in this Action Memorandum under a settlement agreement with the U.S.D.A Forest Service.

The proposed actions set forth in this Action Memorandum are consistent with the Final EE/CA that was prepared for the Forest Service by its consultant Pioneer Technical Services, Incorporated. The EE/CA developed various alternatives that address impacts associated with hazardous substances present at the Project area (Pioneer, 2006). The Final EE/CA provides the details and basis for the proposed response action for features within the Project area and is attached to this memorandum as supporting documentation (Attachment 2). The discussion in the balance of this Action Memorandum substantiates the need for a removal response, identifies the proposed action, provides the specific risk reduction criteria under which the proposed action will be conducted and a determination these criteria are protective of human health and the

environment, and explains the rationale for the Forest Service's selection of the proposed action.

The proposed action will be executed by following the non-time-critical removal action process as defined by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA; 42 USC 9604) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 CFR Part 300). Response actions as explained in the U.S. Environmental Protection Agency's (EPA) *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* -- are implemented to respond to "the cleanup or removal of released hazardous substances from the environment ... as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare or to the environment..." (EPA, 1993).

II: SITE CONDITIONS AND BACKGROUND

A. Site Description

This Action Memorandum as well as the EE/CA uses a variety of terms to describe site conditions, materials present at the Project area, the risks associated with these conditions or materials, cleanup levels, and conditions that will be present after completion of the proposed action. Many of these terms overlap. For clarity and ease of understanding, the definition of these terms as they are used in this Action Memorandum has been provided as Attachment 3. This attachment also provides, as appropriate, clarification of how these terms overlap and relate to one another.

During the late 1950s and early 1960s, relatively extensive, unrestricted strip mining conducted by numerous individuals and companies occurred on the NFS lands administered by the Sioux Ranger District during removal of uranium-bearing lignite coal beds permitted under the General Mining Laws and Public Law 357 (requiring no form of restoration). Approximately 1,000 acres of land have been reported to be disturbed by excavation, spoils deposition, and subsequent erosional deposition from the original source sites (USFS, 1964).

Mining in the area consisted of the removal of overburden to allow access to the uranium-bearing lignite coal beds, which in places were 80 feet below the original ground surface. The mines addressed in this Action Memorandum were operated by Kermac Nuclear Fuels Corporation and cover approximately 200 acres of highwalls, pit floor, and spoils. For purposes of identification, the acreage is broken into six individual bluffs. These bluffs are described below (see enclosed figure). During mining, much of the overburden was piled on the outer edges of the rim rock or pushed over the rim rock edges. The highly erosive spoils remained piled on the pit floor. In some cases the contaminants of concern associated with the ore deposit were left exposed when mining ceased in 1964.

Bluff B

Bluff B encompasses approximately 150 acres of spoils piles (overburden), highwalls,

and open pits. Bluff B has an estimated spoils volume of 1,140,000 cubic yards. Approximately 65,600 cubic yards of acutely contaminated material (primarily in lignite-bearing spoil piles) exist on Bluff B. Riley Pass, a significant historic pioneer wagon route during the 1890s, is approximately 500 feet north of the Project area.

The waste materials (spoils/overburden) have been a major source of sedimentation to Pete's Creek to the east of Bluff B and Schleichart Draw to the southeast. A majority of the bluff is either barren or sparsely vegetated and shows signs of severe wind and surface water erosion. Sediment from the east half of the Project area is currently being carried approximately .75 mile and deposited on the main access road to Riley Pass and the adjoining private property. Sediment basins have been installed and maintained by the USFS in Upper Pete's Creek and Schleichart Draw. However, due to the amount of sediment eroding from the Project area, frequent maintenance of the basins is required.

Due to the predominant soil type present, sandy clay and silty clay, soil piping and tunneling with occasional sink holes are present. Piping and large gullies are most prevalent in areas where the overburden was placed along or below the rim-rocks. Some of the pipes that have formed are 10 to 15 feet in diameter, and gullies up to 25 feet in depth have formed in places subject to concentrated surface water flow.

The mined pit floors are generally at or near bedrock. Some spoils have been placed along the edges that eroded to the land below Bluff B. Small, shallow ponds have formed in some of the areas creating small retention basins, which during snowmelt and small storm events assist in controlling some of the surface water erosion. Water from these ponds most likely evaporates or seeps through the bedrock during the summer months.

The analytical results for soil samples collected from Bluff B during a sampling investigation that occurred in 1999 show concentrations greater than three times background for radium²²⁶ and uranium²³⁵.

Bluff C

Bluff C encompasses approximately 10 acres with good vegetative cover of the spoils piles and exposed bedrock. This bluff is approximately 4,257 feet south, southeast of Bluff B. Spoils piles and berms are small in nature and are scattered throughout the Project area. Based on visual estimation, there is approximately 600 cubic yards of spoils materials present at Bluff C. There are no signs of active erosion from the berms or spoil piles and existing vegetation cover at the Project area is approximately 85 to 90%.

The analytical results for soil samples collected during the 1999 Project area investigation from Bluff C show concentrations greater than three times background for arsenic, molybdenum, thorium, uranium, radium²²⁶, and uranium²³⁵. The samples were taken along the toe of the southwest berms and spoils piles.

Bluff D

Bluff D encompasses approximately 5.2 acres, with good vegetative cover of the spoils piles and berms. Bluff D is approximately 4,157 feet southeast of Bluff B. There are some areas of exposed bedrock located within the Project area. There are no active signs of erosion from the berms or spoil piles. Vegetation cover at the Project area is approximately 85 to 90%. There are small areas of naturally exposed bedrock in locations that have not been disturbed by mining activities.

The analytical results for soil samples collected during the 1999 Site investigation from Bluff D show concentrations greater than three times background of arsenic, molybdenum, uranium, radium²²⁶, and uranium²³⁵. Locations of materials with elevated concentrations of these contaminants include the bedrock/un-vegetated areas located on the northeast side of the bluff.

Bluff E

Bluff E encompasses approximately two acres, with good vegetative cover of the spoils piles and berms. Bluff E is approximately 5,355 feet southeast of Bluff B. There are some areas of exposed bedrock located within the. There are no signs of erosion from the berms or spoils piles and vegetation cover at the Project area is approximately 90 to 95%.

The analytical results for soil samples collected during the 1999 site investigation from Bluff E showed concentrations greater than three times background of radium²²⁶ and uranium²³⁵. The samples were taken on the southeast and west sides of the bluff.

Bluff G

Bluff G encompasses approximately five acres, of which approximately two acres consist of exposed bedrock. This bluff is approximately 7,698 feet southeast of Bluff B. There are also several bare and eroding steep (1.5H:1V) slopes, where the materials have been pushed off the rimrock. Sampling results indicated one acutely contaminated area has been left on top of the bluff. The greater portion (approximately 90%) of the top of the bluff has been excavated down to bedrock with very little vegetation present. On some of the less steep slopes, vegetation is present with approximately 40 to 60% vegetative cover. The southwest steep slope appears to be very difficult to regrade due to excessive steepness and limited access to the slope. Equipment access to the bluff would be difficult and would entail traveling through Bluffs I₁ and I₂ and then traveling across a small saddle that has been filled in with waste materials. This is the only bluff where access is an issue. Currently, the materials in the saddle are sparsely vegetated and there are no signs of erosion.

The largest spoils pile is located below the rimrock on the southwest side of the bluff. It

encompasses approximately one acre with extremely steep side slopes (1.5H:1V), very little vegetation, and severe erosion gullies and rills present on the face of the slope. Spoils material volume is estimated to be approximately 46,000 cubic yards. A smaller, more vegetated spoils pile (approximately 40 to 60% vegetation cover) is located along and below the rimrock on the southeast side of the bluff, it encompasses approximately half an acre, with an estimated volume of approximately 23,400 cubic yards.

There are several berms/spoils piles along the north and east side of the bluff. Surface erosion is localized to two areas on the berms/spoils piles on the north side of the bluff. An area of acutely contaminated materials located within the spoils pile on the east side. The volume of this material is estimated to be approximately 300 cubic yards.

Additionally, a small spoils pile is located in a saddle between Bluffs I₁ and G. While the mining was taking place, these materials were used as road construction material between the bluffs and covers approximately half an acre with an estimated volume of approximately 550 cubic yards. The spoils material is poorly vegetated, but is moderately stable, showing very little surface erosion.

The analytical results for soil samples collected during the 1999 site investigation from Bluff G show concentrations more than three times background for arsenic, molybdenum, uranium, radium²²⁶, and uranium²³⁵.

Bluff H

Bluff H encompasses approximately 30 acres. Bluff H is approximately 10,274 feet southeast of Bluff B. The Project area consists of several spoils piles (approximately 553,850 cubic yards) that have been placed along and over the rimrock edges. These slopes are generally very steep (1.5H:1V) and show signs of severe water erosion, especially on the northwest and northeast spoils piles. Vegetation growth on the side slopes is very limited (<10% cover). There is a pit area with unstable highwalls on the southwest portion of the Project area.

A portion of the spoils piles on the north and northeast side of the bluff is currently located on private property. A spoils pile of approximately 1.1 acres in size with an estimated volume of 54,350 cubic yards is located on the northwest corner of the bluff. The slope is extremely steep (1.5H:1V) and barren of vegetation. There is one large erosion gully located on the south portion of the spoils pile. Water and sediment from this gully flow into an intermittent dry draw/drainage. However, some of the sediments are being deposited on private property located adjacent to Bluff H.

The spoils pile located on the northeast end of the bluff is moderately vegetated. There are erosion gullies and rills that are transporting sediment onto private property and into an intermittently dry draw/drainage. Approximately one third of this spoils pile is currently situated on private property. A large spoils pile located on the west side of bluff encompasses approximately three acres, with an estimated volume of 340,150 cubic yards. The spoils are sparsely vegetated with numerous erosion gullies and rills. One large erosion gully (approximately 12 feet in depth) is located on the south end of

the spoils pile, and drains into an intermittent dry draw/drainage.

A spoils pile containing approximately 159,340 cubic yards of spoils, and encompassing approximately 4 acres is located on the south end of the bluff. This spoils pile is moderately vegetated with limited signs of surface erosion.

The analytical results for soil samples collected from Bluff H during the 1999 site investigation show concentrations greater than three times background of arsenic, molybdenum, uranium, radium²²⁶, and uranium²³⁵. Radiation surveys identified an area of acutely contaminated material (estimated at 22,000 cubic yards) in the western portion of this Bluff.

1. Removal Site Evaluation

In 1964, the Forest Service noted that overburden from one of the claims mined by Kermac had slipped down the hill, through the Forest boundary fence, and caused considerable disturbance on an adjacent property owner's land and destroyed over 320 feet of fence. In 1991, after several other incidents at the Riley Pass Uranium Mining site, the Forest Service contracted Denver Knight Piesold to conduct an Environmental Evaluation at the main disturbed area (later identified as Bluff "B") within the Project area. After 1991, other time-critical actions (described later in this document) were taken at the Project area. Potential for similar releases still exist.

