New World Mining District Response and Restoration Project

PROJECT SUMMARY 2001

United States Department of Agriculture
Forest Service
Northern Region
Gallatin National Forest

August 2001

PROJECT SUMMARY
NEW WORLD MINING DISTRICT
RESPONSE AND RESTORATION PROJECT

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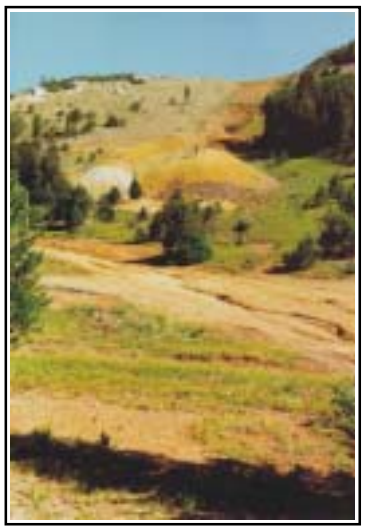
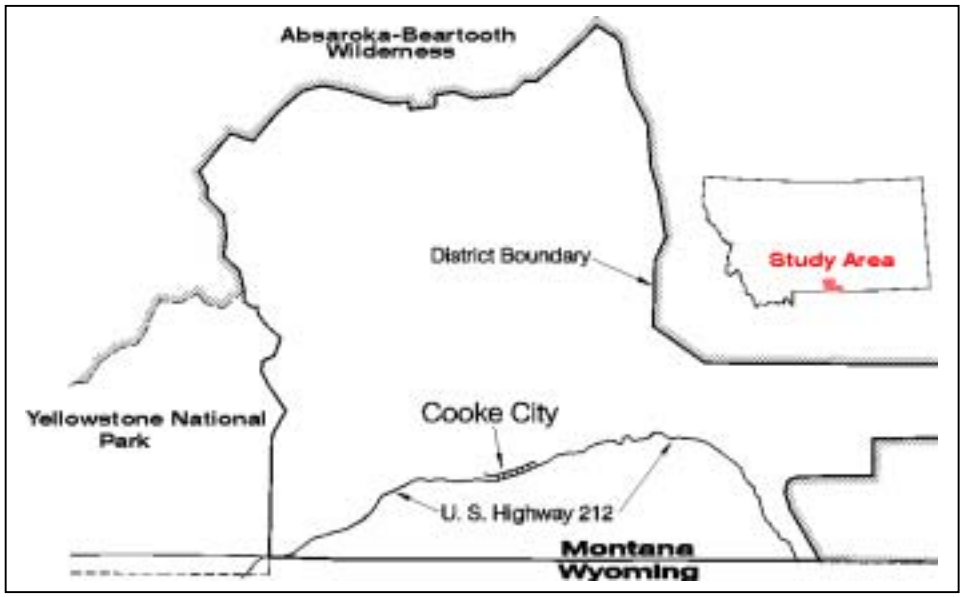
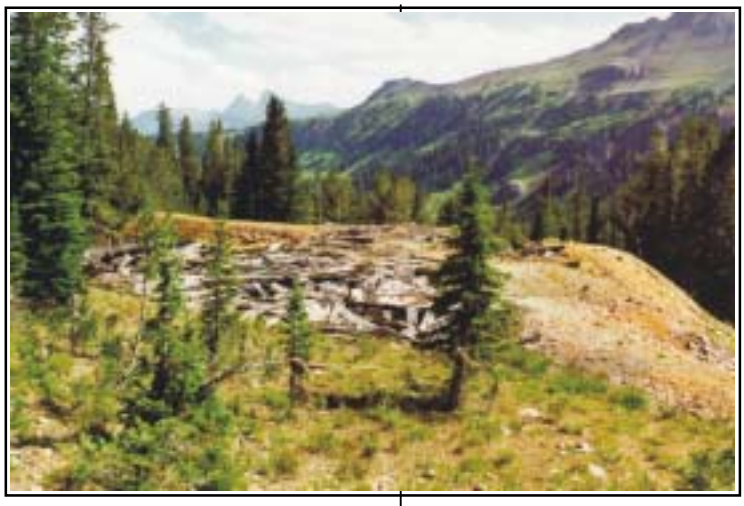


