
Comments on the Groundwater Technical Impracticability Evaluation for Butte Priority Soils Operable Unit

**Prepared by
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1.0 Introduction

This paper provides CTEC comments on the Groundwater Technical Impracticability Evaluation for Butte Priority Soils Operable Unit (TI document) issued by the Atlantic Richfield Company (ARCO) on June 6, 2005. These comments are intended to provide EPA and the public with CTEC suggestions for how the TI document can be improved to correctly characterize the understanding of the alluvial aquifer in the BPSOU and adequately describe risks to humans and the environment from contaminated groundwater.

It was CTEC's experience in reviewing the TI document that it is often biased in its presentation and analysis of information and data describing conditions within the Butte Priority Soils Operable Unit (BPSOU) alluvial aquifer. The TI document often relies heavily on the Focused Feasibility Study of the Metro Storm Drain (FFS) (CDM, 2004) for providing information to support the proposed waste in place remedy for contaminants within the BPSOU alluvial aquifer. In many instances the TI document serves to discredit, sometimes brashly, information from other sources such as the Montana Bureau of Mines and Geology (MBMG) and State of Montana Natural Resource Damage Program (NRDP) that provide information that is contrary to the FFS. In other instances, the TI document reads as if it is a promotion for the proposed waste-

in-place remedy for contaminants and treatment of effluent groundwater with lime in the lagoons at Lower Area One (LAO). The TI document is not an appropriate place for a PRP to promote a desired remedy; rather the TI document should be a factual document describing why an ARAR waiver is sought for the alluvial aquifer. CTEC contends that the TI document needs to provide an unbiased review of the whole of data and analysis available concerning the BPSOU alluvial aquifer so that the TI document will in its final form be an honest review of the treatment options for the alluvial aquifer and associated risks to the public and the environment in the vicinity of the sources of groundwater contamination. Stakeholders in the BPSOU including Butte-Silver Bow, ARCO, the State of Montana, EPA, and CTEC should work together to resolve issues with the TI document before it is finalized. CTEC requests that the final TI document be amended to incorporate the comments in sections 2 and 3.

Section 2.0 presents CTEC General Comments on the conditions and practical treatment options for alluvial groundwater within the BPSOU. Section 3.0 provides specific comments on the TI document. Specific comments refer to sentences, paragraphs, or pages in the document where CTEC requests changes or additions. Specific comments include administrative, technical, and selected grammatical changes.

2.0 General Comments

2.1 Water quality data presented in the TI document shows positive trends for wells located at LAO indicating that significant water quality improvement can occur under partial removal of COC source areas.

Table 9 in the TI document presents water quality monitoring for alluvial aquifer wells for the period 1989 – 1999. Text within the document states “review of water quality data showed no significant change in water quality over time” and “there were no discernible patterns to the water quality result comparisons and no change was as large as an order of magnitude”. CTEC’s review of the water quality data indicates that both of these statements are false; in actuality water quality at LAO has been improving since removal actions were performed. CTEC presents the following evidence to support this:

- Water quality data from table 9 for selected wells located at LAO is presented in figures 1 and 2 below. Figure 1 shows arsenic concentration

over time for wells that had high arsenic concentration in 1989 (ie: contaminated wells). Figure 1 clearly shows great improvements in water quality since removal of tailings at LAO commenced in 1993 and was completed in 1997. Arsenic concentrations in two wells have improved 2 orders of magnitude (note figure 1 has a logarithmic scale) and have improved at least one order of magnitude in all wells. Figure 2 shows copper concentration over time for wells that had concentrations of copper exceeding 12000 ug/L in 1989. Copper concentration in all wells show improvement since the 1989 sampling event and currently all wells are experiencing improving water quality. The water quality improvements seen at LAO underscores the fact that dramatic improvements in water quality are quickly realized even under partial removal of source areas (1.2 million cu yd of a total of 2.2 million cu yd of identified COC source material has been removed at LAO). Two wells in figure 2 show dramatic improvements in water quality by 1998, one year after the partial tailings removal was completed.

