Clark Fork River

Site Description

The Clark Fork River Operable Unit (OU) of the Milltown Reservoir/Clark Fork River Superfund Site covers 120 miles of river, floodplain, and fields irrigated with river water in the upper reaches of the Clark Fork River Basin in Montana. It consists of surface water, stream bed sediments, tailings (mining waste), soils, groundwater, aquatic resources, terrestrial resources, irrigation ditches and related sediment deposition, and air located within and adjacent to the 100-year historical floodplain of the Clark Fork River. The OU extends from the confluence of the old Silver Bow Creek channel, with the reconstructed lower Mill-Willow bypass, to the maximum Milltown Reservoir pool. The Clark Fork River has been divided into the following three reaches based on physical features, proximity to historic mining operations and impacts from historical mining and smelting:

- **Reach A—Deer Lodge Valley Reach:** Extends 43 river miles from the southeastern tip of the OU near Warm Springs Creek to just upstream of Garrison. Reach A has the broadest extent of the 100-year floodplain and is nearest to historic mining and milling sites in Butte and Anaconda.

- **Reach B—Drummond Valley Reach:** Extends 31 river miles from immediately upstream of Garrison, where the Little Blackfoot River enters the Clark Fork, to downstream of Drummond at river mile 76. The addition of water from the Little Blackfoot River may, under certain flow conditions, nearly double the Clark Fork's flow.

- **Reach C—Bearmouth Canyon Reach:** Extends 47 river miles from Drummond to the northwest tip of the OU area. Several tributaries contribute to the flow in this portion of the river, reach C is farther away from the historic mining sites.

Potential Responsible Parties (PRP)

Atlantic Richfield Company (ARCO) is the PRP for this site.

Threats and Contaminants

Historical mining and milling of deeper copper sulfide ores in Butte and Anaconda upstream of the Clark Fork River OU contributed much of the mining waste residuals

now found in the Clark Fork River OU. The constituents of concern (COCs) are arsenic, cadmium, copper, lead and zinc.

Site History

In 1992, the United States Environmental Protection Agency (EPA) designated the Clark Fork River, from the outlet of Warm Springs Ponds to upstream of the Milltown Reservoir, as an operable unit of the Milltown Reservoir Superfund Site.

In 1995, an investigation was conducted into the nature and extent of contamination of the Clark Fork River. The EPA entered into a Consent Order with ARCO to conduct a Remedial Investigation and Feasibility Study (RI/FS).

In 2000 EPA issued a time-critical removal action memorandum (and issued a Unilateral Administrative Order to ARCO for implementation of the removal action) to address immediate human health risks to residents of Eastside Road in Deer Lodge, based in part on an Agency for Toxic Substances of Disease Registry health consultation and EPA *Human Health Risk Assessment* action levels. The removal action was within the Clark Fork River OU and included removal of soils from known yards and fields that exceeded risk-based criteria for arsenic in soils. As stated in the April 2004 Record of Decision (ROD) “The contaminated soils around residences were removed and transported to an offsite disposal repository, in some cases the contaminated soils were re-incorporated into pasture soils, and the residential sites were backfilled with clean soils and revegetated. In addition, the vegetation and soils on properties adjacent to the residential areas (used primarily as pastures), which were also impacted by metals levels and low pH resulting in phytotoxic conditions (plants can uptake contaminants directly from the soil through their roots), were remediated by in-situ methods. Appropriate lime additions were made to the soils to assure neutralization. Properties were then deep plowed using several passes to mix the lime with the soils up to 2 feet deep. Confirmation sampling was conducted to ensure that the response action was effective. Planting of appropriate seed mix and vegetation completed the process. The response action was effective for historically irrigated lands of participating landowners (some follow-up maintenance work is required). At least three residences with likely impacted soils refused access to conduct sampling or to work on their lands. These impacted lands will be cleaned up and other re-vegetation and operation and maintenance issues will be addressed under the post-*Record of Decision* remedial action” (EPA, 2004).