INTRODUCTION

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 to collate all existing data into a common database, further investigate portions of the District that were not well understood, and prepare engineering designs for proposed cleanup projects. Because a considerable amount of work has been done since the start of the project to address numerous technical and political issues, the USDA Forest Service has prepared this document to summarize the project's history, cleanup process, and legal issues, and present the Forest Service's approach to completing the project. As the project proceeds through a predicted eight-year cleanup period, this document will be updated periodically to keep the public informed of the project's progress.

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. This historic mining district, which is centered northeast of Yellowstone National Park, 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, open pits, acidic water discharging from mine openings, and stream sediments. Cleanup work will be challenging in this harsh, mountainous environment due to the severe climate, short construction season, and the relatively large amount of snowfall that the District receives.



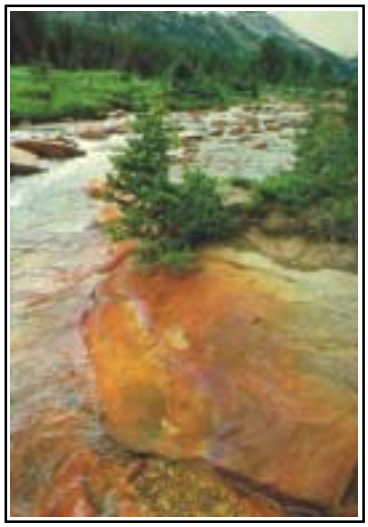


The 40 square mile District is located at an elevation that ranges from 7,900 feet to over 10,400 feet above sea level, and is snow-covered for much of the year. Historic mining disturbances affect about 65 acres with the largest disturbances attributed to the McLaren Pit (17 acres) and the McLaren Tailings (11 acres). The Glengarry Adit and the nearby Como Basin 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 Clark's 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.

Maps of the project site and numerous technical documents concerning the site are available at the project Web site, ***http://www.fs.fed.us/r1/gallatin***, and information repositories in Bozeman, Gardiner, and Cooke City. 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.

PROJECT HISTORY



Through the years, an extensive amount of data have been collected to determine the nature and extent of metals impacts in the Daisy Creek, Fisher Creek, and Soda Butte Creek drainages. Since 1977, numerous investigations were conducted in the District by both state and federal agencies. Prior to the Forest Service's involvement at the site, the most recent investigations were conducted by Crown Butte Mining, Inc. and the EPA. The mining company collected environmental baseline information to support their application for an underground gold mine. Some of these data were used to site a tailings impoundment and other mine facilities for the proposed mine, while other data were collected to characterize some of the historic mining impacts. In 1995, the EPA began an investigation of historic mining pollution in the District. The EPA's investigation was the first to focus on groundwater flow in the McLaren Pit and Como Basin areas. The EPA investigation involved installation of monitoring wells, surface water sampling, and mine waste characterization.

On August 12, 1996, the U.S. government signed a settlement agreement with Crown Butte Mining, Inc. to purchase the mining company's interest in their District holdings (also referred to as District Property). This transfer of property to the U.S. government effectively ended Crown Butte Mining's proposed mine development, and provided $22.5 million to cleanup historic mining impacts in the District. Of the total cleanup funds, up to $2.5 million was set aside specifically for natural resource damages incurred in the District. In June 1998,

the interested parties, which included government agencies, several local and regional environmental groups, and the mining company, signed a consent decree. The consent decree, which was approved by the U.S. District Court, finalized the terms of the settlement agreement and made available the funds that are being used for site cleanup.

PROBLEM DESCRIPTION

The USDA Forest Service has developed a conceptual model that describes the sources of mine wastes in the District and the pathways by which metals contaminants move in the environment. This model, although not complete, is based on the results of numerous previous investigations into the source and movement of metal contaminants. The conceptual model provides insight into the likely mechanisms that are involved in releasing pollutants into the environment, and the ways in which humans and the environment are exposed to pollutants.