- Copper trends for highly contaminated wells presented in table 9 that do not show an improving trend are located in the Parrott Tailings. We would not expect to see an improving trend in wells completed in the Parrott because no source material has been removed. The text is misleading in presenting Parrott well data and suggesting that the data shows the futility of source removal. The text should more accurately state that if COC sources are left in place in the MSD then water quality should be expected to continue without improvement.

An appropriate analysis for wells in LAO would show water quality trends in wells downgradient from source area removals. Results from such an analysis would provide valuable insight into the efficacy of source area removal and should be used to determine whether ARARs can be achieved by removal of accessible waste within the alluvial aquifer. CTEC requests that such an analysis be undertaken before an ARAR waiver is granted for the BPSOU alluvial aquifer. Furthermore, in light of the errors in analyzing these data EPA should take over responsibility to finalize the TI document.

2.2 Adequate information is not provided in the TI document supporting the claim that discharge of contaminated groundwater from the MSD alluvial aquifer will not occur to downstream surface water. The TI document states on page 23, fifth bullet that “the lateral extent of elevated concentrations of COCs in the deeper portion of the system is generally more extensive than in the shallow portion.” CTEC believes that this fact underscores the likelihood that contaminant transport from the source areas within the MSD is by deeper circulation. CTEC and MBMG have provided analysis which show that travel times for deep flowpaths are on the order of decades and therefore the Parrott Tailings and other buried mine waste within the MSD are currently and will continue to impact the baseflow of MSD, Silver Bow Creek, and Blacktail Creek. The fact that deep contamination is laterally extensive indicates that the weight of evidence suggests the current sub-drain configuration may not now or in the future adequately capture contaminated groundwater flux from the MSD.

Review of potentiometric maps and information provided in the TI clearly shows flux of contaminated groundwater from the MSD alluvial aquifer towards Blacktail Creek. Figure 2.2-12 of the FFS shows flowpaths within the south end of the lower MSD converging on the channel of Blacktail Creek. Text within section 3.1.1 of the TI document further supports that Blacktail Creek and Silver Bow Creek gain water from the MSD alluvial aquifer. CTEC has reviewed chemical data for the MSD aquifer that indicates primary contaminant sources or secondary sources within the lower MSD will likely continue to leach arsenic to surface water. Arsenic contamination occurring at concentrations of 485 ug/L in the vicinity of well MF-02 shown in figure 2.2-12 of the FFS is clearly upgradient of lower Blacktail Creek.

The occurrence of high levels of arsenic contaminated groundwater and alluvial material in proximity to Blacktail Creek indicates that the MSD sub-drain may not capture some highly contaminated groundwater flux to surface water. CTEC feels it is of extreme importance that contaminant flux from the MSD be eliminated under the remedy. Allowing COCs to continue to leach from the MSD alluvial aquifer puts both the Silver Bow Creek Streamside

Tailings Operable Unit (SSTOU) remedy and Warm Springs Ponds (WSPOU) performance standard compliance at risk. Ultimately, the success or failure of the Superfund remedies currently in place or under construction downstream is at stake. Inadequate Superfund remedies at the BPSOU must not jeopardize downstream remedies that have cost hundreds of millions of dollars.

CTEC believes that the effectiveness of the sub-drain in capturing MSD alluvial groundwater must be assessed and any analysis of the sub-drain must be peer reviewed and agreed upon by the State of Montana prior to this remedy being selected. The sub-drain is currently in place making an accurate analysis of the capture zone of the sub-drain currently possible. Installation of additional piezometers is necessary in the vicinity of any contamination currently located on flowpaths that will not intercept the sub-drain. Water level monitoring in all wells and piezometers should be used to create accurate potentiometric maps for the discharge boundary of the MSD alluvial aquifer. Currently flux within the MSD aquifer is responding to severe drought and the flow field should be anticipated to change during wet climate. Numerical groundwater modeling should be used, calibrated to existing groundwater levels, to predict the flow field under a reasonably expected period of wet climate. Unless it is determined that all virtually all flux of contaminated groundwater will be intercepted by the current sub-drain configuration, additional drains or extraction wells should be designed and constructed.

