

PROJECT SUMMARY
2012
NEW WORLD MINING DISTRICT
RESPONSE AND RESTORATION PROJECT

Prepared For:

USDA Forest Service
Gallatin National Forest
Bozeman, Montana

Prepared By:

Tetra Tech
303 Irene Street
Helena, Montana 59601

January 2013

INTRODUCTION

The New World Mining District (District) Response and Restoration Project officially began when the USDA Forest Service submitted an implementation plan to the State of Montana on January 22, 1999. Since that time, the Forest Service has engaged in a number of activities including collecting environmental and engineering data to better understand the site, further investigate portions of the District that were not well understood, and design and construct cleanup actions for the highest priority sites in the District.

Because a considerable amount of work has been done since the project was initiated by the USDA Forest Service, this Project Summary, which was first distributed in the fall of 2000 and updated annually through 2008 and again in 2011, is being updated this year to summarize all work to date and keep people abreast of on-going project activities. This Project Summary focuses on project cleanup activities conducted through 2011 and erosion control completed in 2012. Previous summary documents presented the project's history, mining-related problems, legal considerations, and cleanup process.

In 2012 the project entered a 20-year Long Term Operations and Maintenance phase during which time water quality and vegetation monitoring will continue regularly as will maintenance of erosion control features when required. Because all reclamation work is complete this Annual Summary report will be the last one prepared.

PROJECT SETTING

The District, which includes a mixture of National Forest and private lands, is a historic metals mining area located in the general vicinity of Cooke City, Montana, in the Beartooth Mountains. The historic mining district is centered northeast of Yellowstone

**See *Figure 1* for *Project Location* (p. 2)
and *Figure 2* for *Land Status* (p. 3)**

National Park, and contains hard rock mining wastes and acid discharges that impact human health and the environment. Human health and environmental

issues are related to elevated levels of heavy metals present in mine waste piles, acidic water discharging from mine openings, and stream sediments. Cleanup work is challenging in this harsh, mountainous environment due to a severe climate, short construction season, and large amount of snowfall that the District receives.

The 40 square mile District is located at an elevation that ranges from 7,900 feet to over 10,400 feet above sea level and is snow-covered for much of the



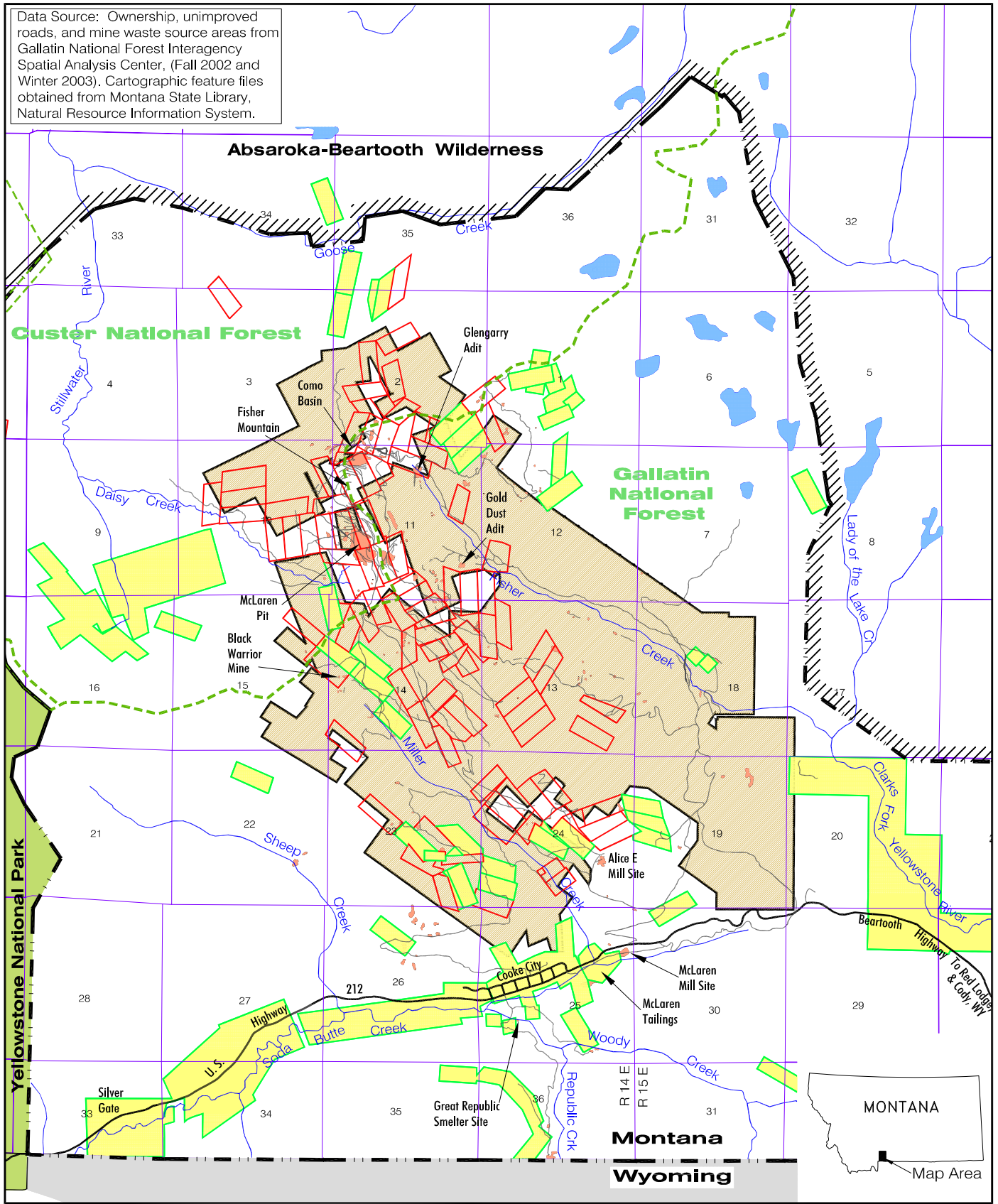
View of Daisy Pass (center) & Crown Butte (right)

year. Historic mining disturbances affect about 65 acres with the largest disturbances attributed to the McLaren Pit (12 acres) and the McLaren Tailings (11 acres). The Glengarry Adit and the nearby Como Basin (5.5 acres) are the other major source areas in the District that contribute pollutants to headwater streams.

