Project Description
Golden Sunlight mine is located in Jefferson County, 5 miles northeast of Whitehall, and is presently mined utilizing open-pit methods. The ore treatment facilities use carbon-in-pulp technology and Sand Tailing Retreatment to extract gold deposits.

The present reclamation work undertaken at the Golden Sunlight Mine [GSM] serves to employ 1 Barrick Gold Corp. [BGC] supervisor and 2 full-time operators. Additional remediation work is contracted to Smith & Sons Construction [Whitehall], which employs 15-25 full-time individuals based on an annual cost-budget arrangement with BGC.

Current project work includes re-sloping of mined areas [2:1], covering these areas with 3’ of growth medium, installing drainages [every 140’ vertical] and re-seeding the area using Montana State Certified seed [consisting of 80% native species]. The entire process to remediate sectors of the property averages two years’ time.

History
GSM first saw mining operations begin in 1890, when gold and silver speculators first discovered mineral deposits in what became known as Bull Mountain. The Golden Sunlight mine was the first mine in Jefferson County to have claims registered. Small, individual parcels continued to be mined until 1975 when Placer Dome Inc. [Vancouver, Canada] purchased the mineral rights. Placer Dome began open-pit mining operations in 1982, utilizing cyanide heap-leaching methods to extract the mineral. This method entails submerging crushed ore in 900,000-gallon vats of cyanide. Gold becomes water soluble in this cyanide solution, and the waste rock is removed, dried, and placed in waste piles [Figure 20-7].
In 1985, a 19,000,000 gallon spill of cyanide-laced water occurred at the GSM site. This release resulted in litigation, and ultimately, owing to severe groundwater pollution, necessitated the purchase by Placer Dome of several of GSM’s neighboring properties.

Additional negligent environmental impacts occurred when migrating waterfowl began to frequent GSM’s 250-acre settling pond in 1988. Because of the dangers this posed to wildlife, rock music was played through loudspeakers 24-hours per day to prevent the waterfowl from being unknowingly subjected to toxic wastes by landing on these toxic waters. This bird-hazing practice has ceased since GSM has begun treating their discharged water prior to it arriving in the settling ponds.

In 1994, engineering errors resulted in the earth shifting beneath the mine site, with a 2’ crack opening at the mine’s mill site. The mine was forced to temporarily cease activities.

A Montana state voter initiative banned the use of cyanide in open-pit mining in November 1998; however, due to GSM’s historical use of cyanide, they were granted a grandfathered exemption.

Barrick Gold Corp. [Toronto, Canada] made an unsolicited offer to acquire Placer Dome Inc. in November 2005, which it succeeded in purchasing in early 2006. Barrick Gold Corp. has since purchased all the old mining patent claims in the immediate vicinity.

The current void left in the earth’s crust, resulting from open-pit mining methods, measures 2,000’ deep and ¾ mile in length.

GSM currently employs approximately 180 individuals with an average income of $54,000/year. An additional 26 employees will be added in early 2011 to assist in mining a recently permitted area north of the GSM facility’s area. This permit, which will also include use of cyanide heap-leaching, was granted by the Montana Department of Environmental Quality’s Operating Service Permit Section.
Chronology
Full-time reclamation activities began in 1999, with the creation of a work force specifically dedicated to reclamation. To date, reclamation activities have occurred, or are occurring, on a total 1,400 acres at the GSM site.

Cost and Source of Funds
In 2009, Golden Sunlight produced 28,000 ounces of gold at a cost of $581/ounce.

An average from 2007-2009 indicates that approximately $2,000,000 annually has been provided by the mine’s owners to Smith & Sons Construction for their remediation activities at the GSM site.

Project Design
Remediation design is primarily undertaken by Barrick Gold Corp. staff engineers; however, it has also been historically subcontracted to outside engineering firms whose information was not provided.

Project Labor
Due to the chemicals used to retrieve gold from ore at GSM, namely cyanide, all employees working at the Golden Sunlight Mine, including contracted and subcontracted workers, are required to have a certification in Hazardous Waste Operations and Emergency Response [HAZWOPER]. This certification consists of a one-time 24-hour course specifically for above ground exposure, with an annual 8-hour refresher.

Reclamation project labor is supplied by three full-time, benefitted Barrick employees. This consists of one Reclamation Superintendent [~$75,000/year], and two full-time Level I Operators [$24.50/hr.].

Additional reclamation support is provided, via contract, by Smith & Sons Construction [Whitehall]. This contractor has been undertaking work at the GSM site since 1959, and presently employs a total of 18 on site, non-benefitted, full-time employees whose wages range from $18-20/hr. Their continued employment and hours are subject to an annual contract renewal between Barrick Gold Corp. and Smith & Sons Construction.

Reclamation employment at the site consists almost exclusively of truck drivers, cat skinners, heavy equipment operators, and general labor.

Project Oversight
Project oversight is provided by the Barrick Gold Corp, Reclamation Superintendent.

Figure 20-5 – The horizontal drainage ditches can be observed on this reclaimed section of Golden Sunlight property. Additionally, the differences in annual revegetation are observable along the vertical axis separating the lush green vegetation [planted two years’ previous] from the darker brown vegetation [planted 1 year previous]. [Photo: H. Janssen, August 2010]
Figure 20-6 – Once the ore is processed and the gold is removed, the waste rock is disposed of, creating large mounds of processed rock. The trucks used to transport the waste rock measure up to three stories in height. [Photo: H. Janssen, August 2010]

Figure 20-7 – These large piles of waste rock are then sloped to a 2:1 ratio using heavy equipment. [Photo: H. Janssen, August 2010]

Figure 20-8 – Once the piles have been sloped, 3’ of growth medium is added to the rock piles and the sloped are then re-graded to 2:1. [Photo: H. Janssen, August 2010]

Figure 20-9 – A state certified seed mixture is then added to the growth medium, and the site undergoes the installation of drainage ditches to prevent run-off of toxic tailings’ waste. [Photo: H. Janssen, August 2010]
21 - Bald Butte and Great Divide Reclamation Projects
Montana Department of Environmental Quality
Abandoned Mine Lands Program

Project Description
The Bald Butte Mills site is located approximately 17 miles west of Helena, near the headwaters of Dog Creek, a tributary to the Little Blackfoot River. Bald Butte lies within the historic Marysville Mining District.

The Great Divide Sand Tailings site is also located within the historic Marysville Mining District, roughly two miles from the Bald Butte repository, and was consolidated with the Bald Butte site due to its relative proximity to the repository. The Great Divide area rests on Bureau of Land Management [BLM] owned land, with a portion of impacted areas resting on land privately owned by the Great Divide Skiing Company.

The reclamation project undertaken by the Montana Department of Environmental Quality’s [MT DEQ] Abandoned Mine Lands [AML] program was comprised of the construction of an on-site repository, to contain approximately 165,000yds³ of mine waste, the excavation of historic mine waste from the Bald Butte historic mining site [estimated at 125,000 yds³], and the removal of historic mine waste from the Great Divide Sand Tailings site [estimated to be 40,000yds³]. The Bald Butte/Great Divide repository was constructed on BLM land, in a central location to both excavation projects, roughly two miles from each and resting along the Continental Divide. Final reclamation components consist of capping and revegetating the repository, re-grading the excavated areas, re-seeding the disturbed areas with native vegetation, and implementing groundwater monitoring stations to assess potential run-off from the repository site.

History
The Bald Butte mine site is comprised of the Bald Butte mine and millsite and approxi-
mately 12 other historic mines that include the Albion, the Devon/Sterling, the Larson, the Rose Densmore and numerous others. Bald Butte mine and millsite first began recorded production in 1882, predominantly of gold, silver, and lead. The Bald Butte mill operated on a 10-stamp facility from its inception, but upgraded in 1891 to a 40-stamp facility, which operated 24-hours per day, over 315 days per year. 1896 annual reports from the mine list that capital expenditures were made to restrain mine tailings and avoid damage suits, this included the acquisition of 40 acres adjacent to Dog Creek. This land was used to enlarge and strengthen the tailings dam.