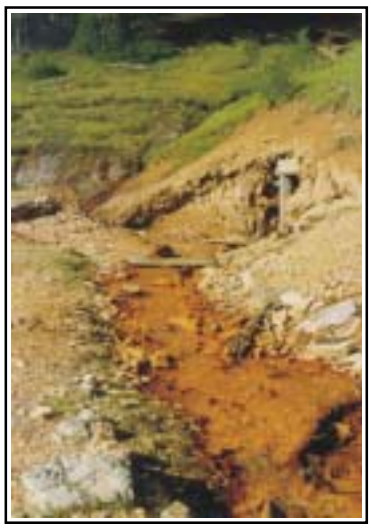
The major sources of contaminants at the site are acidic, metal-laden mine waste dumps located at mine openings and massive sulfide ore deposits underground that are exposed to the atmosphere by either mine workings or natural fracturing and faulting. The major source areas in the District are the McLaren Pit, McLaren Tailings, Como Basin, and Glengarry Adit. Other secondary sources of contaminants include stream sediments that have been transported downstream from other sources. The primary mechanisms of movement of metal-laden mine wastes include the following:

- Erosion into surface water courses
- Dissolving of contaminants in runoff
- Infiltration of dissolved metals into soil and groundwater
- Movement of impacted water through open historic underground mine workings and improperly abandoned exploratory borings
- Groundwater discharge into surface water
- Contaminated surface water flow to groundwater.

Mine waste sources in the District are many and widely scattered. Not only are there in excess of over 150 mine dumps on District Property totaling about 430,000 cubic yards of solid waste, but there are more than 20 mine discharges, numerous acid seeps, and extensive reaches of streams impacted by metals-laden sediments.

Except for some of the larger waste dumps, individual contributions of specific mine waste sources via the pathways identified above are difficult to quantify. Work by previous investigators, primarily the U.S. Geological Survey, has shown that metal loadings in area streams are derived from groundwater inflow, adit discharges, tributary inputs, and leachate from waste dumps. For example, a study done on Fisher Creek showed that 20% of dissolved copper load in the creek comes from the Glengarry Adit discharge, with 14% ascribed to leachate

from the Glengarry dump, 21% to tributary input from the Como Basin, and 14% in tributary input from Fisher Mountain. About 30% of the dissolved copper load could not be attributed to any particular source of pollution.

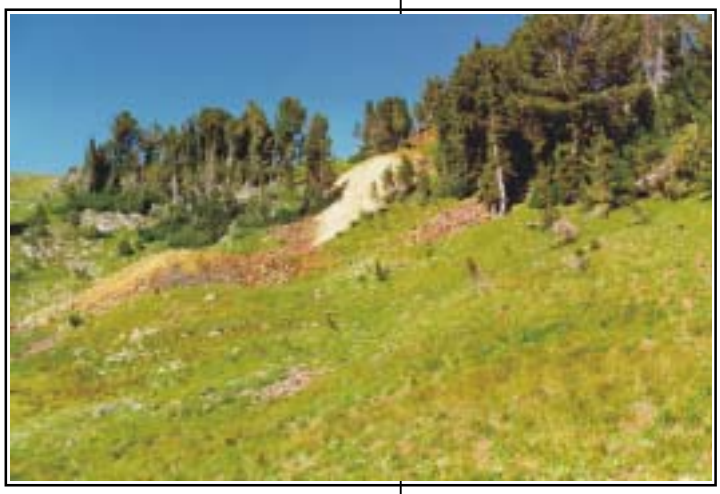


Using this information as a rough approximation of the potential beneficial effect of response and restoration actions, it is evident that adit discharges contribute a considerable amount of metals to Fisher Creek and cleanup actions directed at reducing or treating flows from the more substantial adit discharges like the Glengarry should directly result in water quality improvements. This is also true of leachate generated from waste dumps that directly impact surface water, as shown in the example of the Glengarry dump. The effect on surface water or groundwater quality resulting from cleanup actions directed at mine waste sources located further from surface water drainages or in areas where groundwater is deeper is much harder to quantify. Likewise, the effect response or restoration actions may have on other sources, such as stream sediments, is very difficult to quantify. Metals in stream sediments have complicated chemical reactions with surface water and change markedly with varying flows.