The District is situated at the headwaters of three river systems that all eventually flow into the Yellowstone River. These rivers include the Clarks Fork of the Yellowstone, the Stillwater, and the Lamar. The Lamar River flows through Yellowstone Park. The major tributary streams affected by mining disturbances within the District include Daisy, Miller, Fisher, and Soda Butte creeks.

Mine waste source areas, District, and private property as they existed during the majority of the reclamation work period are shown in Figure 1. In 2009, the Forest Service acquired lands that were privately held by the Reeb Estate which further consolidated District Property ownership as shown in Figure 2.

Data Source: Ownership, unimproved roads, and mine waste source areas from Gallatin National Forest Interagency Spatial Analysis Center, (Fall 2002 and Winter 2003). Cartographic feature files obtained from Montana State Library, Natural Resource Information System.



0 Meters 1500

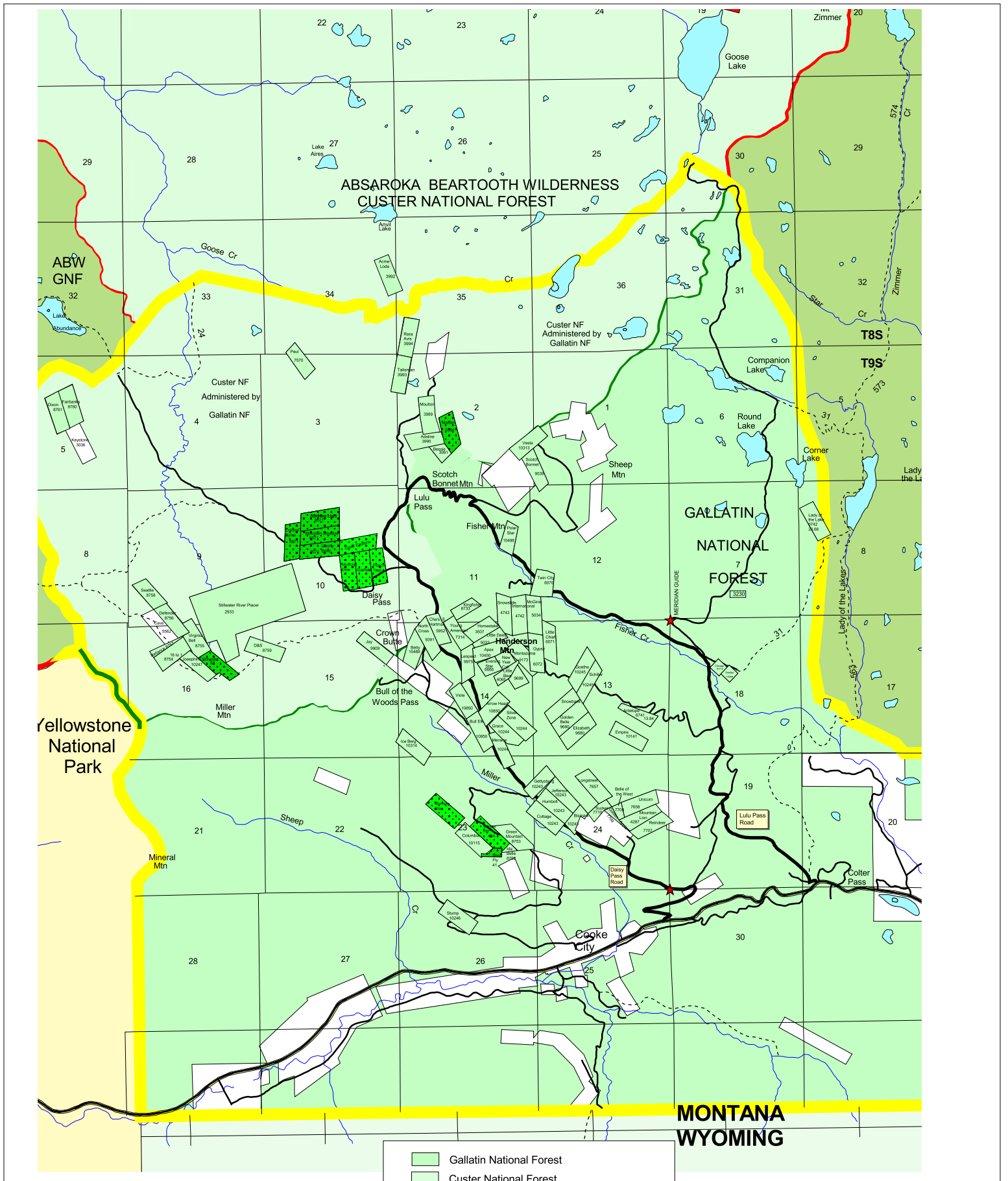


7561506.110

- New World Mining District Boundary
- District Property Boundary
- Wilderness Boundary
- Unimproved Road
- National Forest Boundary
- Mine Waste Source Area
- District Property (Patented Claims)
- District Property (Unpatented Claims)
- Private Property

Project Vicinity Map
 New World Mining District
 Response and Restoration Project
 Cooke City Area, Montana

FIGURE 1



**New World Mining District
Land Status After
Reeb Estate Acquisitions
Cooke City Area, Montana**

FIGURE 2

PROJECT RESOURCES

Maps of the project site, previous Project Summaries, and numerous technical documents concerning the site are available from the project website and at information repositories located in Cooke City at the Chamber of Commerce office and in Bozeman at the Gallatin National Forest Supervisor's Office. We encourage you to investigate these information sources to gain a more complete and detailed understanding of the New World Mining District Response and Restoration Project.

