DEQ
Montana Department
of Environmental Quality

April 26, 2017

Mr. Nikia Greene
Remedial Project Manager
U.S. EPA, Region 8
Federal Building
10 West 15th Street, Suite 3200
Helena, MT 59626

Subject: **Fourth Five-Year Review Report**
For the Montana Pole and Treating Plant Site

Dear Mr. Greene:

The Department of Environmental Quality (DEQ) is submitting the final Fourth Five-Year Review for the Montana Pole and Treating Plant Site, Butte-Silver Bow, Montana.

If you have any questions or concerns, please call me at (406) 444-6335.

Respectfully,

David Bowers
Project Manager

Five-Year Review Report

Fourth Five-Year Review Report
For the Montana Pole and Treating Plant Site

Butte,

Silver Bow County, Montana

May 2017

PREPARED BY:

Montana Department of Environmental Quality
Helena, Montana

For U. S. Environmental Protection Agency
Region 8
Denver, Colorado

Approved by:

Date: 6/30/17

Betsy Smidinger
Assistant Regional Administrator
Office of Ecosystems Protection
and Remediation

Table of Contents

Tables

Table of Contents (Cont.)

Figures

Appendices

Attachments

List of Acronyms

AML	Abandoned Mine Land
ARAR	Applicable or Relevant and Appropriate Requirements
AOC	Administrative Order on Consent
ARCO	Atlantic Richfield Company
B2 PAHs	PAHs that are probable carcinogens
BPSOU	Butte Priority Soils Operable Unit
BRW	Butte Reduction Works
BSB	Butte-Silver Bow
BTL	Butte Treatment Lagoons
CAMU	Corrective Action Management Unit
CDM	Camp Dresser & McKee
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CGA	Controlled Groundwater Area
COC	Contaminant of Concern
CTEC	Citizens Technical Environmental Committee
D PAHs	PAHs that are not classifiable with respect to cancer impacts
DEQ	Montana Department of Environmental Quality, including its contractors
EPA	United States Environmental Protection Agency
FS	Feasibility Study
FYR	Five-Year Review
GAC	Granular Activated Carbon
gpm	Gallons per minute
HCC	Hydraulic Control Channel
I-15/90	Interstate 15/90
IC	Institutional Control
IRIS	Integrated Risk Information System
ISCO	In-Situ Chemical Oxidation
LAO	Lower Area One
LNAPL	Light non-aqueous phase liquid
LTU	Land treatment unit
LUST	Leaking Underground Storage Tanks
MBMG	Montana Bureau of Mines and Geology
MCA	Montana Code Annotated
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDHES	Montana Department of Health and Environmental Services (now DEQ)
MDT	Montana Department of Transportation
mg/kg	Milligram per kilogram
MPTP	Montana Pole and Treating Plant
MT	Montana
NCP	National Contingency Plan

List of Acronyms (Cont.)

NCRT	Near Creek Recovery Trench
NHRT	Near Highway Recovery Trench
NPL	National Priorities List
O&M	Operation and Maintenance
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
OU-1	Operable Unit 1
PAHs	Polycyclic aromatic hydrocarbons
PA/SI	Preliminary Assessment/Site Inspection
PCP	Pentachlorophenol
pg/L	Picogram per Liter
P&T	Pump and treat
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RSL	Regional Screening Level
SSP	Soil staging and pretreatment piles
TCDD	2,3,7,8-tetrachlorophenol dibenzo-p-dioxin
TCDD-TEQ	Sum of toxicity equivalents for individual polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), expressed as concentration of 2,3,7,8-tetrachlorophenol dibenzo-p-dioxin (TCDD)
TEFs	Toxicity equivalency factors
TEQ	Toxicity Equivalent
µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter
USGS	United States Geological Survey
UU/UE	Unlimited use and unrestricted exposure
WHO	World Health Organization
WTP	Water treatment plant associated with MPTP remedy
WWTP	Butte-Silver Bow wastewater treatment plant

Montana Pole and Treating Plant Site

Fourth Five-Year Review Report--2016

I. Introduction

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

This Five-Year Review is a cooperative effort of both the Montana Department of Environmental Quality (DEQ) and the U.S. Environmental Protection Agency (EPA) Region 8, and has been prepared pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, 42 U.S.C. § 9621, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fourth Five-Year Review for the Montana Pole and Treating Plant (MPTP) site in Butte, Montana. The triggering action for this statutory review is completion date of the previous FYR in June 2011. The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

This FYR addresses Operable Unit 1 (OU-1) which is the only operable unit (OU) for the Site and includes all known sources and contaminated media at the Site.