In 1999 the USDA Forest Service contracted with Pioneer Technical Services to complete a Site Investigation. That investigation resulted in a number of water, soil, and sediment samples being collected from the site and the result of that sampling effort being published in the final Site Investigation (SI) report that was issued in 2002. Following the issuance of the SI, Pioneer Technical, still under contract with the Forest Service, utilized the result from the SI to develop a Draft Final Engineering Evaluation and Cost Analysis (EE/CA). Additional sampling was done by Portage Environmental (also under contract to the Forest Service) in 2004 in order to develop a comprehensive Human Health and Ecological Risk assessment that was included into the Draft Final EE/CA which was completed by Pioneer Technical in 2005. After receipt of public comments on the Draft Final EE/CA, a Final EE/CA (including a revised Final Risk Assessment) was issued by the Forest Service in October of 2006.

2. Physical Location

The Riley Pass Uranium Mines Site is located in the North Cave Hills area of Harding County, South Dakota. The Site is approximately 25 miles north of Buffalo, South Dakota, which is the county seat, and 100 miles north of Belle Fourche, South Dakota. Ludlow, South Dakota, is the nearest town to the site and is located approximately five miles due east. The Sioux District Office of the Custer National Forest of the USFS primarily administers the area, but a small fraction of the Project area is also situated on private land. The mined areas that are associated with the Site covers approximately

250 acres of highwalls, pit floor, and spoils in Sections 20, 21, 22, 23, 25, 26, 27, 29, 35, and 36 of Township 22 North, Range 5 East of the Black Hills Meridian and are broken into 12 bluffs. These bluffs are shown on the enclosed map. The sites are bordered by USFS, private, and U.S. Department of Interior/Bureau of Land Management (BLM) land.

The North Cave Hills area serves as the headwaters of the South and North Forks of the Grand River which flows into the Missouri River at Mobridge, South Dakota, 200 miles away.

There are currently several ranches within one to five miles of the Project area. Primary land uses in the area include grazing, hunting, hiking, ATV/motorcycle use, camping, and American Indian spiritual use.

3. Site Characteristics

The Project area is located at an elevation of 3,200 feet above mean sea level. The USFS records from 1931 through 1973 report average annual precipitation at Ludlow, South Dakota, at 14.8 inches. Approximately 73% or 10.8 inches of this precipitation appears in the form of rain during May through September. Significant precipitation occurs during convective storms, often accompanied by strong winds and occasional flash flooding. June is the wettest month of the year, with an average rainfall slightly over three inches.

The North Cave Hills form a diverse and varied landscape compared with the surrounding short and midgrass prairies. The rimrock hills, with their complex slopes and aspects, create unique microclimates and diverse vegetation. Several habitat types have been recognized by the USFS in this region. Landscapes include hardwood draws, ponderosa pine woodlands, and several grassland ecosystems.

Schleichart Draw Reservoir was constructed as a stock water dam and unrelated to the abandoned uranium mines, as was the Schleichart Draw Ducks Unlimited Pond located below Schleichart Draw Reservoir. Sediments from the mines, mainly Bluff B, have been transported to the reservoir. Bluff B is approximately 1.25 miles away from Schleichart Draw Reservoir and approximately 1.5 miles away from the Schleichart Draw Ducks Unlimited Pond. Schleichart Draw Reservoir was reported to have been a trout pond for a number of years prior to mining.

4. Release or Threatened Release into the Environment of a Hazardous Substance

a. Hazardous Substances

The hazardous substances, as defined in section 101(14) of CERCLA, found at the Project area include arsenic, molybdenum, thorium, uranium, and radium²²⁶ metals.

Concentrations of hazardous substances in solid wastes and surface water are documented in the EE/CA (Pioneer, 2006).

b. Sampling and Analytical Data

The sampling methods used to collect the chemical data are described in the EE/CA (Pioneer, 2006).

A substantial number of soil, sediment, and water samples were taken at the Project area during the course of three (3) major sampling events from 1991 to 2004. The sampling events documented the concentration and migration of the contamination from the historically mined portions of the bluffs to the various re-deposit points in Pete's Creek drainage and Schleichart Draw. Laboratory analytical results indicated elevated levels of arsenic, molybdenum, thorium, uranium, and radium²²⁶ as compared to measured background concentrations.

In addition, radiological measurements were made at the various bluffs to determine radiation exposure levels at the Project area. Measurements revealed that the highest radiation levels are from the lignite material which was the source of uranium mined in the area.

Surface water sampling took place at several locations within the various drainages associated with the Project area as well as two other non mined drainages. Indications are that the water quality for the area is naturally degraded due to the mineralization associated with the area. However, it was documented that the historic mining activity and subsequent erosion stemming from that activity is locally impacting the surface water quality from the source of the contaminants to points at or near the Forest Service boundary.

c. Mechanism for Past, Present, or Future Release

The sediment and mine waste generated by past activity at the Project area to a large extent are un-vegetated and unconfined due to the geological make up of the material. Runoff erodes material into Pete's Creek and Schleichart Draw. Winds can cause material to be airborne and transported offsite.

d. Events or Features that could Spread or Accelerate Releases

Large runoff events, particularly during the late summer, present potential conditions for increasing erosion of the material into the surface water drainages and onto the surrounding land surfaces. Water quality in Schleichart Draw has been shown to be impacted by the contaminants. Retention ponds built by the Forest Service in the 1980s, have been filled to capacity and have been cleaned out on at least two occasions. Additional sediment loading and eventual embankment failure of these retention ponds could result in large-scale releases. Schleichart Draw reservoir and the Ducks Unlimited pond also appear to contain large amounts of sediments eroded from the mined areas.

e. Properties that Influence the Rate of Releases

The primary mechanisms of movement of contaminated material:

- Erosion into surface water courses and onto adjacent land
- Dissolution of contaminants in runoff
- Infiltration of dissolved metals into soil

Because of its chemical and soil characteristics the contaminated material associated with the historic mining activity does not readily support plant life and continues to be vulnerable to erosion by water and wind. In addition, the contaminated materials are uncontained and the outer slopes are quite steep, contributing to accelerated erosion.

Actions taken during the non-time-critical removal are designed to vegetate the site, reduce overland migration of the contaminated material, and reduce infiltration of water into the contaminated material which would result in the release of the contamination.

Actions directed at reducing infiltration through, and runoff from, the contaminated material should result in surface water quality improvements. In addition, isolation of the highly contaminated material in engineered repositories will prevent the highest contaminated material from being exposed to water and wind thereby substantially reducing the human health and environmental threat.

5. National Priority List (NPL) Status

The Riley Pass is currently not on the National Priority List. No other removal or remedial activities are currently in progress.

6. Maps, Pictures, and other Graphic Representations

A location map and map of Project area features from the Final EE/CA (Pioneer, 2006; Figure 2-1) is provided as Attachment 1.

B. Other Actions to Date

1. Previous Actions

As previously mentioned, numerous actions, investigations and time critical actions have been taken at the Project area. These include:

1965-The Forest Service moved a segment of the Riley Pass road that was being buried by overburden from Bluff B.

1973-After negotiations with Kerr McGee (predecessor to Tronox), the company constructed flow control dikes and diversion ditches at Bluff B. In addition, another portion of the Riley Pass road was relocated.

1989-The Forest Service constructed five sediment retaining ponds to trap sediment eroding from Bluffs A and B.

1990-The Forest Service had sediment removed from two of the five sediment retaining ponds.

1991-Denver Knight Pièsold of Denver, Colorado, was retained by the Forest Service to evaluate existing conditions, develop plausible response action alternatives and provide a cost estimate for each alternative. Denver Knight Pièsold's investigation was limited to Bluff B. The 1990 and 1991 investigation included surface water quality analyses and radiological measurements.

1996-The Forest Service sent Kerr McGee Corporation (predecessor to Tronox) a CERCLA 104 (e) letter notifying them of potential liability under CERCLA. The Forest Service conducted a time critical removal action to remove sediment from the sediment retaining ponds.

1999 to 2002- The Forest Service retained Pioneer Technical Services to conduct all steps needed to produce a Site Investigation and EE/CA.

2002-The Forest Service posted signs in the area warning the public of the potential hazards associated with the Project area.

2004-The Forest Service retained Portage Environmental Incorporated to gather additional samples and information to produce a comprehensive Human Health and Environmental Risk Assessment. In addition, the Forest Service conducted a time-critical removal action to remove sediment from the sediment retaining ponds.

2005-The Draft Final EECA was delivered to the Forest Service and released to the public.

The Forest Service continued discussions with the State of South Dakota, EPA, and Tribes.

A Public meeting was held in May 2005 in Buffalo, South Dakota to inform interested parties of history, conditions of the site, as well as, the processes associated with CERCLA. A public notice appeared in the Rapid City Journal on July 11, 2005 and the Nation's Center News on July 14, 2005 announcing that the draft EE/CA was available, setting the time for the comment period, and listing the location of the Information Repositories. A 60-day comment period was established which ended on September 12, 2005. Three public meetings were held on August 24, 25, and 26, 2005. The meetings were held in Rapid City, Buffalo, and Bullhead, South Dakota, to solicit comments on the EE/CA. Comments and data collected were incorporated into the final version of the EE/CA. Copies of the Administrative Record, including the final and all draft versions of the EE/CA are available for public review at Information Repositories in Camp Crook (Sioux Ranger District of the Custer National Forest) and Buffalo (County Courthouse).

The Forest Service received numerous public comments generated by the release of the Draft EE/CA.

2006-The Forest Service came to an agreement with SD State DENR on the ARARs to be included in the Final EE/CA.

In January of 2006 Tronox was sent a formal demand for reimbursement of costs incurred by the Forest Service for all actions taken to date at the Project area. Negotiations with Tronox were conducted to reach a settlement agreement under which the proposed actions in this Action Memorandum will be conducted by Tronox. Tronox voluntarily performed the installation of preliminary re-vegetation test plots on Bluff B. A Responsiveness Summary to public comments received was prepared, and a Final EE/CA incorporating a revised final risk assessment was prepared and released.

To date The Forest Service has expended over \$637,464 for response actions taken at the Riley Pass Uranium Mines site to address those bluffs and features addressed by this Action Memorandum.

2. Current Actions

The primary objectives for the removal action at the Project area are to attain a degree of isolation, containment, and clean-up of hazardous substances that assures protection of public health, safety and welfare of the environment; as well as reducing erosion of contaminated material from the Project area, reducing stream sedimentation attributable to soils erosion; eliminating risk of future offsite soils migration; and achieving revegetation of the Project area consistent with a long-term maintenance plan that will require a minimum of effort.