Visit our project website for additional project information, project documents, and current activities.

<http://www.fs.fed.us/r1/gallatin>

CLEANUP APPROACH

The USDA Forest Service is the lead agency responsible for implementing the cleanup of mining-related impacts in the District. Other state and federal agencies are cooperating with the effort, including the U.S. Department of Interior (DOI), the Environmental Protection Agency (EPA), and the Montana Department of Environmental Quality (DEQ). Numerous interested parties are also actively involved in following project activities and providing comments to the Forest Service. These groups include the Beartooth Alliance, Greater Yellowstone Coalition, Park County Environmental Council, Northern Plains Resource Council, and many concerned citizens and residents of Cooke City and Silver Gate.

The USDA Forest Service uses their authority granted under the Comprehensive Environmental Response, Compensation, and Liability Act (the Superfund enabling law) to proceed with the cleanup. Following EPA guidance, the Forest Service follows the Non-Time-Critical Removal Action process to implement the cleanup.

The overall goal for cleanup is to improve water quality in the District to the highest quality possible, and reduce or eliminate risks to people and the environment from historic mining impacts. The

general strategy the USDA Forest Service has used on this project was to mitigate the readily identifiable solid waste sources as a first phase of cleanup. This was followed by a second phase that evaluated problems associated with the more difficult mine discharges.

To support activities that occur each year of the project, the USDA Forest Service prepares annual work plans that identify the work proposed each year. Recognizing that this project also involves restoration in addition to response actions, the Forest Service integrates restoration elements within the cleanup process by including restoration in the overall strategy, where possible, for each of the cleanup projects undertaken.

A brief description of the approach used for cleanup is provided in the following discussion.

PRIORITIZING AND EVALUATING MINE WASTE SOURCES

One of the key parts of the cleanup evaluation was ranking the mine waste sites in the District using a modified hazard ranking system developed by the Montana DEQ. This system, the Abandoned and Inactive Mine Scoring System (AIMSS), uses site specific data to evaluate the risk of pollution from mine waste sources via four pathways: groundwater, surface water, direct contact, and air. About 50 site variables, including the results obtained from sampling waste materials, are input to the scoring system to determine both individual pathway scores and a total score. Higher weights are ascribed to the following: observed releases to groundwater and



Inside the Glengarry Adit

surface water, especially where an exceedance of a standard is documented; sources that are closer to a population base; and, higher contaminant concentrations, large contaminant quantities, and/or large areas of disturbance. Results of the AIMSS scoring have been presented in numerous project documents, including the Selective Source Response Action Engineering Evaluation/ Cost Analysis.

Using the goals and objectives outlined in the Consent Decree and the results of the AIMSS ranking, higher priority sites are waste sources that are in direct contact with surface water or groundwater, or that have discharges that impact water quality or human health. There are a number of District waste sites that fall into this category, such as the McLaren Pit, McLaren Adit, Como Basin, and Glengarry Adit. Waste sources that were relatively benign were considered for minor work which was completed at some of the lowest ranked sites.

The Consent Decree and Settlement Agreement that form the framework of this project require that project funds first be expended on cleanup of mining wastes present on "District Property". However, these funds can be used for assessment and engineering/design work on Non-District Property. District Property is defined in the Consent Decree as all property or interests in property that the mining company relinquished to the U.S. Government. The McLaren Pit and Glengarry Adit sites, for example, are on District Property. The McLaren Tailings site, on the other hand, is a non-District Property. Non-District Property cannot be cleaned up until the Notice of District Property Work Completion from the federal government and the State of Montana are received. The USDA Forest Service, through other funding mechanisms and its agency cooperators obtained additional funding to cleanup some Non-District Property wastes, such as the Republic Smelter and the McLaren Millsite.

ENGINEERING DESIGN AND CLEANUP CONSTRUCTION

Due primarily to weather limitations, cleanup construction in the District was completed during the short field season from mid-July to mid-October. Because of this limitation, the USDA Forest Service has broken the cleanup into smaller projects that

were constructed in one to two seasons. To this end, cleanup actions are evaluated each fall/winter/spring in a CERCLA document called an Engineering Evaluation/Cost Analysis (EE/CA).

In an EE/CA, source area characteristics were appraised and cleanup alternatives developed to mitigate site-specific problems. This process involved taking a comprehensive look at site characteristics and human health and environmental risks, and then following an established procedure of screening relevant response options, developing response alternatives, and evaluating alternatives in detail.

The detailed analysis of alternatives in an EE/CA weighs the expected results of an alternative against seven criteria including overall protection of human health and the environment, compliance with laws and regulations, long- and short-term effectiveness, implementability, and cost. After weighing the pros and cons of a number of alternatives, the USDA Forest Service selected preferred alternatives and issued the EE/CA to the public to solicit comments. Significant comments were addressed in final EE/CAs and decision documents called Action Memorandums were issued. EE/CAs were generally prepared annually for the project.