2.3 Discussion of the treatability of alluvial groundwater in the lagoons at LAO does not address the issue of increased COC loading during periods of wetter climate. Figures 8 and 9 show that groundwater gradient for the period 2001 – 2003 is the lowest for the period of record. Groundwater gradients for the period 1995 – 1998 were approximately 3 times higher indicating that flux through the aquifer would be 3 times as great. Table 5 shows surface water gains attributable to groundwater discharge. CTEC graphed data from table 5 in figure 3 below showing the correlation between climate and groundwater flux. CTEC figure 3 shows that the period 2001 - 2003 during which the TI document discusses the success of groundwater treatment at the lagoons is the period of lowest groundwater flux. The viability of groundwater treatment at the lagoons needs to be determined for

maximum probable COC loading from the alluvial aquifer. An analysis should be undertaken to determine the maximum probable flux of the alluvial aquifer that considers both climate effects on groundwater gradient and the effects of rising water levels within the Berkeley Pit on the position of the groundwater divide.

2.4 The practicability of a remedy that would combine selected COC source removal with artificial recharge needs to be assessed. Both the State of Montana and CTEC have expressed preference for a remedy for the alluvial aquifer that will provide for better long-term effectiveness and permanence and reduction of toxicity, mobility or volume through treatment. The TI document has not evaluated suitable technologies that may be implementable, cost effective and capable of achieving long-term effectiveness. CTEC believes that a remedy that includes removal of accessible source areas (MSD alternatives 5a and 5b or the FFS and BPSOU Proposed Plan combined with removal of accessible waste within LAO) with artificially recharge has potential to best satisfy both short-term and long-term primary balancing criteria for the Superfund remedy.

Deliberations to date have argued whether groundwater would achieve ARARs in a reasonable amount of time under a removal scenario. Opponents of source area removal have suggested that groundwater would not achieve ARARs within 100 – 300 years. CTEC provides the following evidence to support that the aquifer can recover within a reasonable time.

- General comment 2.1 above discusses the improvements in water quality documented in LAO wells during the period 1989 – 1999 showing that water quality can improve quickly even when only half of the contaminant source areas are removed.
- MBMG (2004b) provides additional documentation of the ability of MSD alluvial deposits to attain groundwater quality remedial goals within a reasonable amount of time if contaminant source areas are removed.
- General comment 2.3 discusses stream gaging data that shows that during periods of wetter climate hydraulic gradients increase groundwater flux

approximately 3 fold. It can be expected that if a clean source of water, such as treated water from the Horseshoe Bend Treatment Plant or groundwater wells upgradient from the Berkeley Pit, were applied to infiltration basins at the upgradient portion of the alluvial aquifer (near the BSB City-County Shops) then flux within the aquifer would be correspondingly increased. Page 27 of the TI document suggests that under current climate groundwater flux within the MSD alluvial aquifer averages 1.49 cfs. Therefore the expected discharge of the Horseshoe Bend Treatment plant of 4.5 cfs if applied as artificial recharge would effectively quadruple the flux of the alluvial aquifer. Additional groundwater flux from natural recharge during periods of wetter climate would be expected. This shows that the flux through the alluvial aquifer could reasonably be induced at least 4 times the current flux. A flux increase of this magnitude reduces estimates of recovery time by a corresponding factor of at least 4-fold from a conservative estimate of 300 years to under 75 years time.