This FYR was led by Montana DEQ with the support of its contractor, Tetra Tech. The DEQ is the lead agency for implementation and operation and maintenance of the remedial action at the Site. Key participants included the following:

- Lisa DeWitt, Montana DEQ (Project Manager)
- David Bowers, Montana DEQ (Project Manager)
- Jeni Flatow, Montana DEQ (Public Information Officer)
- Nikia Greene, EPA Region 8 (Remedial Project Manager)
- Rob Greenwald and Jennifer Abrahams, Tetra Tech (FYR support to DEQ)
- Kathie Roos and Dan Buffalo, Tetra Tech (Remediation Contractor for DEQ)
- Tom Bowler and Travis Dunkle, Tetra Tech (Groundwater Treatment Plant Operators)

The Site visit for the FYR was conducted on March 1, 2016. Interviews with members of the community, and an open house for neighbors, were also conducted as part of this FYR.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Montana Pole and Treating Plant Site		
EPA ID: MTD986073583		
Region: 8	**State:** MT	**City/County:** Butte-Silver Bow

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the site achieved construction completion?** No

REVIEW STATUS
Lead agency: State (Montana DEQ)
Author name (Federal or State Project Manager): David Bowers and Lisa DeWitt
Author affiliation: Montana DEQ
Review period: 6/30/2011 – 6/29/2016
Date of site inspection: 3/1/2016
Type of review: Statutory
Review number: 4
Triggering action date: 6/29/2011
Due date *(five years after triggering action date)*: 6/29/2016

Background

The MPTP site is located at 220 West Greenwood Avenue, on the western edge of Butte, Montana. The Site is a former wood treating facility located in the Silver Bow Creek Basin. Soil, groundwater, and sediments were contaminated by the former wood treating operations. Pentachlorophenol (PCP) is the primary contaminant of concern (COC); dioxin[1] and some polycyclic aromatic hydrocarbon (PAH) compounds other than PCP are also present. The MPTP site is adjacent to the Silver Bow Creek/Butte Area Superfund Site, and the contaminants of concern are distinct between the two sites (i.e., organics including PCP at the MPTP site versus metals from mine tailings associated with the adjacent Superfund site).

[1] Polychlorinated dibenzo-p-dioxins (dioxin) and polychlorinated dibenzofurans (furans) are collectively referred to as "dioxin" in this document.

Figure 1 illustrates the following key features in the vicinity of MPTP that are referred to throughout this FYR, including some features associated with remedial activities for other sites:

- *Active Remedy Components at MPTP* – Features highlighted on Figure 1 associated with the remedy at MPTP include the following:
    - Near Creek Recovery Trench (NCRT) – Collects impacted groundwater just south of Silver Bow Creek for treatment at the MPTP water treatment plant.
    - Near Highway Recovery Trench (NHRT) – Collects impacted groundwater just north of Interstate 15/90 (herein referred to as I-15/90 or "the Interstate") for treatment at the MPTP water treatment plant.
    - MPTP Water Treatment Plant (WTP) – Location where extracted water from the NCRT and NHRT is treated. Water is treated with granular activated carbon (GAC). The treated water is primarily discharged to Silver Bow Creek, though several other discharge options have historically been available (discussed later).
    - Land Treatment Unit (LTU) and Retention Pond – Located in the southeastern corner of the MPTP site, excavated soils from the MPTP site were treated at the LTU using biological treatment. Water was re-circulated between the retention pond and the LTU. The retention pond and LTU are not in contact with the groundwater flow system. The LTU treatment operations meet Record of Decision (ROD) cleanup levels for PCP and PAH, but the treated soils do not meet dioxin cleanup levels. Engineering controls and institutional controls (ICs) are currently being developed and designed to manage the dioxin concentrations in treated soils that are currently anticipated to remain on-Site. The final LTU offload is currently expected in 2017 or 2018, but that is subject to change.
- *Silver Bow Creek* – Located north of MPTP, the portion of the creek adjacent to MPTP was reconstructed in the late 1990s as part of the Lower Area One (LAO) removal action. LAO is part of the Butte Priority Soils Operable Unit (BPSOU), which is a portion of the larger Silver Bow Creek/Butte Area Superfund Site that stretches for approximately 26 miles downstream of Butte, Montana.
- *Historic Silver Bow Creek* – The location of "Historic Silver Bow Creek" (before the LAO construction) is illustrated with dashed lines on Figure 1. Just north of the MPTP fence line, a remnant portion of "Historic Silver Bow Creek" exists as a trench. Further to the west, Historic Silver Bow Creek makes up a portion of the Hydraulic Control Channel (HCC).

The Interstate runs across the Site in an east-west direction and partitions the Site into a northern and a southern section. Other features noted on Figure 1 that are not part of the MPTP site include the HCC, Butte-Silver Bow Wastewater Treatment Plant (WWTP), Butte Treatment Lagoons (BTL), and Butte Reduction Works (BRW) Retention Ponds. These features are associated with management/treatment of metals in groundwater that are due to regional mining activities (i.e., different contaminants than those caused by the MPTP site) and are part of the BPSOU remedial action.