1915 operations mainly consisted of reprocessing old tailings with cyanide, as technology had improved to the extent that this approach was more economical than to extract ore.

In 1931, the property opened as the Idamon Gold Mining Corp., operating shortly thereafter as the Bald Butte Gold Mines Co. and Stratton and Stratton Co., also utilizing cyanide to reprocess old tailings and extracted ore.

1902-1942 mine site records document 167,595 tons of ore processed, which returned an estimated total value of $3,500,000 in gold and silver.

Molybdenum exploration was conducted around the Bald Butte site in the mid-1960s by AMAX Exploration Inc.

Drilling was conducted in the 1970s, resulting in anomalously high heat flows. Subsequent studies by SMU and the US government determined that molybdenum and geothermal prospects were not economically viable.

The Albion and Devon/Sterling mines are located to the northeast of the Bald Butte facilities. In 1881, they began processing ore in a single-stamp facility. In 1883, a 10-stamp facility was constructed. After this time, the mine and mill both remained dormant for a period of six years. The Albion mine reopened in 1890 as part of the Bald Butte Mining Co., after which, records no longer differentiated between extractions and activities at the two locations.

The Great Divide Sand Tailings Site is located on the eastern slopes of Mount Belmont and encompasses roughly six
acres. The tailings impoundment was re-claimed by the BLM in the 1990s with installation of a vegetative cap and drainage ditches to control water runoff. The drainage ditches, however, were of insufficient size and have since become plugged with sediment. This has resulted in uncontrolled mine waste runoff entering surface water as well as entering Jennie’s Fork of Silver Creek in the form of sediment.

Due to the mine waste consolidating near Great Divide and runoff flowing into Jennie’s Fork, BLM and MT DEQ began investigation and design of a reclamation solution in 2002.

**Chronology**

Reclamation investigations at the Bald Butte area began in 2002 with site investigations and soil and water analysis.

Reclamation activities were undertaken at the Great Divide Sand Tailings area by the BLM in the 1990s; however, the construction of the drainage ditches and the cap placed upon the tailings impoundment have become ineffective at containing impacted material, resulting in uncontrolled releases into Jennie’s Fork as well as impacted materials collecting within the parking area of the Great Divide Ski Resort.

On-site construction of the Bald Butte repository began in 2010, with repository design work having been conducted by Pioneer Technical Services Inc. [Helena] in 2009 and 2010.

JEM Contracting Inc. [Billings] began on-site construction of the 165,000 yds³ repository in summer 2010, and the structure was completed in the fall of 2010. This repository measures approximately ten acres in size.

**Current Project**

As of November 2010, the Bald Butte and Great Divide reclamation project is roughly 30% complete. Future work will consist of the continued excavation of impacted mine wastes, the re-grading and sloping of reclaimed areas, stream reconstruction, reseeding and mulching the reclaimed areas, capping the repository, revegetating the repository area, and instituting ground and surface water monitoring systems to ensure that the repository is not releasing any impacted materials.
Cost and Source of Funds
Total project cost as of November 2010 is listed as $4,987,835.

These funds reflect an American Recovery and Reinvestment Act [ARRA] grant of $325,000 supplied by the BLM, with an additional $845,000 provided by the BLM in a non-ARRA grant. The Montana Department of Natural Resources and Conservation [MT DNRC] supplied a Reclamation and Development Grant [RDG] in the amount of $300,000. Final funding was supplied by The Department of Interior’s Office of Surface Mine [OSM] funds, which totaled $3,517,835.

OSM funds arrive from a tax levied on each ton of ore extracted from coal mine sites in Montana. These funds are placed into a federal account. Approximately half of these funds are then made available to the State of Montana to conduct abandoned mine reclamation activities.

As of November 2010, $1,909,916 had been spent on reclamation activities for this project.

Pre-Project Planning & Testing
Pre-project planning, testing, surveying, and document creation began in 2002. These phases were carried out by 4 separate consulting firms for a total of $369,262. This figure reflects 20 separate billing invoices over seven years.

Project Design
Pioneer Technical Services [Helena] was contracted to design reclamation activities and provide construction oversight. For their services, they have received a total billed amount of $80,139. This figure reflects 1,127 hours of engineering labor for $33,007. Hourly rates for engineers on this project range from $20.20-42.75, with a mean hourly wage of $29.28.

Project Labor
All wages paid for on-site construction work are based upon David-Bacon prevailing wage regulations.

JEM Contracting Inc. [Billings] is the primary contractor for all reclamation activities at the Bald Butte and Great Divide sites. For their services, as of November 2010, they have received $1,829,776 for 7,892 billable hours.
JEM Contracting Inc. has subcontracted to Fence Crafters [Helena] and Northwest Linings [Kent, WA]; however, subcontractor labor figures have been incorporated into the overall JEM labor totals, which equal $181,743 in billed labor hours.

Fence Erectors [$26.82/hr] have registered 75 hours on the project, General labor [$26.96/hr.] is responsible for 1139 hours, Operator 2 [$23.94/hr.] have logged 3,894 hours thus far, Truck Driver 2 [$18.84/hr.] have reported 2,146 hours, and JEM site Superintendents [$24.04/hr.] have registered 640 hours.

**Project Oversight**

Project oversight is being conducted by Steve Opp, MT DEQ AML Reclamation Specialist.
Project Description
The Libby Asbestos Superfund site is a cleanup project located in and around the towns of Libby and Troy. Cleanup and remediation activities in these towns have occurred in eight separate Operable Units [OUs] and were undertaken by the United States Environmental Protection Agency [US EPA] for the purposes of protecting public health and welfare and the environment from actual or threatened releases of hazardous substances into the environment.

Historic mining, processing, and exportation of vermiculite and vermiculite concentrate, known herein as Libby Asbestos [LA], have necessitated the extraction and disposal of LA into a properly lined and contained repository, located at the former mine site. Once all LA has been re-placed into the mine site, the site will be capped and revegetated.

LA is amphibole asbestos present in vermiculite historically mined directly northeast of Libby by W.R. Grace & Co. [Grace]. LA has been documented by the US EPA to cause detrimental human health effects, namely mesothelioma and autoimmune disease. The primary focus of remedial action, which began in 1999, has been directed toward four primary areas: indoor dust, indoor air, outdoor dust, and soil.

Vermiculite has been historically used in insulation, feed additives, fertilizer and soil amendments, construction materials, absorbers, and packing materials.

Vermiculite is processed through a process known as “exfoliation,” which occurs through rapid heating of the ore [800-1200°F]. Invoices indicate that over 10 billion pounds of vermiculite were shipped to proc-

Figure 22-1 – All impacted materials are saturated to ensure that contaminants are not released into the air during transport. [Photo: Property of the US EPA]

Figure 22-2 – Blue trucks are used to haul contaminated soils to the staging site at the base of the former mine site, while red trucks are used to haul the impacted soils up to the mine site for placement into the repository. Blue trucks are thoroughly washed after depositing loads, to ensure that no contaminated debris will be released into the air on the return trip to Libby. [Photo: Property of the US EPA]
essing facilities throughout the duration of Grace’s 30-year ownership.

**History**
1880s – Historic hard rock mining begins around the Libby area.

Early 1900s – Prospectors first discover deposits of vermiculite on Rainy Creek, northeast of Libby.

1919 – Edward Alley, a Libby resident, discovers vermiculite’s beneficial insulating properties and files the first claim for a vermiculite mine as the Zonolite Company.

1963 – Grace purchases Alley’s mining claims and begins operating mining and processing facilities [dry milling from 1963 to 1985; wet milling from 1985 until 1990].


1990 – Grace undertakes remediation activities, which consisted of the demolition of all existing facilities, land recontouring, and revegetation.