- Table 7 in the TI document presents Darcy flux calculations for potential aquifer recovery times. Calculations within this table use a hydraulic gradient of 0.004. Actual gradients in the vicinity of the Parrott Tailings as shown in figure 2.2-14 of the FFS average 0.034, approximately 9 times greater than those used in table 7. Using the actual measured gradients from the FFS in the Darcy flux calculations in table 7 reduce the aquifer recovery time for cadmium, the most retardant of the COCs, to 37 years.
- Arguments suggesting that COCs chemically bound to fine grained units within alluvium will continue to leach to groundwater significantly longer than coarse grained deposits do not consider the inherent mixing associated with groundwater flowpaths within the aquifer. Although fine grained deposits will take longer to leach to recovery, fine grained units constitute a small portion of the total flux of the aquifer. Flux occurring along zones of preferential flow associated with coarse deposits will mix with the much smaller flux associated with more contaminated fine grained deposits. The resulting mixed water will have chemistry similar to the flux associated with cleaner coarse grained deposits. Therefore

suggestions that fine grained deposits will cause prolonged exceedence of ARARs is speculative. Hydrogeochemical modeling using a numerical software platform should be used to gain a refined prediction of actual aquifer recovery.

2.5 The TI document inappropriately argues that groundwater remediation is not practical because aquatic surface water standards would not be met. ARARs determined for the BPSOU alluvial aquifer are based upon National Primary Drinking Water Standards and Montana WQB-7 standards for groundwater. It is not necessary to return the aquifer to surface water aquatic life standards to return the aquifer to its beneficial use for drinking water. Statements in the TI document that it will take longer for the aquifer to recover to meet surface water aquatic standards further avoid the issue of whether or not the aquifer can recover to meet ARARs. Other options are available for treatment of surface water and should be discussed outside of the TI evaluation for groundwater.

2.6 Appropriate remedial goals for the alluvial aquifer should be determined that reflect remediation of the aquifer to natural conditions. The TI document argues in section 3.4.3 Additional Considerations that geochemical conditions related to the natural mineralization of the Butte area could prevent groundwater from meeting Montana WQB-7 standards under any remedy. CERCLA clearly states that it is intended to remediate impacts created by anthropogenic hazardous wastes. Therefore it would be appropriate for remedial goals (RGs) for BPSOU alluvial groundwater to reflect natural conditions of elevated metal and arsenic concentrations. EPA should evaluate what natural geochemical concentration in BPSOU alluvial groundwater would be and determine if natural conditions are attainable by available remediation technologies. It is not appropriate to consider remediation of alluvial groundwater technically impracticable if RGs are unobtainable due to naturally occurring mineralization.

2.7 Reasonable assurances need to be provided that flux of contaminated groundwater within the base of the alluvial material and in weathered bedrock will not escape interception at LAO. The TI evaluation states that flux within competent bedrock is less than 6 gpm. CTEC is concerned that

flux of severely contaminated groundwater in weathered bedrock and at the base of the alluvium can escape interception by the hydraulic control channel (HCC) at LAO. Higher conductivity units at the base of the alluvial aquifer or in weathered bedrock would serve to effectively lower the hydraulic head at the base of the alluvial aquifer. The resulting flow field would cause significant flux of contaminated groundwater from the BPSOU alluvial aquifer into the Silver Bow Creek floodplain alluvial aquifer. This fundamental groundwater flow concept is depicted in figure 6.4 a & b of Freeze and Cherry, 1979.

NRDP (2004) monitoring data of water and sediment in Silver Bow Creek shows that the SBC-SST OU is vulnerable to recontamination from upstream areas in the BPSOU. The SBC-SST OU remedy does not include protection from groundwater sources of contamination making it paramount that contaminated groundwater does not escape the BPSOU alluvial aquifer at LAO. CTEC contends that a network of monitoring wells needs to be established below and west of LAO to establish that contaminated groundwater is not leaving the BPSOU and causing impairment of Silver Bow Creek. Multi-level nested monitoring wells should be completed within alluvium, weathered bedrock and bedrock. Wells should be used for assessing aquifer properties, monitoring the movement of contaminants in both alluvial and bedrock aquifer systems, and monitoring hydraulic gradients. CTEC requests that the ROD stipulate the maintenance of a positive hydraulic gradient from alluvium and weathered bedrock wells immediately down gradient of LAO towards the HCC ensuring that the HCC is capable of capturing contaminated groundwater at all depths above competent bedrock.