The risks to humans and animals from mine waste sources are primarily related to direct contact or ingestion of metals contaminants. Because the main sources present on District Property are located away from permanent residents, consumption of groundwater or surface water is not considered a significant exposure pathway for humans. The exposure risk of animals to surface water or consumption of surface water has not been quantified.

Exposure pathways to aquatic organisms primarily occur in-stream. Aquatic exposure results from contact with or consumption of metals-laden sediment and surface water. Plants that might recolonize waste dumps are exposed to metals contaminants primarily from root uptake. These plants are often weakened or are absent due to chemical conditions in the waste materials.

CLEANUP PROCESS



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, the 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 numerous other concerned citizens and environmental groups.

As specified in the consent decree, the Forest Service is able to use their Superfund authority, which is granted under the Comprehensive Environmental

Response, Compensation, and Liability Act (the Superfund enabling law), to proceed with the cleanup. This Superfund law, in concert with guidance provided by the EPA, establishes a process whereby cleanup actions follow specific procedures.

Under Superfund, particulars such as characterizing the nature and extent of pollution, assessing risks, identifying and evaluating cleanup alternatives, and keeping the public informed and involved are part of the cleanup process. Following EPA guidance, the Forest Service custom-tailored this process to address the specific nature of contaminants in the District and the specific nuances of this project.

LEGAL CONSIDERATIONS

The consent decree and settlement agreement require that funds for this project be first expended on cleanup of mining wastes present on "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, for example, are District Property. The McLaren Tailings, on the other hand, are non-District Property. Only after District Property is cleaned up to the satisfaction of the U.S. Government and the State of Montana, can the remaining funds be spent on cleanup of other mining wastes in the District, such as the McLaren Tailings.

As the cleanup progresses, the USDA Forest Service must abide by a temporary water quality standards rule approved by the Montana DEQ specifically for this project area. These temporary water quality standards apply to portions of Daisy Creek, Fisher Creek, and the Stillwater River. The temporary standards allow the Forest Service to proceed with cleanup without violating the more stringent statewide water quality standards. The goal at the end of cleanup is to provide the highest quality water practicable in the District's receiving streams, and, if possible, comply with the more stringent statewide standards.

Other legal considerations involved with cleanup of mining wastes are the body of laws and regulations (federal, state, and local) known as "applicable or relevant and appropriate requirements", or the acronym ARARs. For each yearly cleanup project proposed, the Forest Service must consider how their cleanup alternatives will comply with this body of laws and regulations. To the extent practical, cleanup activities should comply with ARARs unless extenuating circumstances require the need for a waiver from ARARs.

Administratively, the Department of Agriculture has set policy for certain aspects of cleanup activities. One of these policies limits off-site disposal of mining wastes located on federal property to controlled hazardous waste managed facilities. This policy places a heavy economic burden on off-site disposal due to

the distance to controlled disposal sites, the nearest which are located in Utah and Idaho.

CLEANUP APPROACH

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. Because the USDA Forest Service is involved with abandoned mine cleanups on numerous national forests in the Rocky Mountain states following a similar Superfund process, they have developed a cleanup approach to hardrock mining wastes that balances both cleanup effectiveness and cost. The Forest Service's approach at other similar hardrock mine sites has resulted in mine waste impacts being mitigated by either disposing the wastes in constructed repositories and/or by treating the wastes in place. The general strategy the USDA Forest Service has used on these similar projects was to mitigate the readily identifiable solid waste sources as a first phase of cleanup. This is followed by a second phase that addressed problems associated with the more difficult mine discharges and polluted stream sediment sources.

For the New World project, the Forest Service's approach began with clearly identifying project objectives and will end with monitoring the effectiveness of cleanup actions to ultimately achieve project closure. In between these two milestones are steps which include establishing a public participation process, collating existing data, collecting additional data that are needed to make informed decisions, prioritizing and evaluating mine waste sources, preparing engineering documents for construction, and completing construction. Recognizing also that this project involves restoration, the Forest Service will integrate restoration elements within the cleanup process by including restoration in the overall strategy, where possible, for each of the cleanup projects undertaken. Components of the cleanup approach are further described below.