As explained in the EE/CA, although not an objective of this removal action, the reduction of stream sediment that will result from the proposed action is expected to minimize the impact to surface water quality stemming from total metals within the sediment.

No other government or private cleanup activities are currently being conducted at this Project area.

C. State and Local Authorities' Role

1. State, Local, and Tribal Actions to Date

The Forest Service has been cooperating throughout the project with the South Dakota Department of Environmental & Natural Resources, South Dakota Game, Fish & Parks, the South Dakota Division of Forestry, the South Dakota Governor's Office, the Harding County Commissioners, and the Bowman/Slope Soil Conservation District. A list of Applicable, or Relevant and Appropriate Requirements (ARARs) has been developed for the project with significant input provided by the State of South Dakota.

A briefing was given to the Standing Rock Sioux Tribal Council. Notification letters were sent to the Crow, Northern Cheyenne, Standing Rock Sioux, Cheyenne River Sioux, Crow Creek Sioux, Lower Brule Sioux, Yankton Sioux, Ogalala Dakota Nation, Mandan-Hidatsa-Aikara and Three Affiliated Tribes regarding various public meetings and opportunities to add input into the process. Meetings were held on Project area with various Tribal Historic Preservation officials to receive input concerning cultural concerns at the Project area.

All cooperating agencies and governments have been provided an opportunity to review the various project documents. Comments have been provided to the USDA Forest Service and are documented in the Responsiveness Summary included in the Final EE/CA. All communications with the various agencies and governments have been documented in the Community Involvement Plan for the Riley Pass Abandoned Uranium Mines (USFS, 2006).

2. Potential for Continued State/Local Response

Neither the State nor local authorities have the resources or authority to conduct a Removal Action at this time. State and local constituents will continue to be involved in site activities and will be kept apprised of all activities conducted as part of this Removal Action.

III. THREATS TO PUBLIC HEALTH OR WELFARE AND THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES.

The EE/CA indicates there is a threat to public health or welfare, or to the environment as set forth in the National Contingency Plan (NCP) at 40 CFR 300.415(b)(2). Briefly, this threat is the risk associated with exposure to metals and radionuclides in areas impacted by mining and risk of present and future metals and radionuclide contamination of the surrounding lands and surface waters in the Schleichart Draw and Pete's Creek drainages.

Due to the concentrations of contaminants in the mine waste sources (Pioneer, 2006), conditions at these sources meet the criteria for initiating a Response Action under 40 CFR 300.415(b)(2) of the NCP. The following factors from 40 CFR 300.415(b)(2) of the NCP form the basis for USDA Forest Service's determination of the threat present and the appropriate action to be taken:

- (i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;
- (ii) Actual or potential contamination of sensitive ecosystems;
- (iii) High levels of hazardous substances, pollutants, or contaminants in soils largely at or near the surface that may migrate;
- (iv) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.

A. Threats to Public Health or Welfare

A Risk Assessment conducted for the Forest Service by Portage Environmental Incorporated (Portage, 2006) identified human-health and ecological risks posed by current conditions at the Project area that exceed minimum U.S EPA-defined risk levels that are protective of human health and the environment [i.e., an excess lifetime cancer risk higher than 1×10^{-4} (1 in 10,000)]. The risk assessment determined that the risk levels for maximally exposed individuals could potentially be as high as 3×10^{-3} . Potential human-health exposure pathways identified include ingestion of contaminated soils, surface water contaminated by contact with surface soils, consumption of beef by local ranchers, consumption of game meat by hunters, inhalation of airborne contaminated soils, direct dermal contact with exposed contaminated soils, and direct gamma irradiation from contaminated soils. These pathways, and the associated

calculated potential risks are the result of elevated concentrations of contaminants (metals and radionuclides) in mining spoils (soils) that are exposed at the surface.

The area around the Project area is popular for recreational uses such as hiking, ATV/motorcycle use, hunting, and camping. In addition, the Project area is used by various American Indian tribes for spiritual purposes. There is a potential for inhalation of airborne contaminated soils from such recreational and spiritual uses.

The highest risk potential scenarios (Permit Holder and Recreational Visitor) were used to back-calculate preliminary concentrations in soil that are protective of human health. This range of risk-based preliminary soil cleanup concentrations for radionuclides was presented in Section 5 (Risk Assessment) for 10^{-4} , 10^{-5} and 10^{-6} risk levels assuming ingestion of beef/deer at 10%, 50% and 100% of total meat source. Section 6.2 of the EE/CA presented preliminary risk-based soil concentrations for consideration at the Riley Pass site for a risk level of 1×10^{-6} and assuming 100% beef ingestion (for arsenic) and 10% beef ingestion (for radium).

B. Threats to the Environment

Primary ecological receptors are the animal species that utilize the forage and water resources of the Riley Pass area. The pathways by which ecological receptors could become exposed to contaminants at the Project area are through direct contact with soils, ingestion of contaminated soils, direct contact with water and sediments, ingestion of water and sediments, and ingestion of contaminated food.

The Schleicht Draw reservoir was reported to have been a trout pond prior to mining in the 1960s. Ducks Unlimited developed a waterfowl pond downstream from the Schleicht Draw reservoir. The functionality of both water features have been diminished dramatically due to sedimentation and poor water quality. Aquatic life chronic surface water standards for arsenic and lead are exceeded for many of the sediment retention ponds located at the Project area, while acute aquatic life water standards for copper are exceeded in all water sources at the Project area, including Schleicht Draw reservoir and the Ducks Unlimited pond.

The presence of bare unvegetated soils and sediment deposits can partially be assumed as being the result of phytotoxic conditions.

A threat to the environment also exists through the migration of, and airborne exposure to, contaminated dust. On dry windy days, dust may migrate to surface waters, wetlands, and other areas as the dust becomes airborne.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from this Project area, if not addressed by implementing the response action selected in the Action Memorandum,

may present an imminent and substantial endangerment to public health, or welfare, or the environment.

V. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

The EE/CA (Pioneer, 2006) evaluated six alternatives to address the purpose and need to take action. These are displayed in Table 1 below:

TABLE 1 – Action Alternatives for Riley Pass Uranium Mines Site

Alternative	Description
Alt 1	No Action
Alt 2	Institutional Controls
Alt 3	Minimal Grading and Sediment Control
Alt 4	Comprehensive Grading and Sediment Control
Alt 5	Comprehensive Grading, Consolidation and Containment of Acutely Contaminated Materials, and Sediment Control
Alt 6	Comprehensive Grading, Consolidation and Containment of Acutely Contaminated Materials, Sediment Control, and Reduction of High Walls

The EE/CA evaluated how each alternative complied with Applicable or Relevant and Appropriate Requirements (ARARs). More detail on the removal action objectives and alternative analysis can be found in the final EE/CA. The Agency preferred response consists of a combination of alternatives documented in the final EE/CA and are displayed in Table 2 below.

INDIVIDUAL BLUFF	PREFERRED ALTERNATIVE	ESTIMATED COST*
Bluff B	Alternative 5	\$12,943,004.00
Bluff C	Alternative 3	\$409,784.00
Bluff D	Alternative 3	\$494,099.00
Bluff E	Alternative 3	\$454,222.00
Bluff G	Alternative 5	\$730,150.00 - \$1,217,060.00
Bluff H	Alternative 5	\$2,070,587.00

* The estimated cost for reclamation of bluffs are preliminary and may vary as the Removal Action progresses

The proposed action will consist of implementation at the Project area of the preferred alternatives as generally described in Sections 7 and 8 of the EE/CA, applying the

criteria specified below. After review of public comments received on the site-wide EE/CA, the Forest Service determined it was not necessary to revise the selection of these preferred alternatives for the Project area in response to public comments. The Forest Service has determined that implementing the proposed action in this way is expected to result in post-reclamation conditions at the Project area that are materially consistent with the stated objectives of the preferred alternatives, Forest Service responses to comments, appropriate risk reduction requirements and criteria established in this Action Memorandum by the Forest Service, and the requirements of the NCP.

1. Proposed Action Description

The proposed action is to contain, consolidate, stabilize, and vegetate contaminated soil, spoils, and sediment associated with the historic mining activities within the Riley Pass Uranium Mines site associated with Bluffs B, C, D, E, G, and H that are on lands administered by the Forest Service. The proposed actions will substantially lower the human health risk to an approximate value of 1×10^{-5} which is considered safe by both the U.S. EPA and Forest Service by mitigating exposures to acutely and significantly contaminated materials as explained immediately below and then in Section 1.a. At its discretion Tronox may be involved during this removal action with the mitigation of material (including contaminated material) on adjacent private lands that have migrated from historic mining activities on lands administered by the Forest Service. This may involve the return of impacted materials that have migrated off of National Forest System lands back to NFS lands. Management of these materials will be in accordance with the criteria established herein.

The proposed action will be accomplished by implementing the preferred alternatives for these bluffs identified in the EE/CA and in doing so, applying the reclamation criteria specified below. The selection of one alternative over another was based, as described in the EE/CA, on the presence of acutely contaminated material on a given bluff and the relative reduction of the human health and environmental risks required at each bluff to meet U.S. EPA risk-protective standards. The preferred alternatives that constitute the proposed action are:

Alternative 3: Minimal Grading and Sediment Control (proposed action for Bluffs C, D, and E)

Alternative 3 is the preferred alternative for bluffs where the presence of significantly or acutely contaminated materials was not documented in the EE/CA. It involves, in those areas disturbed by mining where a protective vegetative cover has not successfully re-established and active erosion is occurring, smoothing of spoils and berm piles located on top of the bluffs and possibly using excess materials to spread over areas of high concentrations of arsenic, molybdenum, radium²²⁶, and uranium²³⁵ and exposed lignite that may be identified. After any regrading of such areas, the materials would then be amended with organic material and/or fertilizer followed by the seeding of the area. Sediment basins and control ditches may be incorporated into the design as part of a Best Management Practice (BMP).

Alternative 5: Comprehensive Grading, Consolidation and Containment of Acutely Contaminated Materials, and Sediment Control (proposed action for Bluffs B, G, and H)

Alternative 5 is the preferred alternative for bluffs where the presence of significantly or acutely contaminated materials was documented in the EE/CA. It includes regrading the disturbed areas on portions of a bluff that contain limited amounts of contamination, and mitigation of significantly contaminated materials. Side slopes may need to be graded to allow for successful establishment of vegetative covers and for safety of workers during the implementation of the action. Partial removal of acutely contaminated waste materials would occur within the Project area. This removal and isolation is necessary for areas containing high concentrations of arsenic, radium²²⁶ and uranium²³⁵, and to prevent more waste materials from entering the drainages of Schleichart Draw and Upper Pete's Creek. These acutely contaminated materials would be placed in engineered waste consolidation areas located within a bluff. Additional, excess waste materials from the side slopes may be excavated, hauled, and placed next to the high walls or within waste consolidation areas. Conceptual locations and designs of the waste consolidation areas were stated in the EE/CA. However, further work to locate and design appropriate waste containment areas will occur as part of the Removal Action. Construction of sediment basins would occur to control sediments from being carried from the area. As part of this alternative, run-on/runoff control ditches may be incorporated into the design to control storm water events. All re-graded areas will be amended with organic material or fertilizer and seeded.