Como Basin Reclamation – July 2006

PROJECT ACTIVITIES

In March 1999, the USDA Forest Service initiated the planning process for the project. Planning documents were in place by June, and work began with the monitoring of surface water and groundwater quality at selected monitoring points. Activities that the Forest Service has conducted to date include the following:

- Prioritized mine waste sources in the District.
- Established a database management system for the Project.
- Cataloged existing information available for the site and completed a technical evaluation of existing data.
- Developed a suitable basemap to support engineering design.
- Obtained data to fill identified data gaps for proposed response actions at the site.
- Identified unrecorded cultural features.
- Conducted geochemical sampling of mine wastes throughout the District.
- Improved portions of the Daisy Pass and Lulu Pass roads to accommodate construction traffic.
- Completed a repository siting evaluation and collected hydrogeologic data on prospective repository sites.
- Evaluated areas of erosion contributing excessive sediment to area drainages.
- Reopened the Glengarry Adit and Como Raise to more fully characterize underground sources of water within the mine.
- Completed a U.S. Geological Survey-led surface water tracer study on Daisy Creek and Miller Creek to determine surface water inputs of metal contaminants.
- Evaluated water quality treatment alternatives for acid mine discharges.
- Prepared EE/CAs for the following Response Actions: selective mine waste sources in Fisher Creek; the McLaren Pit; the Como Basin, Glengarry Adit, and remaining sources in Fisher Creek; mine waste sources in the Miller Creek drainage, and adit discharges in the District.
- Cleaned up selected waste dumps and placed about 68,000 cubic yards of mine waste in an engineered repository.

All activities completed have been documented in work plans, reports, or technical memoranda, and have been presented to the DOI, DEQ, EPA, and the public for review and comment.

- Reopened and investigated water sources discharging from the McLaren Mine.
- Grouted a borehole in the McLaren Mine and numerous boreholes in the Gold Dust mine to reduce inputs of surface water and groundwater that enter the mines.
- Covered McLaren Pit wastes with an engineered cover.
- Covered disturbed soils in the Como Basin with an engineered cover.
- Closed the Glengarry Adit using a combination of plugging, grouting, and backfilling technologies.
- Closed the McLaren Adit using an infiltration basin and backfill/regrading the adit portal.
- Conducted road surface stabilization and drainage improvements on 30.0 miles of District roads.
- Monitored revegetation success at reclaimed sites.
- Monitored surface water and groundwater quality several times each year at numerous sites throughout the District.
- Maintenance of erosion control features in the Como Basin.

CLEANUP ACTIVITIES

Numerous activities have been conducted to prepare for or to complete cleanup at prioritized sites. These activities and projects are described below.

REPOSITORY STUDY

One of the first priorities established by the project team was to identify a central repository site that could be used to isolate mining wastes that could not be reclaimed in-situ. The initial (Phase I) repository siting evaluation examined locations able to contain a minimum of 500,000 cubic yards of waste material.



New World Waste Repository – July 2008

Phase I was conducted in March through July 1999 and used existing technical information available from previous investigations to identify sites with physical and environmental characteristics that would be suitable for disposal of mining wastes. The data evaluated included groundwater, surface water, geology, soil, geotechnical, vegetation, and other environmental information. Phase II was conducted from July 1999 through September 2000 and involved collecting site-specific data at the highest ranked sites determined in the Phase I evaluation.

The site, located east of the Lulu Pass Road about 0.5 miles north of Highway 212, ranked the highest of the 28 sites evaluated. Evaluation criteria included: location of major faults; geologic setting; steepness of slopes; avalanche potential; precipitation and snowfall; and, access using existing roads. One of the key characteristics of this site is the presence of a relatively thick surface deposit of glacial till,

which is preferred to bedrock or alluvium because of its lower permeability and because it can be salvaged and used in repository construction. The amount of fine-grained material in the till results in relatively low horizontal and vertical hydraulic conductivity, two characteristics important in limiting the movement of leachate that could potentially migrate below a repository facility.

ROAD IMPROVEMENTS

To support cleanup construction, the Forest Service initiated a road improvement project in 1999 to enhance the two major roads in the District. Improvements to the Daisy Pass and Lulu Pass roads primarily involved regrading the road surface, improving drainage, and bringing in gravel surfacing to cover numerous soft spots in the road. In 2000, major road improvements were completed with the construction of two bridges on the Lulu Pass Road. The first bridge replaced the existing low water crossing of Fisher Creek. The second spans Polar Star Creek, a tributary to Fisher Creek just below the Glengarry site.

Additional road improvements were completed in 2011 and are considered to be the last of the maintenance work that will be conducted on District roads. This work included sub-grade stabilization, resurfacing, drainage improvements (culverts, side ditches, drains, water bars, and spillways), and cut and fill slope stabilization on 30 miles of District roads. This work also included lime and compost amendment on 5 acres of acidic surface soils and revegetation of 17 acres of disturbed ground.

SELECTIVE SOURCE RESPONSE ACTION

Using the AIMSS list as a starting point, source area characteristics were appraised and an initial cleanup project schedule was proposed in 1999. The Selective Source Response Action EE/CA analyzed removal of eight waste dumps impacting surface water in the Fisher Creek headwaters, and the preferred alternative (waste removal to a repository) was selected. As a result of public and DEQ comment, however, the 1999 cleanup work was delayed so that more groundwater information could be collected at the repository site.