3.0 Specific Comments

3.1 **Page 4, section TI Justification Summary.** This section states, “Currently, water quality standards (WQB-7) in SBC are either largely being met or are approaching attainment because of these completed remedial actions.” CTEC believes that this statement is misleading; water quality in Silver Bow Creek (SBC) is currently very poor. Water from SBC is not currently safe for humans to consume or recreate in and SBC does not currently support a

functioning natural biological system. CTEC requests that the text be corrected to reflect CTEC's analysis presented above.

3.2 Figure 3, Conceptual Model of the Current Alluvial Groundwater Flow System in the Butte Priority Soils Operable Unit. This figure lists sampled concentration of contaminants at selected wells within the BPSOU and wrongly states that concentrations are in mg/L. Concentrations listed in this figure are in ug/L and should be correctly labeled.

3.3 Page 15, section Groundwater Models – CDM Federal Model of the Metro Storm Drain, 4th bullet. This section references the FFS stating “alluvial groundwater quality below 250 ft is only moderately impacted by the Parrott Tailings if it is impacted at all.” Concentration of arsenic in well GS-50 which is approximately 260 ft deep has been sampled as high as 287 ug/L indicating significant impact by the Parrott complex. CTEC requests that water quality sampling data from all wells 250 ft or deeper be included in this analysis and be accurately reported in the final TI document.

3.4 Page 20, section 3.1.1 Hydrogeology, last bullet. This section states “variability in aquifer properties is demonstrated in figure 3, the graphic representation of the alluvial aquifer conceptual model and more specifically in figures 5a through 5m, geologic and lithologic cross-sections of the alluvial aquifer.” Figures 5a through 5m do not show lithology of the alluvium nor the actual variability of the aquifer properties. In fact review of the cross-sections might lead a reader to believe that the pre-mining aquifer is completely heterogeneous. Figure 3 of the site conceptual model shows very generalized textural change in the alluvium (ie: two units, coarse and fine deposits). There are discrepancies between the depths at which coarse-grained high transmissibility units are located in figure 3 and those described by MBMG (2004a,b). Cross-sections in the TI document should incorporate accurate lithologic detail so that the reader can evaluate the conceptual model proposed in the TI document and FFS.

3.5 Figure 5i. Cross-section B-B' shown in figure 5i is not the correct location for cross-section B-B' in figure 5j. CTEC requests that the figure be corrected to reflect the correct location for this cross-section.

- 3.6 **Page 20, section 3.1.1.1 Groundwater Volume.** Calculation of the volume of contaminated groundwater in this section assumes that porosity of the alluvial aquifer is 20%. The TI document references the Mine Flooding Operable Unit RI (Canonie/ARCO, 1994) on page 14 stating that porosity ranges 29.3-54.1 and averages 46.3 in the alluvial aquifer. Actual site measurements should be used in volume calculations.
- 3.7 **Table 1.** Several standards listed in table 1 need to be corrected. The WQB-7 aquatic chronic standard for cadmium is 0.16 ug/L. The human health standard for copper is 1300 ug/L. The groundwater standard for zinc is 2000 ug/L.
- 3.8 **Table 3.** Table 3 lists average percent COC removal for BPSOU treatment lagoons facility for the drought years 2002-2004. The efficacy of treatment with lime in lagoons must be evaluated based on the ability to treat large flows with maximum concentrations. Therefore average concentrations do not give an indication of the ability to treat groundwater episodic high COC loads in the lagoons. Evidence should be provided that the lagoons can treat the highest expected input loads of metals and arsenic under reasonably expected wet climate conditions.
- 3.9 **Page 22, section 3.1.1.2 Groundwater Quality.** This section presents tables showing minimum, maximum, and average concentration of COCs sampled in wells in the MSD. CTEC reviewed water quality data in the FFS and found the following discrepancies and requests that the text of the TI document be corrected:
- Maximum concentration of As sampled in the upper MSD is listed as 63 ug/L. Concentrations shown in the FFS for well GS-50 is 287 ug/L and 70.6 ug/L for well AMW-1.
 - Maximum concentration of As sampled in the lower MSD is listed as 38 ug/L. Concentrations shown in the FFS for well MF-02 is 485 ug/L and 175 ug/L in well MF-06. These maximum As concentrations are an order of magnitude higher than those reported in the TI document.
- 3.10 **Page 23, section 3.1.1.2 Groundwater Quality, first bullet.** The areas in which Pb concentrations have exceeded 0.1 mg/L should include the Diggings East Tailings in addition to the other listed areas.