2007 – A settlement is reached between Grace and the US government for $250,000,000.

**Chronology**
1999 – November: The US EPA initiates an Emergency Response Action, addressing concerns raised by Libby residents regarding longterm exposure to LA.

December: The EPA opens an Information Center in downtown Libby and begins evaluation of LA in soils.


2001 and 2002 – US EPA removes several major source areas, primarily located within schools and public recreation areas.

2002 – The US EPA constructs a special Class IV cell at the Lincoln County landfill specifically for asbestos disposal. This cell is open to all residents for the disposal of any LA waste they discover in and around their properties. The US EPA also begins sampling and testing over 3,000 commercial and residential properties as part of its Contaminant Screening Study. 26 homes were remediated. October: The US EPA lists Libby as an official Superfund site.
2003 – 1,200 properties were inspected or sampled. 157 residential and commercial cleanups, as well as the city boat ramp, were remediated.

2004 – 170 commercial and residential properties, the BNSF rail yard and flyway property were remediated. The US EPA announces that Troy will also be included in cleanup activities.

2005 – 225 commercial and residential properties were remediated; investigations are begun to coordinate cleanup activities in Troy.

2006 – 216 commercial and residential properties were remediated; an Outdoor Ambient Air sampling project begins.

2007 – 160 commercial and residential properties were remediated; sampling projects are undertaken in Troy.

2008 – 149 residential and commercial cleanups in Libby and Troy. Work began on local creeks contaminated with impacted rip-rap.

2009 – 159 commercial and residential properties were remediated; removal actions occurred at the Cabinet View Golf Course, Pipe and Libby Creeks.

**Community Figures**

The Libby Asbestos Superfund project only addresses the removal of asbestos; the Libby Groundwater Contamination Superfund is a separate project.

As of September 2010, 2,550 of 3,800 properties have met the criteria to qualify for EPA cleanup. Cleanup time for a residence ranges from three days to three weeks, dependent upon cleanup scale. Residents are provided with local hotel accommodations and per diem while displaced. Cleanup activities occur 24 hours per day.

**Current Project**

Cleanup activities involve the removal and disposal of LA laden vermiculite in and around the communities of Libby and Troy. Approaches taken by the US EPA for outdoor cleanup typically remove the top 12” of soil, where another sample is taken to assess the extent of soil contamination. Soils can be removed to depths of 3’. Clean soil is brought in from the Libby Creek area, 14 miles north of Libby. Clean soils are tested every 3,000 yds³ to ensure that replacement soils are not also contaminated. All employees working on site are required to possess a current Hazardous Waste Operations and Emergency Response

Figure 22-5 – Heavy equipment operators comprise a large portion of labor working upon the Libby Asbestos Superfund Cleanup. [Photo: Property of the US EPA]

Figure 22-6 – Vermiculite serves as an excellent insulator and has been historically used in attics to prevent heat loss. W.R. Grace invoices indicate that over 10 billion pounds of vermiculite were shipped to processing facilities between 1963 and 1990. [Photo: Property of the US EPA]
[HAZWOPER] Certification. The EPA offers this course and its annual refresher, as well as courses in Contractor-Supervisor Asbestos training, and its refresher, free of charge, several times per year. This service enables the US EPA to contract local firms for cleanup activities without requiring them to expend capital on training. Active remediation will continue for the next 2-3 years.

Cost and Source of Funds
W.R. Grace agreed to a settlement of $250,000,000 in 2007 to reimburse the federal government for costs associated with the investigation and cleanup of asbestos contamination in and around the towns of Libby and Troy. This agreement was reached between W.R. Grace, the US Justice Department, and the US EPA.

The following is a list of US EPA responsibilities according to this settlement agreement: contracting all testing and sampling, establishing the presence of a Community Involvement Coordinator in Libby, contracting for physical cleanup work, contracting truck drivers for transporting impacted materials and replacement soils, contracting security firms to guard property 24-hours per day during cleanup activities [preventing unlawful entry and theft], contracting construction crews to replace areas of affected houses, and contracting heavy equipment operators to extract impacted soils.

Project Design
Project design has been completed by the US Army Corps of Engineers.

Pre-Project Planning & Testing
Site testing is conducted at the behest of the US EPA.

Laboratory services are provided by EMSL and ESAT Laboratories [Libby], as well as US EPA soil prep and contract laboratories in Troy and Libby. 50% of test samples are processed in Libby, while the other half is sent to off-site laboratories.

Project Labor
As of February 2011, $109,665,853 has been spent on cleanup activities.

Hazardous Waste Operations and Emergency Response Standard [HAZWOPER] certification and a special course in asbestos awareness are required for all on-site employees. These courses are provided free of charge by the US EPA in Libby, several times per year.

There is no wage increase for possessing the above certifications; they are merely a site requirement.

By September 2010, over 800,000yds³ of impacted soils had been returned to the mine site. This figure represents over 80,000 semitrailer loads of LA tainted soils.

Soil suppliers have played a key role in the restoration activities, bringing in soils from Libby Creek to replace impacted soils that have been removed.
Every 3,000 yds$^3$ of replacement soil is tested to confirm that they have not been inadvertently impacted. Local firms that have supplied replacement soils include Noble Excavating, Wards Trucking, Chapman Construction, and Remps Sand and Gravel.

Household construction workers have also been essential throughout this cleanup project. Specifically, drywallers, electricians, insulators, lumber yard workers, and landscapers.

**Project Oversight**

The US EPA is responsible for all project oversight; however, the US Army Corps of Engineers serves as the contracting mechanism for project activities. The lead contractors are: CDM and Project Resources, Inc. (Denver), and Environmental Restoration (Missoula).

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**Figure 22-8** – Residents are provided the opportunity to delineate where they would not like extraction activities to occur (i.e. vegetable and flower gardens, beneath large trees, etc.); however, the EPA will replace 100% of impacted soils on ones’ property, if desired. *[Photo: Property of the US EPA]*

**Figure 22-9** – Cleanup activities require all on-site employees to wear Tyvek Biohazard suits. Additionally, HAZWOPER certification and successful completion of an asbestos awareness course, both provided for free by EPA officials, are mandatory. *[Photo: Property of the US EPA]*

**Figure 22-10** – This image displays the various stages of asbestos and vermiculite throughout processing. From the top left, clockwise: LA; the formation of vermiculite and LA as formed in the mountain; vermiculite in chunk rock form; exfoliated or “popped” vermiculite; vermiculite before it has been “popped”; mine tailings that remain from vermiculite processing. *[Photo: H. Janssen, September 2010]*

**Figure 22-11** – Cleanup crews working to remove LA from indoor areas have been working 24 hours per day for the past several years. *[Photo: Property of the US EPA]*
Project Description

Construction work at the McLaren Adit, which has also been called the Winter Tunnel, commenced in August 2010. This site rests to the northeast of Cooke City in the “New World Mining District.” A construction contract was awarded to the Knife River Corp. [Billings] in the amount of $1,166,100 by the United States Forest Service [USFS], Gallatin National Forest [GNF].

Construction activity consists of installing an adit water collection system [a concrete drop inlet structure measuring 4’ in diameter x 5’ tall seen in Figure 23-8], constructing and installing a pipeline system leading to the infiltration gallery where adit water will now be diverted [the infiltration gallery measures 30’x20’x5’], burying 657’ feet of 8” HDPE drain piping to carry water from the adit to the infiltration system, spreading 30 yds³ of class II riprap and 241 yds³ of bedding gravel. Lastly, a lime amendment will be incorporated into the top 6” of soil, by use of a disc or harrow, at a rate of 10 tons/acre. The lime amendment will bind to affected soils, neutralizing their pH, and permitting vegetation to re-establish itself.

Additional site work consists of compacting the soil surrounding the adit, re-grading the area in front of the adit, and reseeding the impacted area. Road maintenance will also be conducted on roughly 30 miles of USFS roads around the project site; however this will not occur until mine reclamation activities are complete.