IDENTIFY PROJECT OBJECTIVES

Project objectives were identified early on in this project as an outcome of a meeting among the project team and the agency cooperators in early 1999. The objectives agreed to by this group were presented to the public in a draft *Overall Project Work Plan* that was modified based on public input. As indicated previously, the overall objective of this project is to improve water quality in the District to the highest quality possible

ESTABLISH A PUBLIC PARTICIPATION PROCESS

The USDA Forest Service and agency cooperators have worked diligently in keeping the process open to public input. Public participation was established in the *Overall Project Work Plan* by developing a *Community Relation Plan.*

Elements included in the *Community Relations Plan* to make this process work entail holding public information meetings and technical workshops, providing information and project documents through the project Web site, distributing news releases, accepting public comment on proposed project activities, and making project files available to the public at project information repositories in Bozeman, Gardiner, and Cooke City.

PROJECT PLANNING

With the approach and process groundwork laid, the USDA Forest Service began compiling all available information and used it to develop the conceptual model of sources of contamination at the site and pathways of contaminant movement. Following this information review phase and numerous discussions with the agency cooperators, the Forest Service prepared an overall planning document, the *Overall Project Work Plan.* This overall plan presented the results of the data review, a description of the conceptual model, and a detailed description of how the cleanup process would work.

Several appendices were also included in the overall work plan to direct activities that would be completed during the life of the project. One of these appendices, the *Site-Wide Sampling and Analysis Plan*, describes how field data will be collected, what laboratory analysis will be performed on environmental samples, and the types of validation procedures that will be used to ensure data are accurate and precise. Two long-term monitoring plans were also appended. The *Long-Term Surface Water Monitoring Plan* describes the frequency of sampling and the sampling stations that will be monitored throughout the project life. This monitoring will not only establish pre-cleanup water quality conditions, but also serves to provide a baseline against which improvements to water quality can be measured as the cleanup proceeds. The *Long-Term Revegetation Monitoring Plan* describes how revegetated areas will be monitored throughout the project life. Because the mining company reclaimed a considerable amount of acreage prior to the signing of the settlement agreement, revegetation monitoring allows a way to track the health and performance of vegetation, and, more importantly, provides a way to correct any problems that may occur at revegetated sites.

To support activities that would occur each year of the project, the USDA Forest Service prepared annual work plans in 1999, 2000, and 2001. The annual work plans are more specific in the work that is proposed each year, and, for special tasks not included in the overall work plan, are the documents where these special tasks are described.

SITE CHARACTERIZATION

With planning documents in place, the USDA Forest Service went about the task of collecting data needed to more fully characterize site problems. In 1999,

surface water and groundwater were the primary media sampled. Even with the considerable amount of data collected in the past, only a minimal amount of data was available for certain aspects of the project. One of the identified data gaps was chemical data for many of the mine waste dumps. These data were needed to evaluate the human health and environmental risks associated with the dumps and to rank the impacts associated with the mine sites relative to one another. This data gap was filled by collecting site information from each of the more than 150 individual dumps, collecting samples from more than 60 representative dumps, and analyzing the samples for a wide variety of parameters.