- 3.11 **Page 23, section 3.1.1.2 Groundwater Quality, fourth bullet.** Areas listed with elevated arsenic concentrations in shallow groundwater should also include the Diggings East Tailings, the lower MSD near Blacktail Creek, the Parrott Tailings, and the area hydrogeologically upgradient of the Lower MSD Tailings at the base of the Butte Hill.
- 3.12 **Page 23, section 3.1.1.2 Groundwater Quality, fourth bullet.** The text states, “arsenic concentrations are relatively low in the deeper portion of the floodplain alluvial aquifer.” Monitoring data provided in the FFS shows arsenic sampled at 287 ug/L in well GS-50 completed near the base of the alluvial aquifer. The text of the TI document should correctly state that there is little geochemical control in the deep alluvium and the sample at well GS-50 is one of the higher arsenic concentrations reported in the FFS suggesting that significant arsenic impact occurs in the deep alluvium.
- 3.13 **Page 27, section Water Balance Calculations.** The last paragraph of this section describes that groundwater flux data from 2000 – 2003 is representative of current conditions. General comment 2.3 above discusses why flux data from this period is the lowest for the period of record. The discussion in the TI document should appropriately state that groundwater fluxes would increase substantially during periods of normal and wetter climate.
- 3.14 **Page 28, section 3.1.1.4 Groundwater Travel Times in the MSD Area.** The statement in this section: “in a continuous system with limited recharge, the flows within the higher conductivity zone will be controlled by the ability of adjacent areas to recharge the higher conductivity zone” is misleading. Flux within a saturated system is a function of the spatially integrated hydraulic conductivities of the various heterogeneous units and the recharge and discharge boundaries of the aquifer system. Higher conductivity units at depth in the alluvial aquifer serve to effectively increase the hydraulic gradient across lower conductivity units at shallower depth with a corresponding increase in flux through the shallower alluvium. This fundamental groundwater flow concept is depicted in figure 6.4 a & b of Freeze and Cherry, 1979. CTEC is disappointed that ARCO does not employ

expertise that understands this fundamental concept of hydrogeology. CTEC requests that the above text be omitted from the final TI document.

3.15 Figure 11 and page 43, section MBMG Column Test Data. The concept of vertical recharge as discussed in the TI document is misleading. The scale shown in figure 11 suggests that the distance traveled vertically by groundwater recharge flux is about 1/3 of the total flow distance. This would correspond to an increase in travel time of 50% over horizontal flow. Actual vertical distance of flowpaths is likely less than 200 ft which is 1/16 of the total flow distance. The text should correctly state that vertical recharge flux that travels to a depth of 200 ft would therefore be expected to add 6% to the total groundwater travel time and associated time for contaminant purging.

3.16 Section 3.3.2.2 Aquifer Recovery of Lower Area One; 3.3.2.3 BPSOU Alluvial Aquifer Recovery; 3.3.3 Previous Opinions on Recovery Following Removal; 3.4.3 Remaining Diffuse Sources. CTEC requests that all references to the lack of improvement in water quality at LAO since tailings removal be deleted from these sections. Statements such as “groundwater COC concentration within the BPSOU remain largely unchanged since the SBC Phase II RI even after extensive removal in LAO” in section 3.3.3 are incorrect and misleading. As described in General Comment 2.1 and seen in figures 1 and 2 below water quality is improving since COC source removal.