Historically, impacted water flowed year-round from McLaren Adit into Daisy Creek at a rate of roughly 10-gallons per minute; however, this water will now be channeled into the infiltration gallery, where it will then be deposited into the greater groundwater system. This action will permit the water to be treated via processes of natural filtration.

History

1870s – Gold prospectors begin arriving at what became known as the “New World Mining District,” just outside of Cooke City.

1874 – The first claims are placed on mines in the district.
1876 – Smelters begin to be erected throughout the area for the purposes of reducing ore to bullion.

1882 – The McLaren mine section of land, which rested on Crow Reservation lands, was opened to settlement, as the reservation size was decreased.

1926 – The New World Mining District becomes the third largest producer of precious metals in Montana.

1933 – The McLaren site began functioning as a proposed Gold [Au], Silver [Ag], and Copper [Cu] mine.

1996 – Crown Butte Mines served as owners of the McLaren site until August, when a settlement was reached between them and the USFS.

Also in 1996, an Environmental Impact Statement [EIS] was performed by the USFS and the Montana Department of Environmental Quality [MT DEQ].

1998 – The President Bill Clinton proposed a $65,000,000 buyout of all New World Mining District mineral interests in the area. This included the McLaren site. $22,500,000 was set aside to be used by the USFS for cleanup of the historic mine workings.

2001 – Maxim Technologies re-opens the closed McLaren Adit to conduct an investigation into the extent and magnitude of associated tailings waste.

2003 – The MT DEQ is contacted by local residents with regard to proposed reclamation activities associated with the McLaren Adit.

**Chronology**

2004 – USFS drafts an Engineering Evaluation/Cost Analysis [EE/CA] to address the specific costs and options associated with the McLaren Adit closure and the reclamation of the surrounding environment.

2005 – Tetra Tech [Helena and Billings offices] is awarded the engineering and consulting contract for road rehabilitation design. Tetra Tech was also awarded the contract for designing the Adit closure in 2009.

2010 – A construction contract is awarded to Knife River Corp. [Billings]. In September, construction work at the McLaren Adit began.

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**Figure 23-3** – Heavy equipment operators from Knife River Corp. [Billings] were responsible for all of the earthmoving and the installation of the adit closure elements. [Photo: Property of USFS]

**Figure 23-4** – Removing all obstructions to water flow permitted the mine to discharge at a rate of 10 gallons per minute, year-round. This effluent had been running into Daisy Creek, but with a new infiltration gallery in place, it will now be directed back into the greater groundwater system to undergo processes of natural filtration. [Photo: Property of USFS]
Current Project

Construction services provided by Knife River are approximately 15% complete, and will resume during the 2011 construction season. Activities will consist of soil treatment with a lime amendment, erosion control, rill and gully repair, weed control, and culvert maintenance. Additionally, all road work is being delayed until mine reclamation activities are complete, so as to not disturb the roads with heavy equipment.

All contracted construction activities are to be complete by October 2011, with ongoing New World Mine District site care and maintenance programs continuing for at least 30 years.

Cost and Source of Funds

Total funding allotted for this project is $1,274,178. These funds have been contracted for design, planning, and construction purposes only.

Additional funding will be supplied to USFS employees for oversight. This is projected to be 2-3% of the total contract costs [$24,741-$37,112].

All funding for this project arrived in 1998 from federal government funds set aside to address mine closure and reclamation activities in the historic New World Mining District.

Project Design

Tetra Tech [Helena and Bozeman offices] supplied the design plan for the reclamation activities occurring at the McLaren Adit.

This labor has consisted primarily of designing a de-watering system, formulating design plans for mobilization of earthen banks, designing a practical adit closure approach, and designing road maintenance projects.

Tetra Tech was awarded a contract from the USFS for $70,967 in 2005 for indirect costs, labor costs, and overhead. They completed their design work in 2010, totaling 677 hours of billed labor, for a mean rate of $104.95/hr.

Project Labor

Construction labor is being provided by the Knife River Corporation [Billings]. To date, they have received $171,033 for their services. This reflects roughly 300 hours of labor, materials, and indirect costs. Labor provided by Knife River consists of Heavy Equipment Operators and general laborers.

All construction employees working on site receive Davis-Bacon wages.

Project Oversight

Project oversight is being provided by Peter Werner, Gallatin National Forest Mining Engineer.

To date, USFS oversight has totaled 154 hours. Oversight funding also arrives from the general New World Mining District cleanup funds. The cost of USFS personnel on the McLaren Adit project is estimated to add 2-3% to the total project costs [$24,741-$37,112].

Figure 23-5 – This photo depicts the preparation for the adit area drop inlet structure. [Photo: Property of USFS]
Figure 23-6 – Workers construct the trench that will transfer adit water to the infiltration gallery. [Photo: Property of USFS]

Figure 23-7 – This pond collected sediment when adit water was discharged to the surface. It will be replaced in 2011 with the infiltration gallery shown in Figure 9. [Photo: H. Janssen. October 2010]

Figure 23-8 – Ground water monitoring devices were installed to help measure the flow of run-off from the adit. This photo also depicts the concrete drop inlet structure that serves to redirect adit water to the infiltration gallery. [Photo: Property of USFS]

Figure 23-9 – The infiltration gallery shown above will be fully functioning in 2011. It will replace the previously existing sediment pond displayed in Figure 7. [Photo: Property of USFS]
Project Description
The McLaren Tailings Mine Site is an abandoned hardrock mine/mill site located on the outskirts of Cooke City in Park County. This mine/mill site was a key component of the historical New World Mining District. The site encompasses roughly 20 acres and lies 500’ south of Montana Highway 212.

This reclamation project, undertaken by the Montana Department of Environmental Quality’s [MT DEQ] Abandoned Mine Lands Program [AML], consists of the construction of an on-site repository, the excavation of on-site mine tailings [Figure 24-1], the placement of an estimated 237,000 yds³ of mine waste into the repository [Figure 24-3], and the capping of the repository with an 18” multi-layered cap that will prevent precipitation infiltration and percolation. Processes involved in this action include drying mine tailings, amending affected components with roughly 13,000 tons of lime, thus reducing the pH of contaminated soils, and re-routing adjacent Soda Butte Creek to its historic path.

The purpose of this project is to improve human health and the environment by isolating historic mine wastes from the natural environment and the public. The McLaren Tailings presently discharge acid mine drainage into Soda Butte Creek, which then arrives in Yellowstone National Park approximately five miles downstream.

History
1869 – Placer gold deposits are discovered near Upper Soda Butte Creek, with claims being filed the following year. At the time of discovery, the New World Mining District was part of the Crow Reservation, and mining occurred only via trespass on Native American lands.

1882 – Crow Reservation boundaries were reduced, and the New World Mining District was no longer on Reservation lands.

1889 – The Montana State Mining Inspector documented three smelting facilities in the New World Mining District.
1933 – McLaren Gold Mines Co. discovered a deposit [quickly named the McLaren Deposit] on Henderson Mountain. This mine ore consisted of limestone and shale.

1934 – A flotation mill and tailings impoundment were both constructed near Cooke City. The mill, known as the McLaren Mill, produced gold and copper, which were then shipped to Anaconda for smelting.

1937 – Additional ore deposits were discovered and the mill was expanded to accommodate increased capacity.

1938 – During mill operations, neighboring Soda Butte Creek’s channel was filled with tailings and the stream pushed into a ditch and culvert running along the south side of the property.

1953 – The McLaren Mine ceased operations, as it was no longer profitable.

1960s – Soda Butte Creek [Figure 24-4] is documented by Yellowstone Park officials as being the most polluted stream entering the Park.

**Chronology**

1969 – Bear Creek Mining, a subsidiary of Kennecott Corp., rehabilitated the site by covering the eroding tailings with soil. At this time, all on site buildings were also demolished and a new channel was excavated for Soda Butte Creek along the north side of the tailings impoundment.