Current zoning in the vicinity of the MPTP site is illustrated on Figure 2 (based on information provided at http://co.silverbow.mt.us/DocumentCenter/View/150). The northern portion of the MPTP site (i.e., north of the Interstate) is currently zoned M1 (Light Industrial), and the southern portion of the MPTP site (i.e., south of the Interstate) is currently zoned M2 (Heavy Industrial). On Figure 2, there are areas on the extreme southwest part of the property, and also between the fence line and Silver Bow Creek, that are zoned OSD (open space developable), which would not allow residential development. The current zoning mostly precludes residential construction on the MPTP site, although caretakers and owners may have an appurtenant residential use in Heavy Industrial. Motels also are allowed in Light Industrial. However, Light Industrial zoning also states: "Nothing in this section shall be interpreted as permitting any residential use to be located within an M-1 zone." (See Chapters 17.28 and 17.30 of Butte-Silver Bow ordinances). Therefore, the current zoning prohibits almost all residential zoning, except for certain residential uses associated with industrial uses.

Efforts to develop and implement permanent ICs to restrict residential use for the entire property within the fence line (and anywhere else needed) are underway but are not complete. The Atlantic Richfield Company (ARCO), as required by the 1996 Consent Decree, caused deed restrictions to be placed on certain properties within the MPTP site. The deed restrictions prohibit residential development, drilling of water wells, and other specified uses. Similar deed restrictions will be placed on other properties within the MPTP site where appropriate.

Site reports refer to the following stratigraphic units, from bottom to top:

- Bedrock
- Weathered Bedrock
- Alluvium

The MPTP site is located in a valley that dropped (via faulting). The bedrock is usually described as "granite" or "quartz monzonite" and the valley is filled with sediment (alluvium) derived from erosion of the surrounding hills. The weathered bedrock and lower portion of the alluvium are sometimes hard to differentiate. The unconsolidated alluvium is highly variable and consists of discontinuous layers and lenses of sandy clay, clayey silty sand, sand, and gravel. There is often material of lower hydraulic conductivity consisting of silty clay or peat within the alluvium which separates the upper and lower alluvium and restricts vertical flow to some degree. In addition to the natural heterogeneity, the shallow subsurface has been highly disturbed in the area on and around MPTP by mining operations, excavation associated with the LAO remedy, and excavation associated with the MPTP remedy.

Groundwater is present at the Site under mostly semi-confined conditions, with depth to water approximately 20 feet below grade near Greenwood Avenue, approximately 8 feet below grade near the MPTP WTP, and approximately 2 to 4 feet below grade near Silver Bow Creek. Regionally, groundwater flows from the hills (primarily bedrock) into the valley (alluvium and bedrock), with groundwater flow in the valley from east to west (in the flow direction of Silver Bow Creek). Before reconstruction of Silver Bow Creek, groundwater discharged to Historic Silver Bow Creek from both sides. South of Silver Bow Creek, the flow was generally to the northwest, and north of Historic Silver Bow Creek, flow was generally to the southwest. Reconstruction of Silver Bow Creek and implementation of the HCC, most of which occurred after the installation of the MPTP groundwater collection system, changed the flow system. The reconstructed portion of Silver Bow Creek is designed to be above groundwater when the

groundwater extraction for the MPTP remedy is occurring, and the HCC generally intercepts groundwater under those conditions based on groundwater modeling performed in 2010.

Groundwater flow patterns at the MPTP site are influenced by extraction at the NCRT and NHRT. In recent years it has been documented that flow patterns at the MPTP site are also influenced by periodic extraction for dewatering associated with construction activities at the WWTP (north of Silver Bow Creek).

II. Response Action Summary

Basis for Taking Action

The primary COC at the Site is PCP associated with wood treating operations at the former plant. A ROD for the Site was issued by EPA and DEQ in 1993. The 1993 ROD describes the remedial action necessary for the Site.

The 1993 ROD documents that MPTP operated as a wood treating facility from 1946 to 1984. During most of this period, a solution of about five percent PCP mixed with petroleum carrier oil similar to diesel was used to preserve poles, posts and bridge timbers. The PCP solution was applied to wood products in butt vats and pressure cylinders (retorts). Creosote was used as a wood preservative for a brief period in 1969. Uncontrolled releases of contamination occurred throughout the Site during its active operation.