3.17 Page 55, section Removal. This section states that the aquifer has been “pumped” at its maximum sustainable rate for over a century owing to natural discharge to surface water and therefore groundwater extraction would not increase the flow through the aquifer. This would be correct if the aquifer were bounded on all sides by impermeable boundaries and received recharge only from precipitation. In reality the aquifer is hydraulically connected to other aquifers and to surface water features such as Blacktail Creek. Recharge sources include precipitation on the Butte Hill and flux from alluvium upgradient of the area defined as the BPSOU alluvial aquifer. This upgradient recharge boundary can be clearly seen as potentiometric iso-contour 5462 to the east of the MSD in figure 2c of the TI document. MBMG (2004a) suggests that recharge occurs when East Ridge runoff infiltrates the valley

alluvium. Pumping of the MSD alluvial aquifer would increase the head gradient from these recharge sources and would increase the capture area for aerial recharge from precipitation effectively increase flux through the aquifer. CTEC states in General Comment 2.4 above that removal of accessible waste combined with artificial recharge may be a practical remedy for the BPSOU alluvial aquifer. Groundwater extraction may be able to achieve a similar increase in groundwater flux, albeit at a greater operational cost owing to pumping.

Cited References

ARCO, 2005. Groundwater Technical Impracticability Evaluation for Butte Priority Soils Operable Unit. Prepared by Pioneer Technical Services, June 6, 2005.

CDM, 2004. Final Phase II Remedial Investigation/Feasibility Study Appendix E Focused Feasibility Study of the Metro Storm Drain. CDM Federal Programs Corporation. February 19, 2004.

Freeze, R.A and Cherry, J.A. 1979. Groundwater. Prentice-Hall, Inc.

MBMG, 2004. Draft Preliminary Report Investigation of contaminant transport and potential water-quality recovery in upper silver Bow Creek Butte, Montana. June 1, 2004

MBMG, 2004b. Summary of Investigation Upper Silver Bow Creek, Butte, Montana. MBMG Open File Report 507.

NRDP, 2004. Post-Remediation Monitoring and Data Collection SST-OU Subareas 1-4. Task Order No. 23; DEQ contract No. 400022-TO-23.