1988 – The site is subject to an Emergency Response Action by the United States Environmental Protection Agency [US EPA], which encourages Kennecott Corp. to perform corrective actions at the site.

1991 – Kennecott’s corrective actions from 1988 are deemed by the US EPA to be ineffective at containing the tailings.

1993 – Pioneer Technical Services performs a site investigation at the request of the State of Montana. This report, presented to the Bureau of Reclamation, details numerous environmental and engineering concerns.

1994 – A response detailing reclamation activities is prepared by Pioneer Technical Services for the Bureau of Reclamation.
2000 – At the request of MT DEQ, Pioneer Technical Services conducts a limited site investigation, including sediment, surface water, and tailings sampling.

2001 – Pioneer Technical Services conducts a geotechnical investigation, which included the installation and sampling of multiple boreholes in the tailings area, as well as conducting tests at several backhoe test pits.

2010 – June: Construction work on the waste repository begins. In addition, work to build and upgrade bridges and roads, as well as the excavation of the sediment detention basin is undertaken. Lastly, the construction of the on-site water treatment facility was begun [Figure 24-6]. Construction activity at the site is limited by severe winter weather, and in 2010, seasonal construction activity ceased in October.

2010 – December: Proposed plans to haul mine tailings to Whitehall, where the Golden Sunlight Mine would reprocess the tailings, extracting the remaining gold using contemporary technologies, were shelved owing to difficulties in acquiring the requisite permits for transport through Wyoming to the Golden Sunlight Mine.

**Current Project**

The McLaren Tailings reclamation project is projected to occur over a six-year period, with 2010 as the first year. Activities at the site will continue until 2015.

2011 reclamation activities will consist of the continued excavation of mine tailings, continued construction of the water treatment facilities, and continued amendment of impacted soils with lime. To accommodate all impacted tailings and mine waste on site, Knife River will deepen the mine waste repository. The water treatment facility’s construction is projected to be completed in 2011, and, once complete,
Cost and Source of Funds
The McLaren Tailings Reclamation project has received $20,148,197 in total funding. The majority of these funds arrived from the US Department of Interior’s Office of Surface Mines [OSM].

OSM funds arrive from a tax levied on each ton of ore extracted from coal mine sites in Montana. These funds are placed into a federal account. Approximately half of these funds are then made available to the State of Montana to conduct abandoned mine reclamation activities.

An additional $300,000 was provided from the Montana Department of Natural Resources and Conservation [DNRC] in the form of a Reclamation and Development Grant [RDG].

Project Design
Project design was undertaken by Pioneer Technical Services [Billings].

Pioneer Technical Services received $217,919 for their engineering oversight services in 2010.

This design and engineering work reflects 2,757 hours of labor. This was provided by a Principal Project Manager [45 hrs.], a Senior Engineer [315 hrs.], a CADD specialist [172 hrs.], Senior Design and Technical support [315 hrs.], Clerical work [135 hrs.], a Project Manager [97 hrs.], a Project Engineer [1 hr.], a Senior Project Manager [575 hrs.], a Principal Engineer [18 hrs.], a Project Scientist [990 hrs.], a Staff Scientist [19 hrs.], a Staff Engineer [62 hrs.], and a Technician [13 hrs.]. Pioneer wages range from $12-40.89/hr.

Energy Laboratories [Billings] was also contracted for some sampling work in 2010, for which they received $715.

Project Labor
Knife River Corp. [Billings] is serving as the lead contractor on this project. They have subcontracted some excavation work to Cop Construction [Billings], as well as subcontracting labor for plumbing, electrical, and truck driving to four separate firms. The total number of construction labor hours for 2010, amongst all firms, equaled 9,188 hours, for which Knife River received $3,905,392. This figure includes all subcontractor payments. The majority of labor has been provided in the form of Heavy Equipment Operators [4,077 hrs] and General Laborers [2,108 hrs].

Cop Construction, a subcontractor, represents organized labor in the form of their on-the-ground personnel; however, Cop Construction administrators do not receive union wages or benefits.
Knife River purchased a specialized Pressure Feeder and Mixer [Figure 24-7] from ALLU, a Finnish company, for the purposes of applying the lime amendment mixture. As part of this purchase, ALLU also agreed to provide on-site, set-up labor for this machine. Four Finnish laborers were on site in Cooke City for 20 days throughout the 2010 construction operations.

Project Oversight

Project oversight was conducted by MT DEQ, with primary oversight provided by Tom Henderson, Montana Department of Environmental Quality Abandoned Mine Lands Specialist. MT DEQ oversight totaled 1,390 hours in 2010.

Figure 24-8 – MT DEQ AML project supervisor, Tom Henderson, holds a section of soil, displaying the various strata of contamination present. [Photo: H. Janssen, October 2010]

Figure 24-9 – This machine will be responsible for controlling the groundwater and lime mixture within the water treatment facility, producing Calcium Hydroxide. [Photo: H. Janssen, October 2010]

Figure 24-10 – This photo depicts the various layers of contamination. Workers must first de-water all tailings before they are treated via a 48-hour in situ lime treatment. After the lime treatment, the soils can be place into the repository. [Photo: H. Janssen, October 2010]

Figure 24-11 – A pressure feeder and mixer combines to weigh the tailings and then inject an exact percentage of lime into the de-watered tailings. The mixing machine then churns the substances together to neutralize the pH of the tailings. This system is relatively automated, but does require human calibration and supervision. [Photo: H. Janssen, October 2010]
Project Description
The Upper Tenmile Creek National Priorities List (NPL) site is a federal Superfund site located in Lewis & Clark County. It is approximately 53 square miles in size, and comprises the Upper Tenmile Creek watershed and town of Rimini, southwest of Helena. The headwaters of Upper Tenmile Creek flow into Lake Helena 28 miles downstream, providing Helena with roughly 50% of its drinking water. Only the upper 13 miles of the creek, however, exist within the parameters of the NPL site.

The area around the NPL site is largely undeveloped with the exception of the town of Rimini [37 residential structures], a small residential subdivision [Landmark] located eight miles downstream from Rimini, and a few recreational cabins.

The NPL site is comprised of 150 abandoned or inactive mine sites, which did not cease activity until 1953.

Reclamation activities at the site consist of mine reclamation, construction of an on-site repository, remediation of residential yards and Rimini road, and facilitating the availability of potable drinking water for area residents.

Project completion is expected no earlier than 2012.

History
Historic mining at the site resulted in uncontrolled releases of metal contaminants into local streams that has continued to the present. These releases are directly caused by the presence of waste rock, tailings, and contaminated mine water discharge. Arsenic (As), copper (Cu), lead (Pb), and zinc (Zn) are the primary contaminants of con-
cern [COC] that pose a risk to human health and the environment via groundwater, surface water, and stream contamination.

1870s – Major hard rock mining begins in the Rimini Mining district. Prospectors seek out gold, lead, zinc, and copper.

1930s to 1953 – Limited mining occurs in the Rimini Mining district.

1990s – The Basin Creek open pit gold mine closes [this includes the site of the Luttrell Pit].

**Chronology**

1987 to 1990 – Removal and reclamation activities conducted by Montana Department of Environmental Quality [MT DEQ] at 11 mine sites existing within the present NPL site.

1993 to 1994 – MT DEQ conducts investigations of 17 mine sites.


1998 – April: Lewis & Clark County requests assistance from US EPA and MT DEQ in connection with blowouts at the Bunker Hill Mine.

1999 – June: Environmental Assessment conducted to prepare the Luttrell Pit for conversion to Luttrell Waste Repository, which will be able to contain 1,200,000 yds³ of mine waste.


October: Upper Tenmile Creek placed on NPL [recognizing it as a federal Superfund site].

2000 – Relocation of mine wastes to the Luttrell Repository continues.

2001 – January: Tap water sampling commences; bottled water provisions begin for Rimini residents.