The reclamation objectives are to reduce long-term maintenance requirements, ensure adequate rooting depth for grasses, shrubs, forbs, and/or other plants that will be planted, or may naturally establish, on the Project area, and prevent erosion of the soils and sediment.

The cleanup criteria defined below will determine the extent of excavation, re-grading, mitigation, and internment of the contaminated soils, spoils, and sediment. Cleanup levels established by these criteria (see Section 1.a., below) are protective of humans and ecological receptors from exposure to all contaminants (including the primary contaminants arsenic and radium²²⁶). A direct correlation exists between arsenic and radium-²²⁶ concentrations, therefore cleanup of the Project area to a risk-protective radium²²⁶ concentration will result in arsenic concentrations that, when combined with the risk associated with the radium²²⁶ will be protective of human health and potential environmental receptors. In addition, using radium²²⁶ as the direct clean-up guideline will allow for direct quantifiable measurements to be made in the field during the course of the removal action.

The following specific criteria will be met in the implementation of the Removal Action

Criteria 1: Applicable to Bluffs B, G, and H

The Forest Service has defined the following soil reclamation criteria that it has determined to be risk-protective and that will be applied to these bluffs. These criteria define the reclamation and materials handling requirements for these bluffs where there is demonstrable disturbance attributable to surface mining activities. Measurement to confirm attainment of these criteria will be based on surface gamma radiation readings correlated to radium²²⁶ activity and based on block averaging. Existing gamma survey data will be reviewed and limited supplemental surveys may be conducted as required to refine reclamation plans. This will provide the basis for applying the reclamation criteria. Upon completion of the site reclamation, Bluffs B, G, and H will be divided into appropriately sized grids. Utilizing radiation detector equipment, a transect survey will be conducted to the extent practical across each grid in order to record readings to verify that cleanup criteria have been met. Areas such as side slopes and highwalls will be scanned to the extent safety and accessibility allow. The average of the radiation readings collected in a specific grid block will be used to determine if the criteria have been met for that block.

Category 1: Less than or equal to 30 pCi/g Ra-226

If materials in this category at these bluffs are vegetated and sufficiently stable (i.e., no significant erosion occurring), they will be left undisturbed to the extent practical. If the materials are poorly vegetated and active significant erosion is occurring, they will be addressed by grading, compaction or otherwise stabilized and revegetated. Soil amendments needed to assist in a successful re-vegetation program will be determined by field test plots. Areas where the base rock is exposed will not be recovered and re-vegetated. Areas are to be monitored for successful re-vegetation for a period of 3 years.

Category 2: Greater than 30 pCi/g but less than or equal to 50 pCi/g Ra-226

For materials in this category at these bluffs, mitigation efforts will be implemented to bring average radium measurements down to less than or equal to 30 pCi/g by any practical combination, as necessary, of covering, removing, or other means identified in the field so long as the desired goal is achieved. Areas will be vegetated to achieve soil stability and prevent erosion as described above. Areas are to be monitored for successful re-vegetation for a period of 3 years.

Category 3: Greater than 50 pCi/g Ra-226

Materials in this category at these bluffs which were historically covered by significant volumes of overburden will be excavated and placed in a designed disposal repository located at the Project area. In the case of exposed coal seams in the highwall that exceed these criteria, the seams will be covered or otherwise mitigated where technically feasible but not excavated. While the number of disposal sites will be

limited, there may be more than one to allow for flexibility and efficiency in getting the material to a repository. Disturbed areas will be vegetated to achieve soil stability and prevent erosion as described above. Areas are to be monitored for successful re-vegetation for a period of 3 years.

Criteria 2: Applicable to Bluffs C, D, and E

The Forest Service has defined the following soil reclamation criteria that it has determined to be risk-protective and that will be applied to these bluffs. In areas at these bluffs where minimal overburden was historically present and vegetation has stabilized the soils so that no significant erosion is occurring, no reclamation will be required. In areas where only the base rock is exposed, no reclamation will be required provided no substantial erosion is occurring. In those small areas where active significant erosion is occurring due to poor vegetation cover, appropriate stabilization efforts will be performed along with the establishment of a vegetative cover. Materials associated with historic mining activities existing on and immediately adjacent to Forest Road 3130 in the area of Bluff E exceeding the Criteria 1; Category 2 Radium²²⁶ concentration will be relocated to an area away from the road, then stabilized and vegetated. Institutional controls such as signs or fencing may be temporarily implemented if deemed necessary until vegetative covers have been established and no erosion is exposing soil material. Areas are to be monitored for successful re-vegetation for a period of 3 years.

a. Address Identified Human Health and Environmental Threats

Regrading, stabilizing, and re-vegetation of spoil materials at the Project area will result in the development of a vegetative barrier between the human/environmental receptor and these materials, and will prevent migration of these materials from the Project area. Removal and isolation of acutely contaminated materials and mitigation of significantly contaminated materials is an appropriate response because it will stabilize soils and prevent sediment from migrating into the surface waters or coming into contact with or exposing human or environmental receptors to unacceptable risks.

Given the complex mineralogical make-up of the Riley Pass area and the corresponding background concentrations of certain metals and radioactive elements, the appropriate protective human health risk value for the area based on background arsenic conditions and scenarios described in the EE/CA, is 2×10^{-5} . The cleanup criteria selected by the Forest Service will result in a more protective post-reclamation risk level of 1×10^{-5} .

A radium²²⁶ soil concentration of 30 pCi/g is protective to the 1×10^{-5} risk level for the most exposed individual described in the EE/CA (Permit Holder based on a 10% locally produced beef consumption scenario). When the radium²²⁶ soil concentration is 30 pCi/g, the corresponding arsenic concentration at Riley Pass is expected to be approximately 142 mg/kg (see Table 3- Bluff H data, below). This arsenic concentration in soil conservatively results in an estimated risk to the Permit Holder of 1×10^{-5} .

Exposures of ecological receptors at the Project area will also be risk-protective with

the implementation of the 30 pCi/g radium²²⁶ soil cleanup concentration. U.S. EPA recently published arsenic Eco-Soil Screening Levels (SSL) for protection of representative species of birds and mammals (March 2005). These SSLs support the selected criteria and cleanup levels. For birds the conservatively protective arsenic EcoSSLs range from 43 mg/kg (protective of an avian insectivore consuming all food from a confined area) to 1100 mg/kg for an avian carnivore. Similarly, for mammals, the range is 46 mg/kg for an insectivore confined to the area to 170 mg/kg for carnivores. The proposed action will result in average arsenic concentrations at or below 142 mg/kg in the most contaminated areas, and well below this concentration across the entire ecological exposure area.

TABLE 3 – Estimated Chemical Concentrations at 30 pCi/g Ra-226 in Soil

COPC*	Bluff H Average Soil concentrations mg/kg or pCi/g	Normalized to Ra-226 at 1 pCi/g mg/Kg or pCi/g	With Ra-226 at 30 pCi/g mg/kg or pCi/g
Arsenic	477.6	4.73	142
Molybdenum	616.6	6.10	183
Selenium	1.5	0.01	0.45
U-238	131	1.30	39
U-234	136	1.35	40
Th-230	135	1.34	40
Ra-226	101	1.00	30
Pb-210	101	1.00	30
U235	6.22	0.06	2
Pa-231	6.22	0.06	2
Ac-227	6.22	0.06	2

* Contaminant of Potential Concern

b. Justification for Proposed Response

The USDA Forest Service has proposed a Project area response which is a combination of EE/CA alternatives 3 and 5. This response was selected for the various areas within the Project area because it reduces post-reclamation exposures and risks to levels that are well within the range defined by U.S. EPA as protective of human health and the environment and provides the best combination of effectiveness, implementability, and cost as evaluated in the EE/CA.

Re-vegetation studies will be conducted as part of the removal action to determine the best soil stabilization, plant species mix, fertilizer, and amendment procedures that will ensure continued stabilization of the Project area and protection to human health and the environment.

c. Technical Feasibility and Probable Effectiveness

The proposed actions will effectively reduce exposure levels as well as contaminant mobility at the Project area by establishing a barrier between materials with contaminants at concentrations above risk-protective levels (acutely or significantly contaminated materials) and the human/environmental receptor. The proposed actions

for the various areas are technically and administratively feasible. The actions will reduce the human health risks to the 1×10^{-5} level which is protective under U.S EPA standards, and appropriate for this Project area given the fact that the natural background conditions (due to the complex mineralization of the area) constitute human health risks at a level greater than 1×10^{-6} . Key project components such as equipment, materials, and construction expertise, although distant from the Project area, are available and would allow the timely implementation and successful execution of the alternatives.

Stabilizing and isolating contaminated soils and sediment will effectively eliminate pathways for human health risks such as inhalation/ingestion of contaminated soils and sediment, dermal contact with the contaminated material and gamma irradiation from direct exposure to the contaminated material. This action will require little maintenance and provide long-term effectiveness.

d. Further Information

No further information is needed to select the proposed action.

e. Verify Extent of Contamination

Final contours, visual observations, and field testing will be used to determine the completeness of the removal action. In particular, direct gamma measurements will be used to accurately quantify the radium²²⁶ concentrations. The direct gamma measurements will be accomplished by dividing the reclaimed areas into appropriate grids and by obtaining the average gamma reading for the individual grid cell to determine that the cleanup for that cell is met. This method will be used to direct the extent of the removal action since it is easily implemented in the field, allows for instant results, and because there is a direct correlation between radium²²⁶ and arsenic concentrations, it will allow for simultaneous verification of arsenic concentrations.

f. Sensitive Environments

Increased sedimentation may result during the implementation of the action at the Project area. These impacts can be mitigated by limiting the construction period to the drier months of the year and by implementing best management practices for storm water runoff. Since the Project area and surrounding locations are known to contain a high heritage site density, areas of new disturbance must be reviewed and approved by a Forest Service approved consultant or the Forest Archeologist prior to initiation of restoration work.

g. Access

The FS has legal access into the North Cave Hills across the county Tufte and Johnson Roads. Access roads will be maintained during the construction season. Any temporary access roads will be reclaimed at the completion of the construction season.

h. Uncertainties

Uncertainties associated with implementing these actions are limited to the uncertainty of knowing the exact volumes of the various categories of contaminated soils and sediment that will be addressed or isolated.

i. Institutional Controls

Following construction, a temporary 4-strand barbed wire fence may be constructed around the perimeter of reclaimed areas to protect against livestock and vehicle damage. The fencing will be removed once the area is re-vegetated.