Following an additional year of collecting data at the repository, the Final Selective Source Response Action EE/CA was released to the public in 2000, the preferred alternative was selected, and an Action Memorandum was issued in February 2001. An engineering design package was prepared in the fall of 2000 which detailed reclamation plans for the waste dump removal sites, and presented plans and specifications for the construction of a repository with a bottom liner, leachate collection system, and a double-lined capping system.



**Expanding the New World Waste Repository
Bottom Liner – July 2005**

The Selective Source Response Action was initiated in 2001 and was completed in 2002. This initial cleanup project involved removing approximately 32,000 cubic yards of mine waste rock and mill tailings from nine mine waste areas, disposing of these wastes in the repository, and revegetating about 4.6 acres of the former waste areas. The reclaimed sites represent about 9% of the total acreage and 8% of the total volume of waste on District Property. The repository was designed for expansion, and it was reopened in 2005 to dispose of additional wastes remaining in the District.

The major components of repository construction involved development of a rock quarry, construction of a substantial rock toe buttress, installation of a bottom liner system with toe drains and sump, and installation of temporary and permanent cover systems. Due to difficulties involved with construction and the short construction season, temporary measures used to winterize the site in 2001 did not prevent spring runoff from wetting the

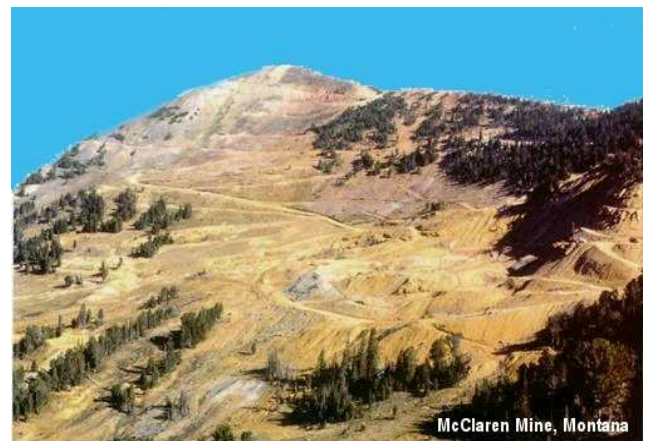
waste placed in the repository, which resulted in a sump designed to collect leachates from the waste filling with water in 2002. This sump was pumped down in 2002 and each year since with the water disposed at the Cody, Wyoming sewage treatment lagoon. With the permanent closing of the repository in 2006, systems designed to prevent water from entering the waste have substantially reduced this annual maintenance task.

The initial cleanup project involved removing approximately 32,000 cubic yards of mine waste rock and mill tailing from nine mine waste areas....

Removal of wastes from the former dump sites appears to have resulted in water quality improvements in tributaries draining the former waste area. Water quality will continue to be monitored at select stations downstream of the reclaimed sites to document water quality changes in accordance with the Long Term Operations and Maintenance Plan.

MCLAREN PIT RESPONSE ACTION

Planning and preparation for the McLaren Pit Response Action began in 1999. A considerable amount of environmental and engineering data was



McLaren Pit Before Capping

needed, and most of these data were collected in the 2000 field season.

The USGS, working under an agreement with the Forest Service, conducted an ionic tracer study of

metals loading in Daisy Creek in 2000, and the Forest Service's primary contractor, Tetra Tech, collected data in the McLaren Pit that would support



McLaren Pit After Capping

the preparation of an EE/CA. Hydrologic and metals loading models were completed with these data, indicating that the McLaren Pit contributed from 20% to 50% of the metals load in Daisy Creek. With the results of these studies, a draft of the McLaren Pit Response Action EE/CA was prepared and released to the public in May 2001.

Capping the McLaren Pit reduced the exposure of about 67% of the total waste present on District Property

Cleanup of the McLaren Pit involved consolidation of waste rock from dumps in the Daisy Creek headwaters into the McLaren Pit, and capping of the consolidated wastes with an impermeable cap. The scope of the McLaren Pit Response Action was to reduce or eliminate uncontrolled releases of metals from mine waste material in the Daisy Creek headwaters.

An engineering design and construction package for the McLaren Pit Response Action was completed in March 2002. The design involved consolidating about 24,000 cubic yards of waste in the pit, capping about 11 acres of the pit with a geomembrane, covering the geomembrane with a drainage layer and soil, and constructing runoff and runoff channels to convey water off the capped wastes. The project was initiated in 2002 with construction of the multi-layered cover completed by October 2003.

Another response action was implemented by the Forest Service for the McLaren Adit adjacent to the McLaren Pit during the summer of 2010. This work included backfilling the adit portal with coarse rock and installing a drain-pipe inward of the rock plug to capture and redirect adit discharge into an infiltration basin located outside and down gradient of the adit. Work was continued in 2011 by amending soil below the adit with lime and compost for revegetation. During 2011, water control structures were installed on 30 miles of district roads, 1.5 miles of historic mining roads were reclaimed, and 17 acres revegetated.

In Daisy Creek, mean concentrations and loads of all metals have declined since the capping of the McLaren Pit under both low and high flow conditions. The greatest changes have been manifested during high flow, when it appears that a relatively greater amount of clean water moves off the cap during the snowmelt period in the spring and early summer, resulting in less metals being mobilized from the McLaren Pit Mine Waste as well as providing enhanced dilution of metals downstream during high flow. Post-capping mean low flow metals concentrations and loads are also lower at each of the Daisy Creek tributary and main stem monitoring stations, with this result likely attributed to the McLaren Pit cap, which reduces or eliminates precipitation received during the summer and fall from percolating through the capped waste rock. The following graph shows the changes in mean concentrations since the cap was completed as measured at Station DC-2, which is located about 0.5 miles downstream of the capped area.