April to October 2001 – Ecological and Human Health Risk Assessments conducted.

yards and Rimini Road, and measures to ensure safe drinking water for area residents.”

2003 to 2004 – Mine cleanup continues and expands to include removal of impacted soils in residential yards and at the neighboring Landmark subdivision. Removed wastes are taken to the Luttrell Repository.


2006 – Residential yard cleanup continues at Rimini with waste taken to Luttrell Repository.

2007 – Contaminated soils continue to be excavated and removed to the Luttrell Repository.

2008 – Landmark subdivision continues residential yard cleanup.

2009 – The Upper Tenmile project receives three separate American Reinvestment and Recovery Act [ARRA] grants totaling $4,990,932. These funds are specifically allocated for project construction.

2009 to 2010 – Installation of septic and residential wells begins; Rimini Road cleanup commences, and residential property remediation and revegetation continues.

**Current Project**

Current work at the Upper Tenmile NPL site consists of continued remediation activities in residential areas. This includes removing contaminated soils, replacing the removed quantities with clean soil, and re-grading and re-vegetating the residential areas.

Additionally, work to remove contaminated wells and septic systems and replace them with new, uncontaminated units will continue. Rimini Road work will continue until all contaminated road waste has been removed, placed in the Luttrell Repository and replaced with untainted road material.

Institutional controls will be placed on future ground water wells construction, continued surface water and groundwater remediation activities will be conducted, and creation and implementation of performance standards and points of compliance for the Luttrell groundwater monitoring network and treatment facility will be instituted.

Upper Tenmile construction activities are not expected to be completed prior to 2012.
Cost and Source of Funds
The US EPA has spent roughly $63,000,000 from 2002 to January 2010 at the Upper Tenmile Superfund site. These expenditures reflect project design, EPA indirect costs, remedial project work, and removal project activities.

Between 2002 and 2008, an additional $19,500,000 was allotted for construction purposes only. These funds arrived in the form of a MT DEQ State Superfund contract.

$4,990,932 was provided via three separate American Reinvestment and Recovery Act [ARRA] grants. These funds were applied to off-set construction costs associated with reclamation activities in 2010, and could not be applied to project design or oversight.

Data on specific project costs are being withheld per a Federal Confidentiality Business agreement between CDM and EPA, as are labor figures by CDM (the lead engineering firm) and Bullock Construction (lead contractor). Additional surveying and engineering work was subcontracted to Morrison-Maierle in 2010. EPA indicated that contractors and sub-contractors on the project will not be releasing billing information or employee wage information for work at Upper Tenmile (Dan Hare, EPA employee tracking stimulus funds). Per phone communications with Neil Marsh (CDM project manager) and Mike Bishop (EPA project manager), all data on the project for the public is available at the recovery.gov website. This data was insufficient for a more detailed examination of costs.

[Future contact on site expenditures: Julie DalSoglio, Montana EPA director.]

Project Design
Project design was conducted by CDM.

Project Labor
ARRA project labor is conducted by CDM, which subcontracted earthmoving to Bullock Construction [Boulder]. Bullock Construction subcontracted to three separate companies for drilling/blasting to enlarge the repository, surveying, trucking, and septic system installation.

No construction contract existed for the 2009 work season.

Project Oversight
Project oversight is being conducted by Mike Bishop, EPA site Project Manager, and Neil Marsh, CDM Project Manager.
Figure 25-8 – A grizzly screen is used to separate large rip-rap material from contaminated soils. The soils are taken to the Luttrell Repository, while the rip rap is used for backfill. [H. Janssen, August 2010]

Figure 25-9 – Directly beneath the Luttrell Repository is a water treatment facility that traps and treats all runoff at a rate of 60-70 gallons per minute. [Photo: H. Janssen, August 2010]

Figure 25-10 – Contaminated runoff is treated with a Barium Hydroxide mixture, where sulfates are held to a 250ppm standard before they can be sprayed into the surrounding forests. [Photo: H. Janssen, August 2010]

Figure 25-11 – Resistance to EPA assistance has been marginal; however, it is present. [Photo: H. Janssen, August 2010]
Project Description
The MT DEQ AML section is responsible for reclaiming former mine sites. The stipulations detailing eligibility for AML reclamation require that the site be affected by past mining and processing practices, abandoned or left in an un-reclaimed condition prior to August 3, 1977, and that there is no continuing reclamation responsibility.

Spring Meadow Lake State Park [SMLSP] is located directly west of Helena along Highway 12 in Lewis and Clark County. It receives 85,000 visitors annually, and lies adjacent to the Montana Wildlife Center [MWC]. SMLSP’s 61.1 acres is administered by the Montana Department of Fish, Wildlife, and Parks. The SMLSP reclamation project comprised portions of both SMLSP and the MWC.

Historic mineral processing at the site left an estimated 34,300 yds³ of contaminated tailings and soils on SMLSP and MWC lands. Additional contaminated sediments were present along the East Arm of Spring Meadow Lake. These contaminants consisted of elevated concentrations of arsenic [As], lead [Pb], and manganese [Mn]. Elevated concentrations of arsenic and manganese were also detected in groundwater at the MWC, as well as in surface water along the East Arm portion of Spring Meadow Lake.

As this site is home to a 30 acre man-made lake, frequented by recreationalists for fishing and swimming activities, the SMLSP reclamation project garnered a high-priority status for reclamation activities by MT DEQ AML.

The overall intent of this reclamation project was to protect human health and the environment via the removal of contaminated soils and to reduce the mobility of those contaminants in the environment. Reclamation activities consisted of excavating and hauling wastes to two offsite landfills, backfilling and grad-
ing, and placing cover soil at affected areas. Work concluded with the revegetation of disturbed areas.

**History**
1892-1901, Stedman Foundry and Machine Co. operated at this location, manufacturing machinery and hardware.

1906-1910, Western Improved Wire Fence Co. manufactured wire fences, fence posts, and other fencing supplies.

1910-1915, Northwestern Metals Co. operated an ore reduction milling facility. This process included the use of dry chlorination, which has been directly attributed to some of the waste at the site.

1916-1920, New York-Montana Testing and Engineering Co. operated a mill facility that processed ore from Butte and Philipsburg. This entity is recognized as being responsible for the majority of contamination at the site.

1928-1957, Helena Sand & Gravel operated a sand and gravel pit, ready-mix plant, and cold-mix asphalt plant [this enterprise ultimately resulted in the creation of Spring Meadow Lake, as the open gravel pit filled with water].

1957-1964, Carson Construction Co. operated a gravel pit.

SML property was purchased by the state and officially designated a State Park in 1985.

**Chronology**
Heavy metals were discovered along the shoreline of Spring Meadow Lake by a Carroll College student in 2002. These findings were reported to the Montana Department of Fish, Wildlife, and Parks [the oversight entity of SMLSP], which contacted MT DEQ shortly thereafter.

A Site Inspection and hazardous materials inventory was conducted by Tetra Tech EMI [TTE] [Helena] at the behest of MT DEQ AML in 2004.

In 2005, MT DEQ AML and TTE undertook a reclamation investigation consisting of extensive sampling and risk analysis. MT DEQ AML and Renewable Technologies Inc. [Butte] completed a chronology of site owner/operator history, and a cultural resource investigation to determine if any of the structures qualified for listing on the State or National Historical Record. They received $16,276 for their services. Expanded engineering evaluation and a cost analysis occurred in 2006, to aide in evaluating reclamation options and costs.
In 2006, the Agency for Toxic Substances & Disease Registry became involved. This agency evaluates health risks to children from metal exposure.

In 2009, a stabilization evaluation was undertaken by MT DEQ AML and TTE on the Pattern House. The results of this study indicated that necessary soil excavation at the MWC would require extra stabilization methods to prevent possible damage to the Pattern House; however, this potential situation proved moot as MT FWP chose to remove the Pattern House due to its dilapidated state after suffering through two fires.