Figure 1: LAO Arsenic Concentration Trends

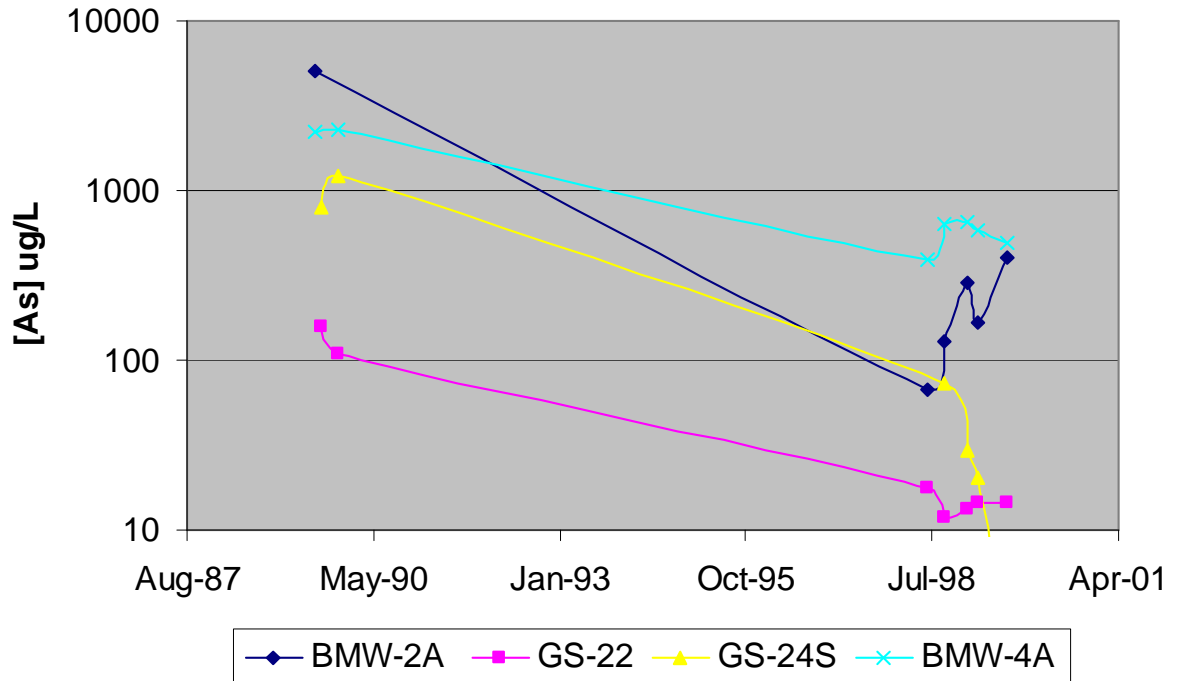


Figure 2: LAO Copper Concentration Trends

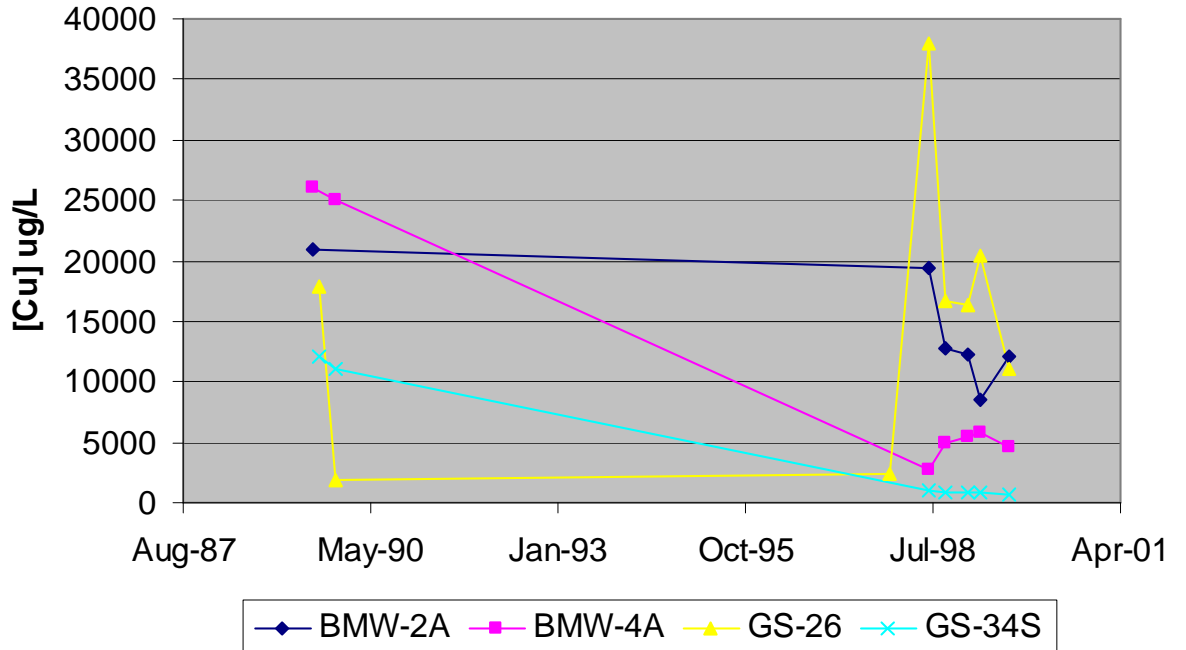


Figure 3: Groundwater flux relationship to precipitation