In August 2002, the EPA released a Superfund Program Clean-up Proposal for the Clark Fork River OU. EPA's preferred remedy combined portions of three alternatives. The EPA invited public comment on the Proposed Plan for 120 days and received nearly 2,000 comments The following was proposed for Reach A and limited areas within Reach B, no action was proposed for Reach C:

- Areas of exposed tailings (referred to as slickens and lacking vegetation) will be removed, except if the area is less than 400 square feet and less than 2 feet deep and contiguous with impacted soils and vegetation areas that will be treated in place. Under this exception the tailings will be treated in place.

- Impacted soils and vegetation areas – areas of buried tailings (mining waste) and soils – as defined in the Feasibility Study will be treated in place, unless they extend more than 2 feet below the ground surface. In that case the top portion will be removed so the remaining impacted soil is less than 2 feet thick. The remaining tailings and soils will be removed depending on field data. Other impacted soils and vegetation areas that are too wet for in-situ treatment will be removed. State of Montana floodplain and solid waste applicable or relevant and appropriate requirements (ARARs) would require removal from the floodplain of any untreated mine waste unless a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) waiver condition is invoked. EPA is proposing use of the technical impracticality waiver found in CERCLA Section 121(d) (4) (c) for certain wastes in the floodplain.

- Streambanks will be stabilized by "soft" engineering along both sides of the river for a total bank length of approximately 56 miles, and a 50-foot riparian buffer zone will be established on both sides of the river

- Excavated soils will be transported to Opportunity Ponds for disposal. Opportunity Ponds is a Waste Repository at the Anaconda Smelter Company Superfund Site located between Anaconda and Opportunity, Montana.

- Best Management Practices (BMPs) will be used throughout Reach A and in limited areas of Reach B to protect the remedy. In this case, land management methods necessary to maintain the effectiveness of the remedy such as:

    - Public education about the impacted soils in the area to prevent exposure of children to soils in recreational areas

- County zoning requirements to limit residential use of floodplain areas
- Prevention of shallow groundwater for consumption or the prevention of shallow water for other uses that may spread groundwater
- BMP Plans such as prescribed grazing practices and a buffer zone for agricultural fields
- Dedicated use of safe recreational areas

- Institutional controls and additional sampling and maintenance will be required to protect human health
- Monitoring during construction and post-construction of water quality and other environmental parameters will be required

The cost of the preferred remedy is estimated to be in the range of $90 to $100 million.

Cleanup Approach and Remedial Activities

A ROD was issued in April 2004 (EPA, 2004). The selected remedy will be implemented along the erosive streambanks and the historic 100-year floodplain of virtually all of Reach A and localized areas of Reach B. The remedy for Reach C is no action. The following is a summary of the types of riparian, floodplain, and upland areas, as defined in the ROD, that may contain constituents of concern. These areas are targeted by the selected remedy.

Streambank and riparian corridor buffer – a zone of approximately 50 feet in width on each side of the river that may vary in width, depending on site-specific conditions.

Slickens areas (exposed tailings) – These areas generally lack vegetation (have less than 25 percent canopy cover), due to phytotoxic conditions, and present the principal waste in the Clark Fork River OU. Tufted hairgrass (*Deschampsia cespitosa*) is present, if there is any live vegetation. Efflorescent metal salts are visible on the soil surface during dry periods.

Impacted soils and vegetation areas – sparsely vegetated areas comprised of slickens and slightly impacted soils and vegetation areas that have an ecologically sound plant community Phytotoxicity in these areas vary, but they do sustain live

plant canopy cover. Tufted hairgrass (*Deschampsia cespitosa*) has greater than 1 percent canopy cover. Efflorescent metal salts may be present on the soil surface during dry periods. Small individual areas of exposed tailings (that appear as small slickens) may be present. Concentrations of COCs within the soil profile exceed the geometric mean values for unimpacted soils for Reach A of the Clark Fork River OU. Copper is used as a surrogate for the COCs; soils with copper concentrations exceeding 300 ppm within the profile are considered impacted by mining-related activities.