Soil and sediment removal began along the shore of the East Arm of Spring Meadow Lake in February 2009. This process was begun while the water level was low and the sediment dry; however, the majority of reclamation activities occurred between August and December 2009. During this time, contaminated soils were removed from the site and sent to the Lewis & Clark landfill and the Valley View Landfill.

The final amount of contaminated soils removed from the site greatly exceeded pre-project estimates, totaling 51,556 yds$^3$ at SMLSP and 4,849 yds$^3$ at MWC.

Some waste material at the MWC failed the Toxic Characteristic Leaching Procedure [TCLP] laboratory test, which is a test to determine if metals will leach into the surrounding environment when exposed to moisture. Since all soils are required to pass the TCLP test prior to legal disposal at a landfill, all waste material at the MWC was dry mixed with 10% cement, tested to ensure it passed TCLP, and only then allowed to be shipped offsite and disposed. A pilot test was performed by MT DEQ AML and TTE to ensure the treatment was effective [Figure 26-9]. Soil samples collected at the SMLSP passed TCLP with no treatment necessary.

Excavation processes at SMLSP entailed removal of soils to depths greater than 2’ throughout much of the affected area [Figures 26-5, 26-6, & 26-7].

38,381 yds$^3$ of clean cover soil were imported to the SMLSP and MWC sites to replace the excavated, contaminated soils. 12 acres of the site then required fertilizing, seeding, and mulching to restore it to its previous, recreational purposes. This phase of the project was completed in December 2009.
Current Project
Current project activities involve monitoring revegetation and erosion patterns at the site. This is being conducted by MT DEQ AML employees.

Cost and Source of Funds
Total project cost, including engineering and construction costs, equaled $2,541,159.

The MT DEQ AML program receives funding to conduct abandoned mine reclamation activities through a grant from the national Office of Surface Mining [OSM]. OSM grant money provided the project with $2,241,159 for the SMLSP reclamation project. OSM grant funds applied to Montana reclamation projects arrive from a tax levied on each ton of ore extracted from coal mine sites in Montana.

An additional $300,000 was provided for reclamation activities via a Montana Department of Natural Resources and Conservation [DNRC] Reclamation and Development grant [RDG].

Project Design
Tetra Tech EMI [Helena] received $271,887 for engineering and sampling work on the project. $87,142 was allocated specifically for 3,016 hours of labor, with wage rates ranging from $13/hr. for clerical services to $57.26/hr. for soil scientist labor. The mean wage for engineering work on this project was $28.89/hr. Other labor supplied by Tetra Tech EMI consisted of civil engineers, geologists, computer graphics specialists, architects, geochemists, and administrative support.

Project Labor
Construction labor totaled $2,269,272, and all on-site labor was conducted at Davis-Bacon wage rates.

Helena Sand & Gravel [Helena] received the contract for sediment removal, which totaled $9,680; this work was conducted over four days, on site.

The reclamation construction contract was awarded to Mungas Company Inc. [Philipsburg], which received $2,259,592 for their services. Mungas labor included Equipment Operators I [$31.52/hr.], II [$31.99/hr.], and III [$32.39/hr.], Labor II [$23.89/hr.], Truck Driver II [$24.76/hr.], and regular [off-site] labor [$18.50/hr.]. Mungas labor totaled $181,670 for 6,473 hours of labor, for an average hourly wage of $28.07.

Mungas Company Inc. subcontracted work to Centennial Concrete and Septic [Butte] in the amount of $104,280 for screening and treating excavated, contaminated materials at a rate of $28.73/ton. This figure reflects the treatment of 3,630 tons by Centennial Concrete and Septic.

K&S Hydroseed [Missoula] was subcontracted in the amount of $21,996 to fertilize and seed the site. Equipment used included a hydroseeder and a tractor with drill seeder, hay buster, and crimper attach-
ments. Reseeding of the area was calculated at rates combining equipment and labor cost, totaling $3,430 for 18 hours of equipment use plus indirect costs.

Schnell Excavating [Butte] and Montana Express LLC [Clancy] were both subcontracted by Mungas Co. to provide trucks and drivers to transport affected materials to the two off-site landfills at a rate of $3.72/ton. Schnell Excavating received $72,842 and Montana Express LLC received $21,757 for their services. Truck driving wages ranged from $95-110/hour for work on the SMLSP project, with labor hours incorporated into an hourly truck rate.

The hauling subcontractor remittances reflect 25,430 tons of impacted material transported to the two offsite landfills.

Project Oversight
Project oversight was conducted by MT DEQ AML Reclamation Specialist, Pebbles Clark.

Special Certifications Required
All personnel working onsite were required to possess current Hazardous Waste Operations and Emergency Response [HAZWOPER] certification.

Figure 26-8 – A total of 12 acres required reclamation activities at SMLSP. This action resulted in 51,556 yds³ of contaminated soil being removed from the site. [Photo: Property of MT DEQ]

Figure 26-9 – This photo depicts the soil/cement mixing pilot test, which was completed to determine the effectiveness of dry mixing 10% cement with affected soils. This combination, when in contact with moisture, causes the affected soils to be encapsulated in the cement, thus preventing the metals from leaching into the environment. [Photo: Property of MT DEQ]

Figure 26-10 – Nearly all soil excavation at the site occurred with the aid of heavy machinery. Note the rust colored soils along the right-hand side of this trench indicating the presence of heavy metals. [Photo: Property of MT DEQ]

Figure 26-11 – All walking trails that were disturbed throughout the August-December 2009 reclamation project were reconstructed upon the projects’ completion, enabling future recreation activities to occur at Spring Meadow Lake State Park. [Photo: H. Janssen, September 2010]
Project Description
The Zortman and Landusky mines are situated on land jointly owned on private lands and United States Bureau of Land Management [BLM] federal lands southeast of Havre. The Zortman mine is comprised of 401 acres, while the Landusky site is 1,200 acres in size.

Current reclamation activities occurring at the site are aimed at groundwater and surface water treatment, as well as an upgrade of operating facilities, including construction and installation of a wind powered turbine to reduce electricity costs.

History
The Zortman and Landusky sites operated as gold mines beginning shortly after the discovery of gold by Pike Landusky and Pete Zortman in the late 1880s. Historic methods used to extract the mineral consisted of underground mining and vat leaching. A 28 mi² portion of the present mine site was purchased for mining exploration from the Fort Belknap Reservation in 1895 under the Grinnell Treaty for $360,000.

In 1979, Pegasus Gold Inc. acquired mining rights to the site and began a cyanide heap-leaching mine operation. In 1993, heavy rains sent acid mine drainage into the town of Zortman, at which time the US Environmental Protection Agency [EPA] fined the mining company for illegally disposing of lead, arsenic, cyanide, and other wastes into seven adjacent drainages. This suit was settled out-of-court in 1996, at which time Pegasus agreed to pay a $32 million water bond and $4.7 million in reparations to be divided among the Fort Belknap tribal council, the state of Montana, and the federal government. Pegasus declared bankruptcy in January 1998. At its height of operation, Pegasus employed 250 individuals, including an environmental remediation team consisting of more than a dozen employees. As part of an out-of-court set-
tlement, a $30 million reclamation bond, a $14 million short-term water treatment bond, and a $15 million long-term water treatment trust fund were settled upon by the Montana Department of Environmental Quality [MT DEQ], Pegasus Gold Inc., and the BLM. These funds were mostly exhausted by 2008, and the state of Montana, in conjunction with the BLM, has, to date, expended an additional $12 million at the site for the purposes of reclamation and water treatment operations.

Presently, the annual operating costs at the site are roughly $1.5 million, twice the amount of the annual water treatment bond available. The difference has, to date, been made up primarily by BLM funds.

In 2010, the American Recovery and Reinvestment Act [ARRA] granted $3 million for upgrades to the facilities, which would serve to reduce annual costs associated with water treatment activities at both sites.

Current oversight is managed under BLM’s CERCLA authority.