Appropriate control measures will be instituted, such as recording a summary of the removal actions in land status documents and deed notices to notify potential users and possible future land purchasers of onsite hazards. These, and other control measures, will be reviewed and could be revised during future actions taken at the Riley Pass Uranium Mines site.

j. Off-Site Disposal

Off-site disposal was considered in the EE/CA, but was not brought forward for further evaluation since the contaminated materials are being disposed on-site and the benefits of transporting the material off-site would not justify the prohibitively high costs.

k. Post-Removal Site Controls

Post-removal site controls will be required. An operation, monitoring and maintenance plan will be prepared to define these controls. Post-removal site control at excavation and re-grading sites will involve monitoring to identify any problems with revegetation, drainage, or erosion.

l. Changes Resulting from Public Comments

Written comments were received on the final draft (June 2005) EE/CA from the EPA, South Dakota Department of Environmental & Natural Resources, South Dakota Game, Fish & Parks, Tronox, and other public and private entities. The comments and Forest Service responses are included in the Final EE/CA that is included with this Action Memorandum.

2. Short-Term Impacts

The major short-term impact to the closest community, residents, recreational users, and wildlife involves increased vehicle traffic and temporary delays to passage on various roadways surrounding the Project area. An increase in traffic will occur during mobilization and demobilization of construction equipment. Travel delays may also be necessary during removal and transport of contaminated material from various sediment

retention areas within the Pete's Creek and Schleichart Draw drainages. Increased traffic may impact wildlife by either changing their daily migration patterns or exposing them to a higher potential for injury or death due to collisions with vehicles. In addition, contaminated material that may be removed from private lands may temporarily impact the land owner's economic use of the area due to the short term removal of that land from agricultural uses.

3. Contribution to Remedial Performance

The selected Removal Action will likely be followed by other actions in the Riley Pass Uranium Mines Site area. This Removal Action will not mitigate all the mining impacts at the site. This source stabilization and removal will, however, address contributions from the major contributing areas within the Project area. This includes sediment impacts to surface water, and, in combination with the sum of all response actions for the overall site, is expected to meet project goals, objectives, and ARARs to the extent practicable. In addition the proposed action will lower the risk to human health and the environment. The proposed action will not impede future responses based on available information.

4. Description of Alternative Technologies

General response actions potentially capable of achieving response action objectives and goals were screened in the EE/CA (Pioneer, 2006). These included no action, institutional controls, engineering controls, excavation and treatment, and in-situ treatment.

a. Institutional Controls

Institutional controls include land use and access restriction. Institutional controls by themselves will not prevent migration of the contaminants off-site through surface water, or air. Therefore, institutional controls as a separate alternative were not considered by themselves in detail. However, institutional controls as components of other alternatives were considered.

b. Engineering Controls

Engineering controls limit the release or threat of release of hazardous substances generally by limiting mobility through isolation, and/or by limiting physical processes necessary for mobility. These measures included removal, containment, chemical fixation, and surface controls. All of these measures were incorporated into the alternatives considered for this Project area.

c. Waste Disposal

Waste disposal options are used as a source control measure by placing contaminated media in an engineered repository. The EE/CA evaluated excavation of the contaminated soils and sediment for disposal in an on site engineered repository.

However, due to the remoteness of the site and the large volumes of material in question, the EE/CA did not evaluate the excavation of the contaminated material for transport and placement in an off-site engineered repository.

d. Miscellaneous Alternatives

No evaluation was conducted for technologies that directly address surface water because water treatment technologies are beyond the scope of this phase of the response action. The removal of solid wastes from contact with the environment makes it likely that a reduction in contaminant concentrations will occur in surface water and streambed sediments.

Various response actions and technology types were evaluated but rejected due to a variety of reasons including uncertainties in effectiveness and high cost. These response actions included onsite reprocessing of the material to extract residual mineralization. The concentrate generated by reprocessing would be shipped offsite for processing, while byproducts of reprocessing would be consolidated and placed in an onsite repository, amended, if necessary, and revegetated.

5. Engineering Evaluation/ Cost Analysis (EE/CA)

Pioneer Technical, on contract to the Forest Service, prepared the final EE/CA that details site characteristics and identifies, develops, and evaluates alternatives. This undertaking was accomplished with substantial input from Forest Service specialists who analyzed the effects of the alternatives identified in the EE/CA and considered public comments. From this effort the Forest Service was able to select the preferred alternative. A copy of the EE/CA is attached (Pioneer, 2006).

6. Applicable or Relevant and Appropriate Requirements (ARARs)

Section 300.415(i) of the National Contingency Plan (NCP) and guidance issued by the Environmental Protection Agency (EPA) require that removal actions attain ARARs under federal or state environmental laws or facility siting laws, to the extent practicable considering the urgency of the situation and the scope of the removal (EPA, 1993). In addition to ARARs, the lead Agency may identify other federal or state advisories, criteria, or guidance to be considered for a particular release.

ARARs are categorized as either applicable or relevant and appropriate. Applicable requirements are those standards, requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, or contaminant found at a site. Relevant and appropriate requirements are those standards, requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that are not applicable to a particular situation but apply to similar problems or situations, and therefore may be requirements for a response action to address.

The following tables identify those ARARs that were evaluated during the development of the EE/CA, and present the Forest Service's final determination of ARARs for the proposed action.

During preparation of this Action Memorandum, the Forest Service identified certain typographical errors in the ARARs tables contained in the Final EE/CA. All identified errors have been corrected in the tables below. The Forest Service reviewed the evaluation of alternatives in the EE/CA relative to ARARs and has determined that the evaluation and selection of the preferred alternatives is consistent with the final ARARs presented below.

FEDERAL ARARs FOR THE RILEY PASS PROJECT

FEDERAL- CHEMICAL SPECIFIC

Standard, Requirement Criteria Or Limitation	Citation	Description	ARAR Status
<u>Ambient Water Quality Criteria</u>	40 CFR Part 131 Quality Criteria for Water 1976,1980, 1986	Sets criteria for water quality based on toxicity to aquatic organisms and human health.	Not an ARAR for the actions being considered for this project
<u>Soils Cleanup Criteria</u>	40 CFR Part 192 Subpart B	This citing sets guidelines for the cleanup of sites that were used to process Uranium ores and as a result generated mill tailings that contain radio-nuclides. The actions proposed for this Project area are based on site-specific risk based clean up goals.	Not an ARAR for the actions being considered for this project
<u>Exposure Limits for Radioactive Wastes</u>	40 CFR Part 190 (10 CFR 20.1301)	Sets radiation exposure limits to the public	Relevant and Appropriate

FEDERAL- LOCATION SPECIFIC

Standard, Requirement Criteria Or	Citation	Description	ARAR Status

Limitation			
<u>National Historic Preservation Act</u>	16 USC § 470; 36 CFR Part 800; 40 CFR 6.310(b)	Requires Federal Agencies to take into account the effect of any Federally-assisted undertaking or licensing on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places and to minimize harm to any National Historic Landmark adversely or directly effected by an undertaking.	Applicable
<u>Archaeological and Historic Preservation Act</u>	16 USC § 469; 40 CFR § 6.301(c)	Establishes procedures to provide for preservation of historical and archaeological data, which might be destroyed through alteration of terrain, as a result of a Federal construction project or a Federally licensed activity or program.	Applicable
<u>Historic Sites, Buildings and Antiquities Act</u> <i>Appendix A, Executive Order No. 11, 990</i>	16 USC §§ 461-467; 40 CFR § 6.301(a)	Requires Federal agencies to consider the existence and location of landmarks on the National Registry of Natural Landmarks to avoid undesirable impacts on such landmarks.	Applicable
<u>Protection of Wetlands Order</u>	40 CFR Part 6, Appendix A, Executive Order No. 11,990	Avoid adverse impacts associated with destruction or loss of wetlands and avoid support of new construction in wetlands if a practicable alternative exists.	Applicable
<u>Fish and Wildlife Coordination Act</u>	16 USC §§ 2901-2912; 40 CFR Part 6.302(g)	Requires consultation when Federal department or agency proposes or authorizes any modification of any stream or other water body and adequate provision for protection of fish and wildlife resources.	Applicable
<u>Floodplain Management Order</u>	40 CFR Part 6	Requires Federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid the adverse impacts associated with direct development of a floodplain. (Only substantive portions are applicable to on-site actions)	Applicable
<u>Endangered Species Act</u>	16 USC §§ 1531-1543; 40 CFR 6.302(h); 50 CFR Part 402	Activities may not jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify a critical habitat.	Applicable

<u>Migratory Bird Treaty Act</u>	16 USC §§ 703	Establishes a federal responsibility for the protection for the international migratory bird resource and requires consultation with the USFWS during reclamation design and reclamation construction to ensure the cleanup of the Project area does not unnecessarily impact migratory birds. Specific mitigation measures may be identified for compliance with this requirement. (Only substantive portions are applicable to on-site actions)	Applicable
<u>Resource Conservation and Recovery Act</u> Criteria for Classification of Solid Waste Disposal Facilities and Practices	40 CFR Part 257	Establishes performance criteria for solid waste disposal facilities and practices to avoid adverse effects on health or the environment	Relevant and Appropriate (For issues pertaining to the design and construction of a suitable repository)

FEDERAL- ACTION SPECIFIC

Standard, Requirement Criteria Or Limitation	Citation	Description	ARAR Status
<u>Clean Water Act</u> National Pollutant Discharge Elimination System (NPDES)	40 CFR Part 122.26	Requires permits for the discharge of pollutants from any point source into waters of the United States. The State of South Dakota has been delegated authority to implement the Clean water Act and enforces these through the Surface Water Discharge System. Sites under CERCLA are required to meet the substantive requirements of the permit but do not have to obtain an actual permit	This is not an ARAR for the actions being taken at this Project area because the action will not cause a point source discharge.
Hazardous	49 CFR Parts	Regulates the transport of hazardous waste	Relevant and

<u>Materials Transportation Act</u> Standards Pertaining to Transporters of Hazardous Waste	106-180	by rail, aircraft, vessel, or public highways. This includes metals that are listed under CERCLA.	Appropriate (If work utilizes State or County highways)
<u>Resource Conservation and Recovery Act</u> Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	40 CFR Parts 264.116 through 264.310	Establishes minimum national standards that define the acceptable management of hazardous waste for owners and operators of facilities that treat, store, or dispose of hazardous waste. Because of the Bevill Amendment for mine wastes these regulations can not be considered applicable and only substantive portions of the regulations are relevant and appropriate to on-site actions)	Relevant and Appropriate (For issues pertaining to the design and construction of a suitable repository)