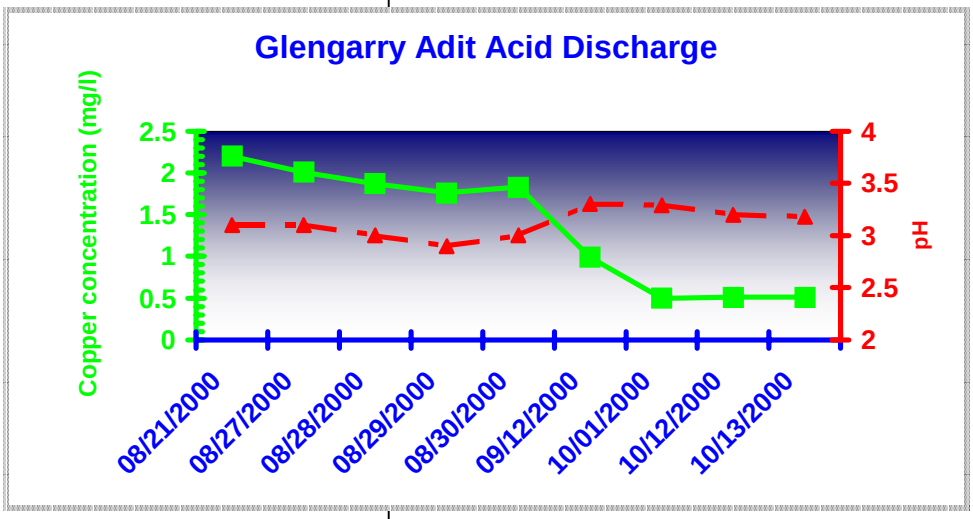
At the same time, the Forest Service began looking for potential mine waste repository sites that could be used in the event that on-site disposal became a preferred alternative for solving certain mine waste problems. Based on past experience, the Forest Service wanted to have these data early on in the process so that, if needed, selection of the preferred site could be based on scientifically sound information.

Results of the repository siting evaluation were presented in two reports. One report, the *Repository Site Evaluation*, described the results of the initial siting evaluation, which used data collected by the mining company to characterize a number of sites suitable for their proposed tailings impoundment. The data collected by the mining company were similar to the data needed to evaluate potential repository sites. Using these data to screen sites against numerous environmental and engineering criteria, two sites exhibited the most suitable characteristics. These two sites were recommended for additional characterization work, which included installing monitoring wells, sampling soil materials, and performing other tests to completely characterize the hydrogeologic nature of the sites. Two sites that were excluded from further consideration during this process included the McLaren Pit and the Como Basin. Both these sites, although currently contaminated with mine waste, failed the screening criteria for distance to major faulting, avalanche potential, and lack of suitable underlying geologic materials.

Results of a Phase II investigation of the two preferred repository sites was published in the *Phase II Repository Site Investigation Report.* This report more specifically described geologic and soil materials, groundwater conditions, and groundwater flow direction at the candidate repository sites. As a follow-up to the data collected at these two sites, a dye tracer study and water level monitoring program were initiated in October 1999. Water level and dye data collected for the study support the hydrogeologic model presented in the Phase II report. The final results of the study are available on the project Web site and at the information repositories (Maxim, 2001b, Appendix G).

PRIORITIZATION AND EVALUATION OF 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 or 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 the waste materials, are input to the scoring system to determine both individual pathway scores and a total score. The results of the AIMSS scoring were presented in the *Selective Source Response Action Engineering Evaluation/Cost Analysis.* The top 50 ranked sites from this evaluation were considered for the initial cleanup projects in the District.



Using the conceptual model to guide response actions, the goals and objectives outlined in the consent decree, and the results of the AIMSS ranking, the highest priority sites for cleanup are waste sources that are in direct contact with surface water or groundwater. There are a number of waste dumps in the District that fall into this category, including the McLaren Pit, the McLaren Tailings, Glengarry Dump, Spalding dumps, Tredennic dumps, Rommel Tailings, and numerous dumps in Miller Creek.

Several of the higher AIMSS ranked sites were not included in the initial cleanup projects because more data were needed before a proper cleanup alternative could be evaluated. These higher ranked sites include the McLaren Pit (ranked No. 1), McLaren Pit spoils (ranked No. 9), McLaren Multicolored Dump (ranked No. 16), Glengarry Dump (ranked No. 14), and higher ranking dumps located in Miller Creek (Miller Creek Headwaters, West Miller Creek, and Alice E dumps). As the required data become available, these higher ranked sites will be included in future yearly projects. Information necessary to fully evaluate the McLaren Pit was collected in 2000. The complete evaluation of cleanup alternatives for the pit and associated sources in the Daisy Creek watershed was completed in July 2001 and is currently available for public review. Information needed to more fully understand the Glengarry Adit and Como Basin source areas was collected in 2000 and is currently being collected during the 2001 field season. However, because the water quality problems associated with these two source areas are complex, an evaluation of cleanup alternatives will not likely be completed until winter of 2002. The resulting response and restoration action for the Glengarry and Como areas will likely be implemented in 2002. Following

this, the sources in Miller Creek on District Property will be evaluated for potential response and restoration action in 2003.