COMO BASIN/GLENGARRY ADIT/FISHER CREEK RESPONSE ACTION

The Glengarry Mine has been targeted for rehabilitation since the inception of the Response and Restoration Project because it is one of the principal sources of metals loading in the headwaters of Fisher Creek. The mine historically discharged 23 to 57 gallons per minute (gpm) of low pH, iron-, zinc-, and copper-bearing water directly into Fisher Creek.

The Glengarry Mine consisted of 3,060 feet of drifting and two nearly vertical raises. One of the raises extended 425 feet upward and surfaced in the



**The Flooded Glengarry Workings
Prior to Closure – July 2000**

Como Basin at the foot of the north flank of Fisher Mountain. The top of this raise passes through the Meagher Limestone formation and a massive sulfide ore deposit hosted in the Meagher.

In September and October 2000, the Glengarry was reopened for assessment purposes. During this first phase of assessment, accumulated debris and precipitated iron mud two to five feet deep were removed from the underground workings beginning at the portal and extending back to a "Y" intersection 1,540 feet in from the portal. The two branches of the "Y" were made accessible, but debris and mud were not removed past the "Y" intersection. The following year, the second raise was reopened from the surface in the Como Basin and repaired down to a point well below the base of the Meagher Limestone. Three separate short horizontal workings were encountered in the raise in the Meagher Limestone. At the first raise, debris was removed and temporary ladders were installed to determine the nature of the raise above a timbered bulkhead at the top of the raise. However, removing this bulkhead was considered too dangerous so no further reopening work was conducted in the first raise.

Using a detailed water sampling program within the Glengarry drift and the Como Raise, major inflows of water and metals loads were identified. Water flowing into the Glengarry comes from essentially three point sources and one diffuse source. The point sources are the Como Raise, the first raise, and a roof leak located 1,050 feet from the adit portal. Diffuse roof leaks were observed primarily in

the first 1,200 feet in porphyritic rock. Load analysis showed that the vast majority of metals loading into the adit could be attributed to the raises and the 1050 roof leak, with the primary source of copper being the Como Raise. The 1050 roof leak contributed more arsenic, aluminum, and cadmium load than the raises, although roughly equal loads of iron, lead, and zinc were attributed to the raises and the 1050 roof leak.

A Draft EE/CA was released to the public in June 2002 that evaluated response action alternatives to address mining impacts from mining-related sources in Fisher Creek, including the Glengarry Adit, the Como Basin, and remaining mine waste dumps in the Fisher Creek drainage. The EE/CA was structured around each of these three source areas, with source-specific response action alternatives developed for each. The preferred alternative selected in the EE/CA was a combination of several alternatives that addressed each source area.

For the Glengarry Adit, the preferred alternative was selected to eliminate the adit discharge at the portal.

**Construction cleanup work for the
Glengarry/Como Basin/Fisher Creek source
areas was initiated in 2003
and was completed in 2006.**

This alternative included grouting and backfilling the Como Raise, grouting the 1050 roof leak, installing several water tight plugs in the main drift, and partially backfilling the drift. For the Como Basin (the second source area), the preferred alternative involved capping unconsolidated and disturbed materials in the basin with an impermeable geomembrane capping system similar to that constructed in the McLaren Pit. For the soil cover over the impermeable liner, soil was salvaged from the capped area and amended with lime to make the soil suitable for revegetation. The preferred alternative for remaining mine dumps in the Fisher Creek drainage involved removing the two largest waste rock dumps (the Glengarry and Gold Dust) to the New World Waste Repository and implementing run-on and runoff controls at dumps that were identified as posing potential sediment and erosion hazards.



Como Basin Cap Area – August 2006

Work on the preferred alternative for the Glengarry/Como Basin/Fisher Creek sources was initiated in 2003 in the Glengarry Adit and involved grouting the Como Raise and the 1050 roof leak, and preparing the plug sites. Plugging and backfilling the Glengarry was completed in 2005. Follow up monitoring at the backfilled Glengarry portal in June 2006 showed a 99% reduction in flow compared to flows measured in October 2000. Water quality of the remaining discharge (0.5gpm) improved as well, with the pH rising to 6.4 standard units (su) from about 3.0 su. Metals concentrations, particularly copper, aluminum, iron, cadmium, and zinc were notably lower than those measured prior to closure. The combined effect of lower flow and lower concentrations from the adit resulted in an average reduction in loading to Fisher Creek of 99.9% compared to pre-closure conditions.

Implementing runoff and runoff controls at selected dumps in the Fisher Creek drainage was completed as a separate project in 2004. This work included pulling waste away from streams where necessary, grading the waste to a stable configuration, incorporating lime and organic amendments to render the soils more hospitable to plants, and covering the site with straw erosion mats to help stabilize the site while vegetation became established.

For the Como Basin, the preferred alternative involved capping unconsolidated and disturbed materials in the basin with an impermeable geomembrane capping system similar to that constructed in the McLaren Pit. Soil cover over the impermeable liner was salvaged from the capped

area and amended with lime for revegetation suitability. This work, along with removal of the Glengarry and Gold Dust dumps, and expansion of the repository was begun in 2005 and completed in 2006.

In 2012, existing rock armored ditches on the Como Basin Cap were extended upslope to intercept erosion features that had developed which eventually would compromise the geomembrane functionality.