STATE ARARs FOR THE RILEY PASS PROJECT

STATE CONTAMINANT SPECIFIC

Standard, Requirement Criteria Or Limitation	Citation	Description	ARAR Status for the Riley Pass Project
<u>Drinking Water Standards</u>	ARSD 74:04:05	Established the MCLs for public water systems. These standards are not applicable because they apply to community water supply systems.	(See Note# 1 below)
<u>Regulated Substances</u>	ARSD 74:34:01:02	Prohibits the un-permitted release of regulated substances to the environment. No person may discharge to the environment a regulated substance listed in § 74:34:01:03 except pursuant to and in compliance with the conditions of a federal or state permit or by activities allowed by federal or state law or rule. The mixture of a listed regulated substance with a non-regulated substance subjects the mixture to full regulation under this chapter.	(See Note# 1 below)
<u>Ambient Air Quality Standards</u>	ARSD 74:36:02:01	Establishes air quality guidelines.	Relevant and Appropriate

Standard, Requirement Criteria Or Limitation	Citation	Description	ARAR Status for the Riley Pass Project
	ARSD 74:36:02:02	Establishes ambient air quality standards. South Dakota has adopted the ambient air quality standards listed in 40 C.F.R. §§ 50.1 to 50.12, inclusive (July 1, 1997), except as revised in publication 62 Fed. Reg. 38711 to 38712 and 38894 to 38895 (July 18, 1997). They define the types and levels of air pollution above which the ambient air would limit the attainment of the goals specified in § 74:36:02:01. These standards apply to the entire state of South Dakota, and no person may cause these standards to be exceeded. The standards stated in 40 C.F.R. §§ 50.1 to 50.12, inclusive (July 1, 1997), except as revised in publication 62 Fed. Reg. 38711 to 38712 and 38894 to 38895 (July 18, 1997), include normal background levels of air pollutants.	Relevant and Appropriate
<u>Surface Water Quality Standards</u>	ARSD 74:51:01	Establishes water quality standards for surface water in the state of South Dakota.	
	ARSD 74:51:01:02	Requires compliance with the criteria of a designated beneficial use. A person may not discharge or cause to be discharged into surface waters of the state pollutants that cause the receiving water to fail to meet the criteria for its designated beneficial use or uses.	(See Note# 1 below)
	ARSD 74:51:01:05	Prohibits materials causing pollutants to form in waters. Wastes discharged into surface waters of the state may not contain a parameter that violates the criterion for the waters' existing or designated beneficial use or impairs the aquatic community as it naturally occurs. Where the interaction of materials in the wastes and the waters causes the existence of such a parameter, the material is considered a pollutant and the discharge of such pollutants may not cause the criterion for this parameter to be violated or cause impairment to the aquatic community.	(See Note# 1 below)

Standard, Requirement Criteria Or Limitation	Citation	Description	ARAR Status for the Riley Pass Project
	ARSD 74:51:01:06	Prohibits visible pollutants. Raw or treated sewage, garbage, rubble, un-permitted fill materials, municipal wastes, industrial wastes, or agricultural wastes which produce floating solids, scum, oil slicks, material discoloration, visible gassing, sludge deposits, sediments, slimes, algal blooms, fungus growth, or other offensive effects may not be discharged or caused to be discharged in surface waters of the state.	(See Note# 1 below)
	ARSD 74:51:01:07	Establishes that no materials may be discharged or caused to be discharged which affect the pH of the receiving waters by more than 0.5 pH units. This does not apply to pH fluctuations of more than 0.5 pH units attributable to natural influences.	(See Note# 1 below)
	ARSD 74:51:01:08	Prohibits taste- and odor-producing materials. Materials which will impart undesirable tastes or undesirable odors to the receiving water may not be discharged or caused to be discharged into surface waters of the state in concentrations that impair a beneficial use.	(See Note# 1 below)
	ARSD 74:51:01:11	Establishes for the protection of wetlands as surface waters of the state. The discharge of pollutants from any source, including indiscriminate use of fill material, may not cause destruction or impairment of wetlands	(See Note# 1 below)
	ARSD 74:51:01:12	Establishes criteria for the biological integrity of surface waters of the state. All waters of the state must be free from substances, whether attributable to human-induced point source discharges or non-point source activities, in concentrations or combinations which will adversely impact the structure and function of indigenous or intentionally introduced aquatic communities.	(See Note# 1 below)

Standard, Requirement Criteria Or Limitation	Citation	Description	ARAR Status for the Riley Pass Project
	ARSD 74:51:01:14	Establishes allowable concentrations of radioactive iodine, radium, strontium, and tritium. The average dissolved concentrations including the naturally occurring or background concentrations of iodine-131, radium-226, strontium-89, strontium-90, and tritium may not exceed the following concentration limits: iodine-131, 5 pCi/L; radium-226, 5 pCi/L; strontium-89, 100 pCi/L; strontium-90, 10 pCi/L; and tritium, 300 pCi/L.	(See Note# 1 below)
	ARSD 74:51:01:15	Establishes allowable concentrations of miscellaneous radionuclides. For all radionuclides not listed in § 74:51:01:14, the average dissolved concentration limits in surface waters of the state are 1/150 of the corresponding maximum permissible concentration in water for continuous occupational exposure for a 168-hour week as contained in pages 24 to 91, inclusive, of Handbook 69.	(See Note# 1 below)

Standard, Requirement Criteria Or Limitation	Citation	Description	ARAR Status for the Riley Pass Project
	ARSD 74:51:01:16	<p>Establishes that where there is a mixture of dissolved radionuclides in surface waters of the state, the following relationship must be satisfied:</p> $\frac{C}{L} + \frac{C}{L} + \dots + \frac{C}{L} = 1.00$ <p>With C denoting the average concentration of the respective radionuclide and L denoting its concentration limit established in § 74:51:01:14 or 74:51:01:15.</p>	(See Note# 1 below)
	ARSD 74:51:01:18	Establishes criteria for suspended radionuclides. For radionuclides associated with suspended materials in the water, the average concentration limits are 1/150 of the corresponding maximum permissible concentration in water (insoluble form) for continuous occupational exposure for a 168-hour week as contained in pages 24 to 91, inclusive, of Handbook 69. In stream sedimentation of those materials may not produce solids beds and result in noncompliance, because of leaching, with the provisions of § 74:51:01:14, 74:51:01:15, or 74:51:01:16.	(See Note# 1 below)
	ARSD 74:51:01:19	Establishes that the maximum concentration for any one sample may not exceed three times the average concentration limits of radio nuclides specified in §§ 74:51:01:14 to 74:51:01:18, inclusive.	(See Note# 1 below)
	ARSD 74:51:01:34	Establishes the anti-degradation policy for surface waters of the state.	(See Note# 1 below)
	ARSD 74:51:01:38	Establishes policy for anti-degradation of water quality reviews for non-point source	(See Note# 1 below)

Standard, Requirement Criteria Or Limitation	Citation	Description	ARAR Status for the Riley Pass Project
		discharges to surface waters of the state. Non-point sources shall be reviewed as feasible by the board Non-point source discharges shall be controlled utilizing cost-effective methods and reasonable best management practices.	
	ARSD 74:51:01:42	Establishes the beneficial uses of surface waters of the state. The beneficial use classification of surface waters of the state established in this section are not to be construed as limiting the actual use of such waters. The classification designate the minimum quality at which the surface waters of the state are to be maintained and protected.	(See Note# 1 below)
	ARSD 74:51:01:52	Establishes criteria for wildlife propagation and stock watering waters.	(See Note# 1 below)
	ARSD 74:51:01:55	Establishes toxic pollutant criteria. Toxic pollutants at levels which are or may become injurious to public health, safety, or welfare; plant, aquatic, and animal life; or the existing or designated uses of waters may not be present in the surface waters of the state. The toxic pollutants to which this section applies are the priority pollutants and chemicals in 40 C.F.R. Part 131 (July 1, 1995) and any other toxic pollutants or substances determined by the secretary to be of concern at a specific site. Appendix B at the end of this chapter lists the priority pollutants and chemicals for which specific numerical criteria have been adopted by the board. The limits at the site are based on risk based values and may over shadow set levels. However the citation gives guidance for the issue	(See Note# 1 below)
<u>Uses Assigned to Streams</u>	ARSD 74:51:03	Establishes the uses assigned to streams in the state.	

Standard, Requirement Criteria Or Limitation	Citation	Description	ARAR Status for the Riley Pass Project
	ARSD 74:51:03:01	Establishes that the beneficial uses of South Dakota streams include irrigation and wildlife propagation and stock watering. All streams in South Dakota are assigned the beneficial use of irrigation and wildlife propagation and stock watering.	(See Note# 1 below)
<u>Groundwater Quality Standards</u>	ARSD 74:54:01	Establishes the maximum concentration limits for groundwater in the state of South Dakota.	
	ARSD 74:54:01:04	Establishes standards for groundwater of 10,000 mg/L TDS concentration or less.	This ARAR is outside the scope of this removal action so it will not be dealt with during this action.
	ARSD 74:54:01:05	(Applicable) specifies that groundwater shall not contain potential toxic pollutants. Potential toxic pollutants must be non-detectable in groundwater at detection limits of the currently acceptable sampling and analytical techniques as approved by the secretary in § 74:03:15:05 until a maximum contaminant level (MCL) is set by the EPA.	This ARAR is outside the scope of this removal action so it will not be dealt with during this action.

Note# 1- South Dakota has designated uses (wildlife and livestock watering) and as such establishes certain water standards for Schleichart Draw and Pete's Creek. Consolidating and capping waste material at the Project area will reduce storm-related non-point source loading to these tributaries. However, achieving and designated uses and stream standards are likely beyond the scope of this source control removal action. Furthermore construction-related impacts will be minimized to the extent practicable

STATE- LOCATION SPECIFIC

Standard, Requirement Criteria Or Limitation	Citation	Description	ARAR Status for the Riley Pass Project

<u>Wetlands as</u> <u>Surface</u> <u>Waters</u>	ARSD 74:51:01:11	Established for the protection of wetlands as surface waters of the state. The discharge of pollutants from any source, including indiscriminate use of fill material, may not cause destruction or impairment of wetlands	(See Note# 1 below)
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STATE- ACTION SPECIFIC

Standard, Requirement Criteria Or Limitation	Citation	Description	ARAR Status for the Riley Pass Project
<u>Mined Land Reclamation</u>	SDCL 45-6B-37	Final grading requirements.	Relevant and Appropriate
	SDCL 45-6B-39	In those areas where revegetation is part of the reclamation plan, land shall be revegetated in such a way as agreed upon by the operator, the local conservation district and the landowner which establishes a diverse, effective and long-lasting vegetative cover that is capable of self-regeneration and at least equal in extent of cover to the natural vegetation of the surrounding area.	Relevant and Appropriate
	SDCL 45-6B-40	Requirements for the removal and handling of topsoil.	Relevant and Appropriate
	SDCL 45-6B-41	Reclamation operations must be planned and conducted to minimize disturbance to the prevailing hydrologic balance and to prevent material damage to the prevailing hydrologic balance.	Relevant and Appropriate
	SDCL 45-6B-42	Protection from slides subsidence or damage and control of high walls.	Relevant and Appropriate
	SDCL 45-6B-43	All surface areas shall be stabilized and protected to effectively control erosion and air and water pollution.	Relevant and Appropriate
	SDCL 45-6B-44	Establishes requirements for the proposed reclamation plan, including copies to adjacent landowners, approval of the plan, consultation with the landowner and local authorities and the reclamation of of all affected land	Relevant and Appropriate
	SDCL 45-6B-45	Establishes the choices of reclamation.	Relevant and Appropriate