After the highest priority sites are addressed in the cleanup (2001 through 2003), pollutants released in remaining mine discharges will be addressed. The Forest Service took an initial look at feasible water quality treatment alternatives (Unifield, 2000), and has identified one potential passive treatment approach that may be applicable to these mine discharge sources. Pilot scale testing of this passive treatment system may be done in conjunction with the Glengarry Adit assessment. Finally, waste sources that are relatively benign will be addressed as lower priorities, and it is likely that only minor work would be involved with cleanup of these lowest ranked sites, if at all.

As discussed previously, plans for including non-District Property in the cleanup cannot be initiated until certificates of completion from the federal government and the State of Montana are received for District Property. However, the USDA Forest Service has included non-District Property in the assessment phase of the project. The agency cooperators are also involved in obtaining additional funding to cleanup non-District Property wastes, with the National Park Service leading the effort on the McLaren Tailings and the Montana DEQ leading the effort on cleanup of the Republic Smelter site.

ENGINEERING DESIGN AND CLEANUP CONSTRUCTION

Due primarily to weather limitations, cleanup construction in the District must be done during the short field season from late May to mid to late October. The USDA Forest Service has elected to address this factor in the process by breaking the cleanup into smaller projects that can be constructed in one season. To this end, cleanup actions are evaluated each fall/winter/spring in a Superfund document titled *Engineering Evaluation/Cost Analysis* (EE/CA). Using the AIMSS list as a starting point, source area characteristics are appraised and cleanup alternatives are developed to mitigate site-specific problems. After weighing the pros and cons of a number of alternatives, the USDA Forest Service selects a preferred alternative and issues the EE/CA to the public to solicit comments. After careful consideration of comments received on the proposed alternative, the Forest Service issues a decision document that identifies the cleanup work that will be done each year. The USDA Forest Service anticipates that the cleanup project will be conducted over an approximate eight-year period.

Annual EE/CAs were prepared for the project in 1999, 2000, and 2001. The cleanup proposed for work in 1999 was postponed by the Forest Service to allow additional time to complete the study of potential repository sites and to further consider source area prioritization. The proposed project for 2000 was modified slightly in the Selective Source Response Action (2000) EE/CA after the results

of the AIMSS scoring became available and after additional repository monitoring data were compiled.

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 replaces the existing low water crossing of Fisher Creek. The second spans Polar Star Creek, a tributary to Fisher Creek just below the Glengarry Dump.

The Forest Service solicited bids from prospective contractors in September 2000 and awarded a contract in April 2001 to construct the Selective Source Response Action. The Selective Source Response Action involves removal of mine wastes from several selected sites located on District Property and disposing of those wastes in an on-site constructed repository. The repository site is located about two miles north of U.S. Highway 212 on the Lulu Pass road. Approximately 24,600 cubic meters (32,000 cubic yards) of waste will be placed in the repository on a geocomposite liner and covered with a soil and geocomposite cap. Leachate generated from moisture in the waste will be collected in a sump and disposed. Repository construction involves disturbing an area of about 1.5 hectares (3.7 acres) for the placement of mine waste. Mine waste sites will be regraded and revegetated.

PROJECT CLOSURE

Long-term monitoring plans were developed to evaluate the beneficial effects of cleanup on surface water quality and effectiveness of revegetation establishment. With these monitoring plans in place, the USDA Forest Service can evaluate the results of the yearly cleanup projects in terms of both water quality and erosion protection, and then assess what additional actions will be necessary as the project proceeds. Once District Property wastes are cleaned up to the extent practicable, the USDA Forest Service will seek certification of cleanup from the U.S. Government and the State of Montana. If cleanup funds remain following this step of the process, remaining funds can be spent on non-District Property wastes.

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