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Ref: **Response to National Remedy Review Board Comments on the Proposed Remedy for The Milltown Reservoir Operable Unit of The Milltown Reservoir/Clark Fork River Superfund Site**

Page 2 NRRB Comments:

- *The board's information package presented data clearly indicating potential for human health risk from ingestion of arsenic contaminated ground water. Thus, the board recommends that the regions preferred alternative emphasize the importance of addressing the contaminated ground water threat, including the need for source removal of Area 1 arsenic contaminated sediments to promote natural attenuation of contaminated ground water.*

Response: The Region agrees that the importance of addressing the arsenic contaminated groundwater threat to human health in EPA's Preferred Remedy is strongly emphasized in the Proposed Plan. By removing the approximate 2.6 million cubic yards of arsenic source contaminated sediments from Area I and removing the dam and thereby decreasing the hydraulic head pushing contaminants into the aquifer, the present rate of arsenic flux emanating from these sediments will be virtually eliminated, thus allowing natural attenuation and dilution of the arsenic contaminated plume to reach background concentration conditions within a reasonable period of time.

- *However, the information presented to the board supporting ecological risks appeared less well defined. The board notes that the ecological risk concerns are based in part on ice scour events that may occur at an estimated 5 to 10 year frequency (an exposure scenario not often evaluated at Superfund sites). The board acknowledges the difficulties involved in collecting field data that might document actual impacts on downstream receptors following such an event. However, since this exposure pathway is believed to be an important one for the site, the board recommends that the region more fully explain the bases for this pathway assessment, its key assumptions, related uncertainties, and receptor-specific findings in site decision documents.*

Response: The Region agrees that the information to support ecological risks during these infrequent ice scour events are less well defined. To respond, and better explain both the risk and the uncertainty associated with the risk the Proposed Plan will include the following elements:

1) Discuss the significant decreases in trout population estimates by Montana Fish, Wildlife, and Parks (MFWP) in the reach just downstream of the dam during the summer after the last major reservoir lowering/ice scour event in February 1996.
2) More fully discuss the importance of the *Clark Fork River Operable Unit Ecological Risk Assessment* (EPA 1999), and the subsequent development of the *Ecological Baseline Risk Assessment Addendum* (EPA 2000) including the following:
   a. Federal AWQCs were exceeded for copper during the February 1996 reservoir lowering/ice scour event, which may cause a moderate risk to aquatic life.

b. Montana State standards for total recoverable metals were frequently exceeded.

c. Normal high flow events may pose an intermittent, low-level chronic risk to fish because of the combined impacts of copper and other metals in the water column. Fish may also be at risk from copper in the food chain when macroinvertabrates have been exposed to copper.

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- *The board notes that Alternative 2A was not fully developed in the materials presented, particularly in the areas of ecological risk, ground water restoration potential, and cost.*

The board notes that the package did not characterize downstream impacts in the event that the dam is removed (as a result of either a catastrophic failure or other circumstance) without prior removal of contaminated sediment. Since the dam has been determined to be a high hazard dam and serious safety and stability questions have been raised which may lead to costly upgrading, its failure or removal are potential scenarios which bear consideration. The downstream risks from such circumstances may be significant and should be explicitly considered in evaluating Alternative 2A and other alternatives which leave the dam in place.

Response: In early 1997, EPA requested that Atlantic Richfield Company initiate a focused feasibility study (FFS) to augment the draft FS completed in April 1996. This request was based on additional information obtained during the February 1996 event that EPA believed demonstrated "potential releases of hazardous substances during ice scouring and high flow conditions at much greater concentrations than EPA expected or predicted" (EPA 1997a). For all alternatives considered where the dam remains in place, it was presumed that the dam would continue to be operated under Federal Energy Regulatory Commission (FERC) License (Project No. 2543), and that Montana Power Company (MPC) or its successor, as the FERC licensee, would continue to satisfy all present and future obligations of the license. In a May 7, 1999, letter to MPC, FERC stated it had re-evaluated the hazard potential of Milltown Project. FERC concluded that that failure of the dam under any flow condition poses an environmental and health risk as a result of the presence of contamination in the sediment upstream of the dam. Because of this risk, the hazard potential classification for the project was revised from low hazard to significant hazard. In a subsequent letter to MPC on August 27, 1999, FERC directed MPC to determine the stability of the project structures for flows up to and including the probable maximum flood (PMF). MPC, in light of FERC re-licensing considerations, commissioned its consultants to proceed with dam upgrade studies and cost estimates and fish passage options.

For the subsequent draft FFS published November 15, 2000, and the Revised Final FFS published April 27, 2001, EPA directed Atlantic Richfield Company to include the costs of dam upgrades for the PMF and for fish ladders in any alternatives where the dam would remain in place. These alternatives were 1, 2A, 2B, 3A, 3B, 6A, and 6B. As a result, capital costs of $4,359,175 and $3,845,073 for dam upgrades and fish ladders were considered for these alternatives. Additional costs for project management, design, construction management, and conversion to net present value (NPV) costs were reflected in each of the above dam retention alternatives.