Slightly impacted soils and vegetation areas – generally well vegetated and display no visible evidence of contamination from tailings, although the soil may contain copper contamination above 300 ppm. The area expresses no evidence of phytotoxicity and has less than 1 percent bare ground caused by contaminated tailings. Tufted hairgrass (*Deschampsia cespitosa*) has less than 1 percent canopy cover. No efflorescent metal salts are visible on the soil surface during dry periods. Concentrations of COCs within the soil profile exceed the geometric mean values for unimpacted soils for Reach A of the Clark Fork River OU. Soils with copper concentrations exceeding 300 ppm within the profile are considered impacted by mining-related activities. The minimum size is 400 square feet.

The selected remedy is comprised of the following:

- Exposed tailings will be removed, backfilled with soil, and revegetated, with a limited exception. The limited exception is: exposed tailings that are 400 square feet or less, less than approximately 2 feet deep, and contiguous with impacted soils and vegetation areas**,** areas of buried tailings (mine waste) and impacted soils, that will be treated in-situ. When these conditions are present, in-situ treatment will be applied.

- Impacted soils and vegetation areas – areas of buried tailings (mining waste) and soils – estimated in the RI/FS at approximately 700 to 1,760 acres in Reach A. These sparsely vegetated areas can be comprised of slickens and slightly impacted soils and vegetation areas that have an ecologically-sound plant community. Impacted soils and vegetation areas will generally be treated in-situ using addition of lime and other amendments, soil mixing, and re-vegetation.

- Some impacted and vegetation areas will instead be removed where depth of impact prevents adequate and effective treatment in place or where saturated conditions make in-situ treatment unimplementable; or post-treatment arsenic

levels would be above the human health action level after one re-treatment for the current or reasonably anticipated future land use.

- Streambanks will be stabilized by "soft" engineering (and hard engineering techniques, when warranted) for those areas classified as Class 1 or Class 2 streambanks, and an approximate 50-foot riparian buffer zone will be established on both sides of the river. This will lessen the high rate of erosion and release of COCs from streambanks, and will prevent or reduce the uncontrolled release of COCs from within the streambank and potential stream braiding during flooding. Stream stabilization techniques are focused on protecting against shear stresses on unstable banks. Subsequent remedial design activities will define the most practical and effective methods and the exact location for streambank stabilization. The riparian buffer zone width will be flexible and considerate of landowner concerns and the nature of the stream at a given location.

- The removed soils will be conveyed to the Opportunity Ponds for proper placement and/or disposal. Closure of the Opportunity Ponds will be accomplished under the authority of the Anaconda Regional Water, Waste, and Soils Remedial Design/Remedial Action (RD/RA).

- Weed control for in-situ treatment, streambank stabilization, and removal areas is an important component of the selected remedy.

- BMPs will be used throughout Reach A and in limited areas of Reach B to protect the remedy. BMPs will be contained in landowner specific plans, and will be used to ensure land use practices are compatible with long-term protection of the selected remedy. In this case, land use plans (land management strategies) necessary to maintain the effectiveness of the remedy such as:

    - The focus of the BMPs is directed toward agriculture, specifically grazing and will be owner-specific. Fences will be used to manage a rotational grazing system to reduce impacts to woody vegetation and trampling of the streambank in the riparian zone. The rotation will allow for periods of rest and recovery in grazing areas.

    - Riparian pastures will be established on grazing lands by installing a fence a few hundred feet back from the stream, but parallel to the stream. A riparian pasture allows for forage use by livestock while reducing impacts to woody

vegetation. This riparian zone provides grazing vegetation for the landowner while protecting against erosion, soil loss, and floodplain instability.