The Glengarry Mill Site adit was reclaimed during summer of 2008. Reclamation consisted of reopening the adit and removing mud, rock fall debris, and ferricrete deposits from the adit sill. The fracture controlled source(s) of water entering the tunnel were located and three grout rings were installed from within the tunnel to stem flow from fractures. A portal plug with an infiltration basin was constructed and the portal area was regraded and revegetated. Flow from the adit was reduced from 8.1 gallons per minute immediately prior to construction to 2.3 gallons per minute at the end of the one month construction period. A high degree of near surface fracturing and the short length of the adit made it difficult to capture all of the adit flow however a 72% reduction in flow and metals loading was achieved.



Little Daisy Adit

Construction of the cap in the Como Basin, removing the Glengarry and Gold Dust dumps, and expansion of the repository was begun in 2005 and was completed in 2006. Implementing runoff and runoff controls at selected dumps in Fisher Creek was completed as a separate project in 2004.

MILLER CREEK RESPONSE ACTION

An EE/CA for sources located on District Property in the Miller Creek drainage was completed in June 2003 and released to the public for comment. This EE/CA evaluated response options and technologies to mitigate potential impacts from mine waste areas that contribute to surface water quality degradation.

The preferred alternative for the Miller Creek response action was removal of two of the larger dumps in the drainage to the New World Waste repository and implementing surface water controls at several other dumps. The remaining mine waste dumps in the Miller Creek drainage appeared to contribute little in the way of impacts to water quality.

The Black Warrior Dump is the only site identified in the Miller Creek drainage with a human health risk.

The Black Warrior dump was the only human health risk identified in the Miller Creek drainage. It contained about 22% of the total mine waste on District Property in the drainage. At the Little Daisy Mine, waste rock sat at the mouth of the adit and discharged from the adit through the dump. The adit discharge flowed in the subsurface beneath shallow colluvial and talus material below the mine site, but the water did not obviously come to surface further downslope. The Little Daisy dump was comparable in size to the Black Warrior, containing about 24% of the total waste on District Property in Miller Creek. Removing these two dumps to the repository eliminated 46% of the total volume of waste rock present in Miller Creek. Impacts to surface water from the Little Daisy Mine outflow and waste rock could not be detected by a synoptic sampling study completed by the USGS in Miller Creek. The Black Warrior and Little Daisy dumps were removed in 2005.

Elsewhere in Miller Creek, environmental risks appeared associated with mine waste in contact with surface water and/or groundwater at four waste dumps (Cumberland Dump and three Miller Creek Dumps). Work at these dumps was completed in 2004 and consisted of pulling the waste away from

streams, grading to a stable configuration, lime and organic matter incorporation, and covering the sites with straw erosion mats to help stabilize the site while vegetation became established. Other waste dumps in the drainage were located topographically well above the valley bottom, in mostly dry locations, and presented no risk to human health and little threat to surface or groundwater quality (except for brief periods during active precipitation or snowmelt).

In addition to alternatives related to mine waste dumps in the Miller Creek drainage, the Miller Creek EE/CA examined restoration actions to respond to impacts to natural resources that are related to sediment contamination derived from roadways throughout the District. Sediments derived from roads and trails impact surface water quality as well as aquatic habitat, and reducing sediment derived from roads and trails will improve water quality. Areas of known and potential acid production and other areas of anomalous metal concentrations in soil and bedrock represent significant sources of contamination, which are exacerbated by surface disturbances such as roads that expose these materials to ongoing erosion both on roadbeds and cut and fill slopes. Many of these roads were historically developed to access the numerous mines and prospects in the District. The Lake Abundance trail, which accesses the Lake Abundance road from Daisy Pass, was also identified as a site that contributes sediment and has been included in the restoration action. Another natural resource restoration issue considered in the Miller Creek EE/CA was the replacement of damaged wetlands in front of the portal of the Glengarry Adit in Fisher Creek. This was accomplished by propagating willow cuttings in a greenhouse for one season then transplanting them to the reclaimed wetland area following regrading and stabilization of the historic Fisher Creek stream channel.

ADIT DISCHARGE RESPONSE ACTION

Response Actions associated with adit discharges in the District have been evaluated in a separate EE/CA. There are 27 discharging adits in the District, and the likely response actions that would treat or eliminate these discharges are similar.

The EE/CA addresses risks to water quality from these discharges (except for the Glengarry, Glengarry Millsite, and McLaren discharges, which were mitigated under separate cleanup actions as described previously), and analyzes potential treatment scenarios and resulting load reductions that might be realized. The preferred alternative to address impacts from these discharges is continued monitoring and evaluation. A Long Term Operations and Maintenance Plan was prepared in 2011 and describes water quality, revegetation, and aquatic macroinvertebrate monitoring that will be conducted beginning in 2012 and continuing through 2032. Potential maintenance work that may be required at reclaimed sites is also described.

MCLAREN MILLSITE AND REPUBLIC SMELTER

These two sites are located on non-District Property adjacent to Soda Butte Creek near Cooke City. The sites are situated on National Forest System (NFS) and private land and contained waste rock, concentrate, smelter waste, and metals contaminated soil that could potentially impact human health and the environment. The USDA Forest Service and the Montana DEQ conducted site investigations of the McLaren Millsite in 1999, 2000, and 2002. Data from these investigations showed that area mine waste was extremely acidic and had elevated concentrations of copper and lead. Runoff from the Millsite was found to have a measureable impact on Soda Butte Creek with respect to increased acidity and metal concentrations that exceeded aquatic life standards.”



Republic Smelter – August 2008

Investigations of the Great Republic Smelter site by the USDA Forest Service and the Montana DEQ indicated metal contaminants in soil surrounding the smelter site contained concentrations of lead in soil exceeding the project human health guideline for recreational use (1,100 milligrams per kilogram).