Northwestern Energy Company, successor dam owner to MPC, has currently directed its consultants to continue its dam re-licensing studies, particularly regarding engineering safety factors for earthquake stability of the spillway. Initial preliminary estimates to upgrade spillway stability to current FERC safety requirements are estimated to possibly add an additional $30 to $40 million to the current FFS estimates. The final upgrade costs, if any, will not be known until engineering studies are completed next year.

The Region agrees with the RRB that the potential downstream aquatic risks may be significant because of a catastrophic failure of the dam. This was stated in EPA's Continued Releases Risk Assessment. The Region feels its has properly considered the currently defined costs of the dam upgrades in its earlier FFS and the Final Combined FS analysis in this regard, but will add further detail in the Proposed Plan to clarify and further emphasize this concern.

- *The board notes that Alternative 2A as presented in the board's package does not address completely the NCP's expectation to return usable ground waters to their beneficial uses wherever practicable....While 2A discusses the use of institutional controls to protect local populations from exposure to contaminated ground water, it relies on "natural attenuation" to restore the contaminated ground water plume to its beneficial use (drinking water) without detailed analysis of site-specific mechanisms and timeframe for attenuation. Given that the plume appears to be relatively stable (or expanding slightly), it is unclear how restoration is to be achieved without action to address source material (e.g., Area 1 contaminated sediment). Further, the component of Alternative 2A that reduces the downstream ecological risk, i.e., installation of a pneumatic crest to maintain a higher pool elevation during potential ice scour events, may actually increase the driving mechanism for arsenic flux to ground water. The board recommends that the region clarify the approach being proposed in Alternative 2A to restore contaminated ground water at the site. If restoration is not expected in a timeframe comparable to that which could be achieved through active restoration (NCP Preamble at 8734, Federal Register Volume 55, No. 46, March 8, 1990), Alternative 2A should clarify which additional ground water management choices must be made in selecting this alternative (e.g., use of technical impracticability ARAR waivers, use of alternate concentration limits, etc.).*

  Response: The Region will clarify the discussion regarding Alternative 2A per the Board's request. Given the potential failure of the proposed remedy to meet the NCP's expectation to "return usable groundwater to their beneficial uses in a reasonable time frame (expected in 200 to 2000 years)", the basis for an ARARs waiver, continued reliance on the use of the replacement water supply, and the requirement to establish a groundwater control area would have to be clearly described. The record is not clear to whether an ARARs waiver could be invoked at this site, given the viability of EPA's proposed remedy. The proposed plan will emphasize this point. The installation of a pneumatic crest would replace the flashboard system. This replacement would not change the elevation at which the reservoir pool is operated. Rather, it would provide more flexibility for passing ice and debris without damaging the structure.

- *The board notes that the cost estimate for Alternative 2A (20 million dollars) did not include some costs that may be required to safely upgrade and maintain the dam. The region suggested that these additional requirements may add from 30 million to 50 million dollars to the cost of a dam in place alternative. The board recommends that the region further detail activities and costs associated with reliable implementation of Alternative 2A. The board suggests that the region present a range of costs for any alternative where the cost is less certain than is typical.*

  Response: Please see response to page 3, first bullet.

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- *The preferred alternative for ground water utilizes source removal and natural attenuation with related dissipation unique to this site to restore contaminated ground water to the arsenic MCL of 10 ppb. However, the package did not adequately document site-specific mechanisms for attenuation that would justify the estimated restoration time frame of approximately 10 to 20 years. If natural attenuation processes (including related dissipation) are significantly uncertain, the board recommends that the region consider a contingency remedy of active ground water restoration (See OSWER Directive 9200-4.17P, pp. 24-25).*

Response: The remedial investigation and the feasibility study identified two mechanisms that are presently acting naturally, to attenuate arsenic in the groundwater: dilution and adsorption. The FS, when discussing EPA's proposed remedy (Alternative 7A), predicted an estimated restoration time frame for the alluvial aquifer using the following methodology to move the arsenic from the sediments to the groundwater and to its ultimate fate within the aquifer:

- During the RI process, a "flow cell model" was developed to help the Atlantic Richfield Company illustrate and evaluate the movement of arsenic out of the sediments into and within the alluvial aquifer beneath Milltown. The flow cell model divided the groundwater flow regime in the alluvial aquifer beneath the sediments and in the larger alluvial aquifer adjacent to the sediments into several cells or flow tubes based on the groundwater flow directions, hydraulic properties and available water chemistry data presented in the Draft RI. Using Darcy's law (flow = hydraulic conductivity x gradient x area) and arsenic concentration data, the flux of arsenic moving into and out of each cell was calculated. Arsenic mass (concentration times flow) from the sediments was added to each flow cell that abutted the sediments based on available data. The flux of arsenic in an individual cell was therefore defined as the mass entering from the adjacent upgradient cell plus the lateral contribution from the sediments into that cell. The resultant mass flux discharging at the downgradient side of the flow cell was used as the incoming mass for the next cell. This flow tube analysis method was used to predict arsenic concentrations in the aquifer consistent with the predicted reduction in arsenic loading under the preferred alternative.
- It was assumed that a reduction in loading from the sediments would result in an equivalent reduction in concentrations within the flow tube cells and the alluvial aquifer as a whole. The preferred alternative selectively reduced flux from some flow cells but continued to provide mass into other cells along the flowtube, resulting in a steady state arsenic contribution into the groundwater and the aquifer. Assumptions for this method included stable geochemical conditions (no adsorption or desorption), and constant background arsenic levels.
- Once the predicted steady state concentration is in the aquifer, an assessment of the recovery time of the arsenic plume area (assuming the reservoir sediments are completely removed) is calculated. In this analysis, EMC^2 (Atlantic Richfield Company's contractor) used an assumed flushing criteria of 20 pore volumes to reduce the concentration within the plume area to below current Montana arsenic standard of .018 mg/L. Based on the estimated volume of impacted water in the plume (634 million gallons) and assumptions of 20 pore volumes and an estimated flux rate of 1,000,000 cubic feet per year moving through the plume area, the predicted recovery time is about 4 years. This estimate also carries the caveats of stable geochemistry and background, and also specifically excludes mobilization of any of the arsenic that has been adsorbed into the alluvial aquifer matrix.

This modeling effort formed the basis for the restoration prediction in the RRB document. EPA felt that 4 years was overly optimistic given the heterogeneity of the aquifer materials and the inequity of the flushing action, and enhanced the estimate to 4-10 years after dam removal for restoration. EPA believes that the residual arsenic within the aquifer is still subject to geochemical processes that bind it through adsorption (as an iron oxyhydroxide compound), which will also serve to further decrease the available dissolved arsenic and drive the system to restoration targets.

In contrast, an active groundwater restoration program would be very expensive. For example, injection of oxidized water with installation of injection wells estimated at $250,000 each would be the starting point. Such methods do not have a guarantee of being any more successful or expedient than natural attenuation. Removing arsenic from groundwater has proven to be quite difficult. Given the location of the plume, the proposed removal of the arsenic source, and the tremendous oxidizing and dilution effect of the Clark Fork and Blackfoot aquifers, the Region concludes that the natural dissipation of the residual plume elements within a reasonable period (4 -10 years after sediment and dam removal) is likely. Continual monitoring of the plume during remedial action and after will allow a continuous assessment of the plumes status. In the interim, institutional controls will prevent the use of this portion of the aquifer for drinking water until restoration is achieved. The Region believes that a contingent remedy is not necessary under these conditions. The Region will carefully monitor this issue through the five-year review process.

1. *The board recognizes that the region is pursuing a comprehensive management approach to address problems with the Milltown Reservoir sediments. Certain aspects of this approach involve remediation, typically a Superfund responsibility, while other aspects include restoration and community development activities. The board encourages the region to continue to work with other parties and programs to obtain the necessary support for the non-Superfund components of the overall plan. The decision documents should clarify, to the extent possible, what actions will be carried out pursuant to CERCLA and what actions may be carried out under other authorities.*
Response: The Region understands the board's concern of overstepping Superfund authorities into the restoration and redevelopment arenas. The proposed plan clearly delineates those areas where Region 8 believes we have clear Superfund authorities including: 1) removal of only those contaminated sediments (Area 1 sediments) which contribute significantly to the arsenic groundwater plume; 2) removal of the portion of the dam (spillway and radial gate) necessary to reduce the hydraulic head driving contaminants into the aquifer; 3) construction of control structures on the upstream boundaries of the construction area to prevent head cutting and hazardous substance release which could result in downstream impacts to aquatic life and upstream impacts on existing infrastructure; 4) in-place stabilization of sediments which do not significantly contribute to the groundwater plume (revegetation and other soft and hard engineering approaches) to prevent downstream impacts on aquatic life; and 5) reconstruction of the channel only in the areas where contaminated sediments have been removed, to stabilize the system and with comply action specific ARARs. Other potential channel reconstruction to provide a more natural channel and floodplain design or provide additional fish habitat is not included in the proposed plan. Removal of the power house and north abutment of the dam, and any redevelopment activities, such as the pedestrian bridge or park and trail systems, are not included in the proposed plan. We expect other parties to bring independent funding to the project if these other restoration and redevelopment activities are pursued. Region 8 is committed, however, in supporting the natural resource damage trustees and others in obtaining this alternate funding for this restoration and redevelopment. The Region will work closely with these parties to integrate and dovetail designs and construction in an efficient and cost effective manner and to coordinate closely with these parties in the design process.