<u>Solid Wastes</u>	ARSD 74:27:15:03	This Criteria sets standards that all solid waste disposal sites must meet. These requirements apply to any person involved in any aspect of the management of solid waste and rubble sites, including recycling, processing transporting, storing, or disposing of solid waste.	This is not an ARAR for the Project area

<u>Reclamation of Tailings Which Cannot Meet Treatment Standards</u>	ARSD 74:29:05:12	Establishes criteria for the reclamation of tailings which cannot meet treatment standards. Tailings which have been treated and cannot meet the criteria established in § 74:29:05:08 or which cannot feasibly be treated shall be reclaimed so that infiltration into, percolation through, and discharge from such tailings are minimized. Discharges from tailings must comply with the provisions of a groundwater discharge plan pursuant to chapter 74:54:02 or a surface water discharge permit pursuant to chapter 74:54:01, as applicable. The reclamation plan for such tailings disposal sites and tailings disposal practices shall be based on a detailed pathway and fate analysis augmented by engineering plans and specifications and monitoring data. Revegetation must comply with the general reclamation requirements of § 74:29:07:06.	This is not an ARAR for the Project area
<u>Minimum Reclamation Requirements</u>	ARSD 74:29:07:01	Establishes the general requirements for all reclamation types.	Relevant and Appropriate
	ARSD 74:29:07:03, and 04	Gives general backfilling, and grading requirements.	Relevant and Appropriate
	ARSD 74:29:07:06	Specifications for the vegetative cover and performance are provided.	Relevant and Appropriate
	ARSD 74:29:07:07	Establishes the requirements for topsoil management during mining activities in addition to SDCL 45-6B-40.	Relevant and Appropriate
	ARSD 74:29:07:08	Reclamation operations must be planned and conducted to minimize disturbance to the prevailing hydrologic balance and to prevent material damage to the prevailing hydrologic balance.	Relevant and Appropriate
	ARSD 74:29:07:18	Establishes the requirements for specific types of reclamation.	Relevant and Appropriate
	ARSD 74:29:07:20	Rangeland planting requirements.	Relevant and Appropriate
	ARSD 74:29:07:22	Post mining wildlife requirements.	Relevant and Appropriate
	ARSD 74:29:07:23	Post mining reclamation requirements.	Relevant and Appropriate

	ARSD 74:29:07:27	Post mining permanent surface impoundment.	Relevant and Appropriate
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7. Project Schedule

As summarized in Section VIII, implementation of the proposed action will begin immediately following execution of this Action Memorandum. Preliminary field data evaluation, and design activities leading to the development of a series of engineering design plans, revegetation plans, and operations, monitoring, and maintenance plans are expected to begin by February 2007. Work plans and engineering designs will be submitted for Agency review and approval. Upon approval, these plans will be implemented and initial construction are anticipated to commence by the late summer of 2007. Completion of the construction activities required to implement the proposed action will require at least an additional two years.

8. References

Pioneer Technical, 2006. Final Engineering Evaluation/Cost Analysis (EE/CA), Riley Pass Uranium Mines, Harding County, South Dakota. Prepared for the U.S.D.A.-Forest Service, October, 2006.

Portage Environmental Incorporated, 2006. Final Human Health and Ecological Risk Assessment, Riley Pass Uranium Mines, South Dakota. Prepared for U.S.D.A Forest Service, May, 2006.

EPA, 1993. Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA. EPA/540-R-93-057. Office of Emergency and Remedial Response. Washington D.C.

EPA, 2005 Ecological Soil Screening Levels for Arsenic Interim Final OSWER Directive 9285.7-62, March 2005.

USFS, 1964. U. S. Department of Agriculture, Forest Service Northern Region, April 1964, Impact Report Surface Mining Activity in Custer National Forest South Dakota.

USFS, 2006 Community Involvement Plan, Riley Pass Abandoned Uranium Mines, Sioux Ranger Dist, Custer National Forest, April 2006.

B. Estimated Costs

The preliminary estimated cost to implement this action as described under Section V.A.1 Proposed Action Description is \$17,639,000. The total cost of the Removal Action, including design, construction oversight, and post-removal site control is estimated at \$18.5 million.

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN.

If no action is taken to stabilize and isolate acutely contaminated materials and to eliminate surface exposures of wastes with concentrations of contaminants the Forest Service has determined exceed risk-protective levels from water, contaminated sediment from the Project area will continue to impact the surrounding drainages. This situation along with the continued exposure of human and environmental receptors to these materials will continue to present an unacceptable risk to human and ecological receptors.

VII. OUTSTANDING POLICY ISSUES

None

VIII. ENFORCEMENT

Although the USDA Forest Service specifically denies any liability in this situation, it will be the "lead agency" for all response actions occurring on National Forest System Lands, as defined by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR part 300, and all response actions will be undertaken in a manner not inconsistent with the NCP. Tronox has been identified as a Responsible Party under CERCLA for the Project area and has agreed to undertake at its cost all elements of the proposed action as set forth in this Action Memorandum. An Administrative Settlement Agreement (Order on Consent) between the USDA Forest Service and Tronox is the legal mechanism that outlines the responsibilities of the parties to the agreement, and the processes to be followed. It will be executed immediately upon the approval and issuance of this Action Memorandum. The Settlement Agreement incorporates a detailed description of the scope of work to be performed for the removal action, including preparation and submittal of planning, site control, and engineering design, and QA/CC documents, the schedule for the work, the reporting and documentation procedures and requirements, and the performance standards for conducting the work. It also incorporates requirements for post-reclamation monitoring and maintenance. The Settlement Agreement and associated documents is not part of this Action Memorandum for purposes of consistency with the NCP.

IX. APPROVAL

This decision document represents the selected Removal Action for the Riley Pass Uranium Mines site within the Custer National Forest, Harding County, South Dakota, developed in accordance with CERCLA as amended, and consistent with the NCP. This decision is based upon the administrative record for the Project area.

Conditions at the Riley Pass Uranium Mines site meet the NCP Section 300.415(b)(2) criteria for a Removal, and I recommend your approval of the Removal Action:

Laurie Walters-Clark
On-Scene-Coordinator

Date

I concur with the recommendation to implement the proposed action as described in this Action Memorandum for the Riley Pass Uranium Mines site:

Rhonda O'Byrne
District Ranger
Sioux Ranger District


Date

I concur with the recommendations to implement the proposed action as described in this Action Memorandum for the Riley Pass Uranium Mines site:

Kate Walker
Acting Forest Supervisor
Custer National Forest

Date

I concur with the recommendation to implement the proposed action as described in this Action Memorandum for the Riley Pass Uranium Mines site:



Bob Kirkpatrick
Regional CERCLA Coordinator
USDA-FS Northern Regional Office




Date

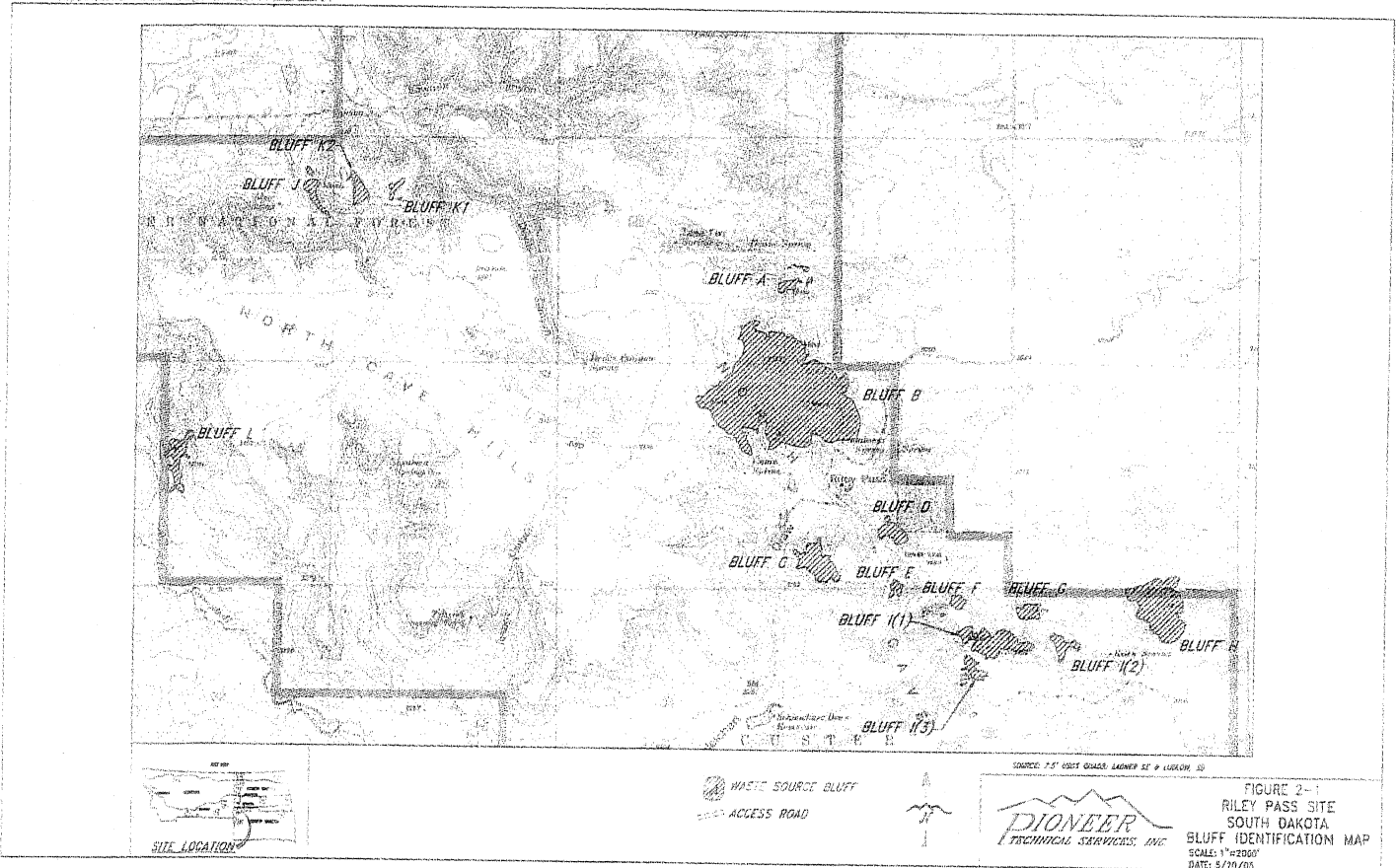
I approve of the proposed removal action as outlined in the Action Memorandum and attached Engineering Evaluation/Cost Analysis for the Riley Pass Uranium Mines site Harding County, South Dakota.