The USDA Forest Service completed an EE/CA for the McLaren Millsite and Great Republic Smelter that was released to the public in February 2004. The preferred alternative was total removal of the wastes and contaminated soils from NFS lands at both sites to the New World waste repository using funding and resources separate from the New World Response and Restoration project. Cleanup work was conducted in 2005, with the USDA Forest Service leading the cleanup on NFS land and the EPA in charge of cleanup on private lands at the smelter site. The total waste removed from both sites was about 10,800 cubic yards.

WATER QUALITY IMPROVEMENTS

Surface and groundwater quality monitoring is an ongoing activity conducted several times each year at numerous monitoring stations. Monitoring is done to detect and measure improvements that result from cleanup actions and to comply with the rules in place for temporary water quality standards related to the project. Water quality monitoring results to date show improvements are beginning to be realized at all downstream stations on Daisy and Fisher Creek and into the upper reaches of the Stillwater River, and continued improvements are expected to be measured in the future.

The most conspicuous improvement in water quality to date has been in the headwaters area of Fisher Creek and results from essentially eliminating the Glengarry Adit discharge, which for over 80 years contributed significant flow and contaminant load degrading water quality in upper Fisher Creek. As a direct result of adit plugging and grouting operations at the Glengarry adit base flows from the adit have been reduced by 99% and metals loading reporting to Fisher Creek at the next downstream surface water site (SW-3) has been reduced by 74% at low flow and 42% under high flow conditions. Flows from the historic Gold Dust adit were also reduced as a result of borehole grouting.

On the Daisy Creek side, the lowest copper concentrations ever measured at the upstream station immediately below the McLaren Pit cap area have been measured each year during high flow conditions since the cap was completed in 2003. These lower copper concentrations, while not low enough to meet aquatic standards, are a direct result of capping of wastes in the McLaren Pit.

revegetation success will continue in 2012 through 2032.

Trends in measurements of pH and metals concentrations and loading during the high flow period at station DC-2 below the McLaren Pit show that pH is becoming less acidic while other constituent contaminant levels are decreasing. In fact, concentrations of metals at DC-2 have decreased 10% during low flow periods and 64% during high flow periods, while metal loading has decreased 58% during low flow periods and 39% during high flow periods after capping the McLaren Pit. Metal loading from minor tributaries has also decreased following completion of the pit cap.



**Reclamation Work in the
Headwaters of Fisher Creek**

CLEANUP TIMETABLE

Table I shows the cleanup schedule for past work. The first year of actual cleanup work was 2001 and cleanup activities were completed in 2011. Remaining work on Non-District Property is contingent on receipt of a Notice of District Property Work Completion from the United States and the State of Montana, as well as availability of funding for cleanup. Monitoring of water quality and

TABLE I CLEANUP SCHEDULE <i>New World Mining District Response and Restoration Project</i>		
YEAR	PROJECT	NOTES
2001	Selective Source Response Action	Removal of waste from 8 sites to a constructed repository
2002	McLaren initial year	Waste rock consolidation and construction of drainage controls
2003	McLaren second year	Complete waste regrading; construct capping system
	Glengarry Adit initial year	Grout Como Raise; prepare Glengarry tunnel for grouting and backfilling
2004	Glengarry Adit second year	Backfill Glengarry Tunnel; install cemented fill
	Fisher Creek Source Controls	Regrade/revegetate waste dumps at 8 sites
	Miller Creek Source Controls	Regrade/amend/veveg waste dumps at 4 sites
2005/2006	Glengarry Adit third year	Install remaining plugs and cemented backfill
	Como Basin Cap and Cover Completed	Cap and cover disturbed and metals-enriched soil materials in-situ
	Lulu Pass Road Reclamation	Conducted in conjunction with Como Basin Response Action
	Fisher Creek Dump Removals	Glengarry and Gold Dust dumps
	Miller Creek Dump Removals	Black Warrior and Little Daisy dumps
	McLaren Mill Site Waste Removal	Cleanup funds outside Consent Decree (National Forest System land only)
	Great Republic Smelter Waste Removal	Cleanup funds outside Consent Decree
	Selective Source Repository Expansion and Closure	Fisher and Miller Creek Dumps, McLaren Mill Site and Republic Smelter wastes
	Monitoring Well Abandonment	Unused monitoring wells were abandoned in the Fisher Creek drainage and in the repository area
2007	Adit Discharge Response Action	Conduct ongoing adit discharge monitoring
2008	Glengarry Bypass Channel Restoration	Incised channel at Glengarry mine site will be stabilized
	Adit Discharge Response Action	Monitoring of McLaren Subsurface Drains for evaluation of response alternatives. Implementation of response alternatives on point source discharges in the District such as the Glengarry Mill Site adit.
	Neutron Probe Access Tube Removal	Plug and abandon nine neutron probe access tubes installed in McLaren capping system.
	Relocation of Lake Abundance Trail	Relocate and reclaim hiking/equestrian trail to Lake Abundance in the vicinity of Daisy Pass.
	Willow Plantings	Plant willows near Black Warrior and Glengarry mine sites.
2009-2011	Adit Discharge Response Action	Implementation of the McLaren Adit Closure.
	Restoration/ Road Work throughout the project area	Preferred alternative from Miller Creek EE/CA
2012	Como Basin Erosion Repair	Extend rock lined ditches upslope to intercept erosion features.
Contingent on Completion of District Property Work	Remaining Non-District Property	Response Actions following Certificate of Completion