**Chronology**

MT DEQ, in collaboration with the BLM, assumed operational management of the Zortman and Landusky sites in 1999. Since this time, reclamation activities have focused upon treating surface and groundwater discharged from the two mine locations, as well as water treatment actions at Swift Gulch Creek, which rests to the north and down gradient from the Landusky mine site. These approaches were undertaken utilizing the water treatment and reclamation bonds posted by Pegasus Gold Inc. from the bankruptcy proceedings.

ARRA-funded work on the Zortman and Landusky sites began in February 2010. Spectrum Engineering [Billings] was retained to oversee the implementation of operational upgrades. This work included the construction of three lined 11-million gallon settling ponds at the Landusky site, upgrading the components of the lime treatment facilities at both the Zortman and Landusky treatment facilities, installation of a wind turbine, upgrading the Swift Gulch Creek water treatment facilities, purchase of sludge removal equipment, and for maintenance on existing equipment. Water treatment facilities at the Swift Gulch Creek facility add lime to diverted creek water in huge processing vats [Figure 27-3]. This enables a reaction that increases the alkalinity of mine drain-

**figure 27-3 – Temporary water treatment facility along the Swift Gulch Creek drainage. This was replaced in fall 2010 with a permanent water treatment system depicted in Figure 27-4. [Photo: H. Janssen; August 2010]**

**figure 27-4 – Present Swift Gulch water treatment system that replaced the temporary one depicted in Figure 27-3. This upgrade was conducted using 2010 ARRA funds. [Photo: Spectrum Engineering]**
age, causing dissolved metals to form solid phase oxides and sulfates which settle in water. These chemical compounds are heavier than discharged water and settle to the base of sediment ponds. This sediment is removed and placed into a lined on-site repository.

Both the Zortman treatment facility and the Landusky treatment facility are automated and monitored by a single individual. One goal of the ARRA upgrades is for the Swift Gulch Creek facility to become automated and remotely accessible without necessitating on-site labor.

Current Project
Spectrum Engineering is presently responsible for the continued remediation work at the Zortman and Landusky sites. The seven staff workers employed by Spectrum were all previously employed by Pegasus Gold Inc. and were retained for continued remediation services. Monitoring and maintenance work at the site is conducted by Spectrum employees year-round, with the construction season occurring between May and September.

ARRA-funded work began in April 2010, and, with the exception of the wind turbine project, was completed by December 2010. The wind turbine project’s expected completion date is 2012.

Cost and Source of Funds
The present upgrade projects being undertaken at the Zortman and Landusky sites are funded by a $3 million ARRA grant.

2009 annual operation and maintenance [O&M] costs were funded through a BLM contribution of $1,046,000, which was augmented by additional funds from the Resource Indemnity Tax [RIT] [a coal tax placed upon mines that is determined by tonnage removed and which is managed by the Department of Natural Resources and Conservation]. The 2009 RIT provided $62,027 for Zortman and Landusky O&M. $55,000 was provided via remaining funds from the reclamation bond. A final $731,000 was provided from MT DEQ through a surety bond set aside for water treatment at mine sites. The total working budget for 2009 O&M activities at the Zortman and Landusky sites equaled $2,362,000.

ARRA-funded Project Design and Labor
Spectrum Engineering [Billings] served as the lead contractor on the ARRA-funded work conducted at the Zortman and Landusky sites.

There were three main subcontractors also hired for this work. MK Weeden [MKW] [Lewistown] was hired to perform the majority of the earthwork at the construction site of the new Landusky Biological treatment ponds. Ionic Water Technologies [IWT] [Reno, NV] was also secured as consultants on both of the water treatment facility upgrades. Lastly, Electrical Consultants Inc. [ECI] [Billings] was sub-
contracted for review of the sites’ electrical grids and development of a plan for integrating wind power.

Work performed by MKW consisted of: bulldozing, excavating, a lowboy, and truck driving labor to remove soil and provide room for construction of three large holding ponds. For their work they received a total of $393,593 of which $58,305 [14.8% of the total received] was paid to laborers. This figure reflects 2,155 total hours, for an average wage of $27.52/hr. The compensation for these positions ranged from $19.50-29.44/hr. and MKW employees receive medical insurance and a 401k option.

The total construction cost of the permanent Swift Gulch Treatment System was $652,800. Labor to construct this facility consisted of consultation supplied by IWT at $75/hr. for 360 hours and $150/hr. for 24 hours, totaling $30,600. Additional Spectrum Engineering fees for this project were $12,840 at $107/hr. for 120 hours, while electrical wiring of the new facilities was supplied at a rate of $1,200/day for 12 days, totaling $14,400. Labor to install the requisite two 5,000 gallon tanks, flow meters, concrete, and a lime silo, totaled $33,000 at a rate of $50/hr. for 660 billable hours. Thus, the total labor cost for the Swift Gulch Treatment facility was $90,800 reflecting 1,260 total labor hours, or 14% of the total construction cost.

Upgrades to the Landusky Biological Treatment Plant facility were $1,134,200. Consulting and engineering fees reflect $87,200 of this sum. Consulting costs provided by IWT totaled $39,000 at rates of $75/hr. for 400 hours and $150/hr. for 60 hours. Spectrum Engineering accrued 450 billable hours on this upgrade at $107/hr. totaling $48,200. Construction costs associated with the Landusky upgrade totaled $1,047,000, and was comprised of lump sum payments per task and payments based upon cubic yardage. Engineering and consultation costs reflect 4.6% of the total facility construction costs.

Upgrades to the Zortman Water Treatment Facility total $76,900, with $3,200 arriving in the form of Spectrum Engineering fees, reflecting 32 billable hours at $100/hr. Construction costs consisted of a $13,700 lump sum payment. Total construction and engineering figures totaled $16,900, which reflects 22% of the upgrade costs at this location.

The construction of an on-site wind turbine represents $1,124,100 in ARRA grant funds. Consulting
for this project by ECI consisted of $72,000 for 600 billable hours at $120/hr. with an additional $33,500 arriving in construction and engineering labor. These totals represent 9.4% of total Wind Turbine construction project costs.

2009 Annual Project Labor
The O&M budget for the Zortman and Landusky mines varies based upon congressional allocation from year-to-year. It has consistently been near $2 million; however, it is increasing owing to inflation and the addition of new treatment facilities. The annual budget is largely contingent on annual rainfall, and is estimated in advance by Spectrum Engineering with MT DEQ oversight.

The 2009 O&M budget equaled $2,362,000. 2009 Spectrum Engineering labor expenditures were $471,405. This total labor cost expresses both on- and off-site labor conducted by Spectrum Engineer-
ing. An additional $251,621 was expended upon subcontractor labor.

On-site labor expenses for the seven Spectrum employees for 2009 totaled $417,156. These employees are comprised of four water treatment plant operators [Avg. wage $22.08/hr.], one site manager [$29.14/hr.], one electrician [$25.94/hr.], and one field technician [Avg. wage $19.87/hr.]. The remaining $54,249 was accrued through 584 billable hours to the Spectrum Engineering Billings office [Avg. wage $92.89/hr.]. Spectrum employees receive medical insurance and a 401k option. Spectrum does provide additional, summer labor on a yearly, need-based schedule.

Project Oversight
Project oversight is conducted jointly by Spectrum Engineering, MT DEQ, and the BLM.
Figure 27-8 – The above depicts the Landusky site, prior to the commencement of remediation activities. [Photo: Property of MT DEQ]

Figure 27-9 – This photo depicts the same area as Figure 8, with third-year vegetation that was introduced. [Photo: Property of MT DEQ]

Figure 27-10 – The Zortman water treatment facility rests adjacent to previously remediated lands. [Photo: H. Janssen, August 2010]

Figure 27-11 – Remediated lands can be viewed in the foreground of this photo, with un-remediated property present existing on the exposed hillside in the background. [Photo: H. Janssen, August 2010]