Abigail R. Kimbell
Regional Forester



Date



ATTACHMENT 1 – Bluff Identification Map

ATTACHMENT 2 – Final EE/CA

ATTACHMENT 3 – Definition and Clarifications of Terms Related to Contaminant Concentration

In the Action Memorandum (and/or in the EE/CA that is the basis for this Action Memorandum), several terms are used to describe or characterize the concentrations of various elements (metals and radionuclides) which are the chemical constituents of concern at the Riley Pass Uranium Mines site. A number of different terms are also used to describe materials at the Project area that will be addressed in various ways by the proposed action. Collectively, these terms are used to describe existing conditions at the Project area, to describe the risks associated with exposures to these contaminants, and to present and describe the cleanup standards that will be applied in implementation of the proposed action set forth in this Action Memorandum. In some cases the definition of these terms overlap. For clarity and consistency, these terms are listed below, defined, and in some cases, clarified. Where a definition contains terms that are defined within this attachment, such terms are shown in italics.

Acutely contaminated materials; a specific but non-quantified descriptive term for *materials* that under Preferred Alternative 5 in the EE/CA were to be identified, excavated/removed from their existing location(s) to engineered isolation or containment areas/structures. With the *cleanup criteria* established in this Action Memorandum, these *materials* are now defined and quantified; Criteria 1-Category 3, *materials* (i.e., > 50 pCi/g radium).

Background (or background concentrations); The *concentrations* of naturally occurring chemical *constituents* (including those that have been identified as *contaminants*) in *materials* or water in the vicinity of the Project area that have not been *impacted* by historic mining activity, or the *release* of *contaminants* or *hazardous substances* from or subsequent to mining activity. For clarification, these *concentrations* have been determined by the analysis of samples collected from un-*impacted* areas near the Project area.

Concentrations; the amount of a chemical constituent, *contaminant*, *COC*, or *COPC* measured or modeled in *materials*, vegetation, animal tissue or surface water. For non-radioactive elements/metals, this is expressed as milligrams per kilogram (mg/kg) of *material*, or milligrams/liter (mg/L) of water, and for radioactive elements it is expressed in pico-Curies per gram (pCi/g), where pico-Curies are a measure of radionuclide activity per unit material

Contaminants; i) a specific category of substances defined under CERCLA; substances not included in the CERCLA list of *hazardous substances* “which will or may reasonably be anticipated to cause...serious adverse health affects”, ii) a substance, element, or compound that may harm humans or other forms of life if *released* into the environment in *concentrations* above specified levels, iii) a general descriptive term used in the EE/CA for naturally occurring chemical constituents found in *materials* at *concentrations* above *background*.

Contaminants (or Constituents) of Concern-COCs (or Contaminants/Constituents of Potential Concern-CPOCs); those chemical constituents/*contaminants* in *materials* at the Project area

shown through analysis and comparison with *background concentrations* and/or *risk-protective concentrations* to exist at levels that could pose an *unacceptable risk* to human health and the environment.

Contaminated; (i) a non-quantified descriptive term for a *material* that contains *contaminants, COCs, or COPCs* at *concentrations* that are at least higher than *background concentrations*. Also synonymous with an *impacted* material. For clarification, *materials* described as “*contaminated*” (or “*impacted*”) may or may not contain *contaminants* at *concentrations* that pose an *unacceptable risk*.

Cleanup levels; the maximum average *concentrations* of *COCs* that will be present in *materials* at the land surface after completion of reclamation activities (the proposed action). For clarification, the cleanup levels that have been set for the Project area have been determined to be *risk-protective*.

Criteria (or cleanup criteria); a set of specific numeric and/or performance standards that define the *risk-protective cleanup levels* that are to be achieved by the proposed action. The Action Memorandum presents Criteria 1 standards for Bluffs B, G, and H, defined as follows:

Category 1; *materials* with measured radium²²⁶ concentrations of less than or equal to 30 pCi/g

Category 2; *materials* with measured radium²²⁶ concentrations greater than 30 pCi/g but less than or equal to 50 pCi/g

Category 3; *materials* with measured radium²²⁶ concentrations greater than 50 pCi/g

For clarification, application of these criteria will result in post-reclamation surface *concentrations* of radium²²⁶ and all other identified COPCs that have been determined to be *risk-protective*.

Elevated levels (or elevated concentrations); a descriptive, non-quantified term for *materials* with *concentrations* of *hazardous substances* or *COCs* greater than *background*. For clarification, to statistically allow for the natural variability of *concentrations* in *materials*, the threshold of 3 x *background* is typically used (as in the EE/CA) to identify elevated levels or *concentrations*.

Excess contaminated materials; a descriptive term used to describe *materials* that during the reclamation process may be relocated during grading, and will require placement and stabilization in a new location.

Excess risk; The excess rate of occurrence of a particular health affect related to exposure to *contaminants of concern*. Also used in the risk evaluation process as a descriptive term indicating a particular exposure scenario might represent an *unacceptable risk level*.

Exposure levels; The amount of a *COC* that a receptor incorporates into their body (i.e., inhales, ingests, absorbs). For radioactive substances, this includes the amount of ionizing radiation that strikes a receptor.

Hazard Quotient (HQ); The ratio of the potential exposure to the *COPC* and the level at which no adverse effects are expected. If the Hazard Quotient is calculated to be less than 1, then no adverse health effects are expected as a result of exposure. If the Hazard Quotient is greater than 1, then adverse health effects are possible.

Hazardous substances; a specific list of substances defined under CERCLA. *COCs*, and *COPCs* identified in the EE/CA are all defined as hazardous substances.

High concentrations; a descriptive, non-quantified term indicating *concentrations* well above *background concentrations*.

Highly contaminated material; a descriptive, non-quantified term indicating higher *concentrations* than those found in *contaminated materials*.

Impacted; i) a descriptive term identifying areas, materials, or features where observations or data indicate that historic mining activities have altered pre-mining conditions, ii) where referring to *concentrations* of constituents in *materials*, a descriptive, non-quantified term, synonymous with *contaminated*.

Included: (as used in Attachment G of the EE/CA describing those materials that “will be included in the removal action”): materials associated with the Project area that will, as appropriate and consistent with the cleanup criteria, be assessed, or moved, or mitigated, or isolated.

Mineralization; The process or processes by which a mineral or minerals are introduced into a rock, resulting in a valuable or potentially valuable deposit. This is a general term, incorporating various types; e.g., fissure filling, impregnation, and replacement.

Materials; an encompassing term for the naturally occurring rock, minerals, *soil*, and *sediment* that make up the North Cave Hills and/or that have been disturbed, exposed, or created by mining activity or subsequent weathering.

The following types of *materials* are present at the Project area, and are described/referred to in the EE/CA. The definitions of these descriptive terms are as follows:

Overburden: a mining term encompassing those *materials* that prior to mining cover the *material* that is being mined by a surface mining operation. The *material* to be mined (in this case the “E-layer” of uraniumiferous lignite) is accessed by removing the overburden.

Sediment(s); a geological term for any *materials* that have been mobilized, and transported from their original location by moving water. For clarification, the location of sediments can vary from immediately adjacent to their original source location to land surfaces and drainage ways a significant distance from the source.

Soil(s); i) a general descriptive term used in the EE/CA for that portion of *overburden*

materials exhibiting the typically recognized physical properties of soils (ii) The unconsolidated mineral or organic *material* on the immediate surface of the earth that serves as a natural medium for the growth of land plants and/or that has been subjected to and shows effects of climate (including water and temperature effects).

Spoil(s); a mining term used to describe *overburden materials* after they have been removed or disturbed by surface mining activity.

Waste(s) (including mining waste, solid waste, or waste materials); general, encompassing, descriptive terms used to describe all of the materials listed above.

Project area; a term that refers to the Bluffs and other features where mitigation activities taken under this action will occur.

Release; a term specifically defined under CERCLA.

Risk-based; Based on a specific risk level (e.g., 1×10^{-5} carcinogenic risk) determined by the Lead Agency for a CERCLA site to be protective of human health and the environment.

Risk levels; Carcinogenic risks or *hazard quotients* calculated by combining potential exposure and intake of *contaminants* for a specific exposure scenario with published toxicity data.


Risk-protective (or risk protective level(s)); Carcinogenic risks within the range of 1×10^{-4} and 1×10^{-6} , and hazard quotients less than 1, as defined by EPA to be protective of human health and the environment. For clarification, the Lead Agency for a CERCLA site establishes site-specific, *risk-protective* levels within this range through the process established under the NCP. For this Project area, the *cleanup criteria* defined above are the *risk-protective levels*.

Significantly contaminated materials; a specific term describing the application of *cleanup criteria*; synonymous with *Criteria 1-Category 2 materials*.

Site; a term that will i) refer to all the areas in the Riley Pass area; ii) refers to a generic location

Unacceptable risk; Estimated or real risks at levels that exceed EPA's established *risk-protective* levels (e.g. $>1 \times 10^{-4}$ carcinogenic risk).

Conditions at the Riley Pass Uranium Mines site meet the NCP Section 300.415(b)(2) criteria for a Removal, and I recommend your approval of the Removal Action:


Laurie Walters-Clark
On-Scene-Coordinator

2-1-07
Date

I concur with the recommendation to implement the proposed action as described in this Action Memorandum for the Riley Pass Uranium Mines site:

Rhonda O'Byrne
District Ranger
Sioux Ranger District

Date

I concur with the recommendations to implement the proposed action as described in this Action Memorandum for the Riley Pass Uranium Mines site:

Kate Walker

Kate Walker
Acting Forest Supervisor
Custer National Forest

2-1-07

Date

I concur with the recommendation to implement the proposed action as described in this Action Memorandum for the Riley Pass Uranium Mines site:

Bob Kirkpatrick
Regional CERCLA Coordinator
USDA-FS Northern Regional Office

Date

I approve of the proposed removal action as outlined in the Action Memorandum and attached Engineering Evaluation/Cost Analysis for the Riley Pass Uranium Mines site Harding County, South Dakota.

Abigail R. Kimbell
Regional Forester

Date

I concur with the recommendation to implement the proposed action as described in this Action Memorandum for the Riley Pass Uranium Mines site:

Rhonda O'Byrne
District Ranger
Sioux Ranger District

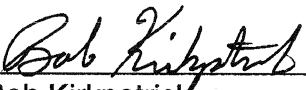
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Kate Walker
Acting Forest Supervisor
Custer National Forest

Date

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2/1/2007

Date

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Abigail F. Kimbell
Regional Forester

2/2/07

Date