  - A comprehensive monitoring plan will be developed as part of a ranch management plan. Owner specific plans will be developed that ensure revegetated areas are managed so that operation and maintenance of the revegetated areas can occur and ensure continued access by the agencies to monitor and maintain the remedy.

  - Remediated lands will be protected to allow growth of new vegetation, once revegetated the land will be used for normal land use activities. The land will be monitored for adequate growth and establishment of vegetation, specifically woody vegetation along the streambank.

  - A weed management program will be implemented to protect against the establishment of invasive plants. A mixture of grasses and forbs will be seeded in all treatment areas.

- Institutional controls and additional sampling, maintenance, and possible removal or in-situ treatment of contamination will be required to protect human health. Specific institutional controls identified as necessary are as follows: continued Anaconda and Deer Lodge County zoning regulations (prohibits building a permanent residence within the Clark Fork River floodplain), deed restrictions and permanent funding for Arrowstone Park, and controls to prevent the domestic consumption of shallow groundwater or uses that may spread groundwater containing constituents of concern above groundwater ARARs and state or federal standards.

- Monitoring during construction, construction BMPs, and post-construction environmental monitoring will be required.

- Continued removal of arsenic contamination in the East Side Road area as needed and further evaluation of irrigated land for potential risks to human health.

This work is estimated to take 10 years and cost approximately $117.5 million. Annual monitoring and maintenance costs for Reach A are estimated to be $1,826,514 and $35,719 for Reach B.

Recognizing the importance of moving forward with cleanup on the Clark Fork River while negotiations continue, the EPA is initiating a preremedial design-level evaluation of the Clark Fork River OU using the Riparian Evaluation System (RipES) tool. This tool was developed as part of the ROD. The RipES work began with aerial photography of the river in May 2006. Data and information such as, differing erosive conditions and lengths of streambanks, pertinent detail regarding existing riparian corridor conditions, and specific areas of exposed tailings or slickens, and areas of impacted soils and vegetation to the edges of the floodplain and cultural features like roads and fences, will be drawn onto the aerial photographs, and a base map will be generated. During 2006, 2007 and 2008, the EPA and its contractors have and will continue to verify this information on the ground, using more precise survey techniques. Some limited soil sampling will also be performed to establish the depth and magnitude of impacted materials. The results of this effort will provide the EPA with an oversight tool that can be used to evaluate future Remedial Design and Remedial Action. Furthermore, application of RipES will generate information needed to develop both preliminary and final site-specific designs for individual properties.

Landowner input will be solicited so that issues such as fencing, livestock watering and agricultural practices can be identified for consideration in developing site-specific design plans. Data tables and maps will be developed in an electronic format that will eventually be available through the internet.

After enforcement proceedings are completed, remedial design and remedial action will be implemented according to the selected remedy.

On November 5, 2004, EPA and the Department of Justice announced an agreement with ARCO, under which ARCO and the US Judgment Fund has agreed to reimburse EPA for $62 million for cleanup work conducted in the Clark Fork River Basin. ARCO will contribute $50 million and the US Judgment Fund $12 million. The areas covered under this consent decree are the Anaconda Smelter Site, the Clark Fork River OU of the Clark Fork River/Milltown Reservoir Sediments Site, and the Warm Springs Ponds and Butte Priority Soils OUs of the Silver Bow Creek/Butte Area Site. The agreement does not address the Milltown Reservoir Sediments OU.

According to the March 2007 update to the ROD (EPA, 2007), the EPA is engaged in settlement discussions with ARCO in an effort to settle cleanup responsibilities and costs associated with the remedy proposed in the ROD. The State of Montana is involved in these negotiations, in hopes that the State's natural resource damage (NRD) claims can be settled along with the EPA's selected remedy.

Per recent communication with the EPA remedial project manager, the Clark Fork River OU is still in the negotiations phase, and no remedy or restoration site work has begun yet. The EPA is hopeful that there will be a signed consent decree by the end of 2007.

References

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