Site conditions documented in the 1993 ROD presented an unacceptable level of risk to human health and the environment at the Site, and described conditions which, at the time, may have presented an imminent and substantial endangerment to human health and the environment. The ROD indicated that the principal threats stemmed from contaminated groundwater, releases of contaminated groundwater and oily wood treating fluids into surface water, and surface soils. The primary human health risk exposure pathways were ingestion of and direct contact with contaminated groundwater and ingestion of or direct contact with soils. Potentially affected receptors included residents, workers, trespassers, recreational users, and terrestrial and aquatic biota.

PCP is the primary Site contaminant; other COCs with cleanup standards established in the ROD for soil or groundwater include chlorinated phenols, PAHs, and dioxins/furans. Standards for water discharged from the MPTP treatment plant to surface water also include criteria for six metals due to proximity to the adjacent Silver Bow Creek/Butte Area Superfund Site, which primarily addresses metals. However, metals are not considered to be COCs for the soil or groundwater at the MPTP site. Specific cleanup standards are addressed later in this document.

Response Actions

Prior to 1993 ROD

In March 1983, a citizen filed a complaint concerning oil seeping into Silver Bow Creek near the Montana Pole facility. The Montana Department of Health and Environmental Services (MDHES), which is now the DEQ, investigated the complaint and discovered an oil seep on the south side of Silver Bow Creek directly downgradient from the Montana Pole facility. Further investigation of the Site revealed oil-saturated soils adjacent to the creek and on Montana Pole property. Subsequent sampling confirmed the presence of PCP, PAHs, and dioxins/furans in Site soils and oil samples. MDHES and EPA completed a preliminary assessment and site inspection (PA/SI) followed by a Hazard Ranking Score in July 1985. The Montana Pole facility was

included on the National Priorities List (NPL) for Superfund sites on July 22, 1987 (Fed. Reg. Vol. 52, 140 Pg. 17623).

In July 1985, the EPA Emergency Response Branch began conducting a removal action on the Site to minimize impacts to Silver Bow Creek and to stabilize the Site. EPA excavated approximately 6,000 cubic yards of highly contaminated soils, bagged them and placed them in storage buildings (pole barns) constructed on-Site. Tanks, retorts, pipes and other hardware were dismantled and stored on-Site in a former sawmill building. Two groundwater interception/oil recovery systems were installed to alleviate oil seepage into the creek. Contaminated areas of the Site and features of the groundwater recovery system were fenced to restrict public access.

In October 1989, EPA granted MDHES the initial enforcement funding to conduct potentially responsible party (PRP) noticing and administrative order negotiations and issuance. In April 1990, MDHES signed an administrative order on consent (AOC) with ARCO under which ARCO agreed to conduct a Remedial Investigation and Feasibility Study (RI/FS) at the Site. In June 1990, ARCO began the RI/FS following the MDHES and EPA-approved RI/FS work plan. The remedial investigation defined the nature and extent of contamination and provided information to complete the baseline human health and ecological risk assessments. The feasibility study included the development, screening and evaluation of potential Site remedies.

In June 1992, the USEPA proposed an additional removal action to control and recover light non-aqueous phase liquid (LNAPL) (floating oils) identified during the (Remedial Investigation (RI). The action included the installation of 890 feet of sheet piling approximately 50 feet south of Silver Bow Creek. Ten recovery wells were installed on-Site. Eight of the wells were located south of Silver Bow Creek in a north/south line running perpendicular to the creek. Two wells were installed parallel to the creek; one on each end of the sheet piling. The wells were approximately 25 feet deep. Each well had two pumps: one to collect free-floating oil and pump it to an on-Site storage tank and the other to pump contaminated groundwater to an on-Site granular activated carbon treatment facility built by EPA. The water treatment facility went into operation January 22, 1993, at which time the system installed in 1985 was shut down.

In 1991, the United States filed suit against responsible parties in federal district court for a liability determination and recovery of response costs. The action was litigated for several years. Court ordered settlement negotiations resulted in a “cash out” Consent Decree for the Montana Pole Site, which was entered on July 16, 1996. EPA recovered some of its past costs and made provisions for the recovery of other costs. Also, the responsible parties provided approximately $35 million for EPA and DEQ to conduct the Site cleanup. Under the EPA/DEQ Site-Specific Superfund Memorandum of Agreement, DEQ, with assistance from EPA, is conducting the cleanup at the Site with funds from the MPTP Settlement Fund.

Remedial Action Objectives and Performance Standards (1993 ROD)

The general remedial action objectives in the 1993 ROD are summarized below.

- Soils and Sediments. “The remedial goal is treatment so that the contaminant concentration levels pose no unacceptable risk to human health or the environment. Since no federal or state chemical specific Applicable or Relevant and Appropriate Requirements [(ARARs)] exist for these media, cleanup levels were determined for contaminants of concern through a Site-specific risk assessment ” (ROD page 43).

- Groundwater. "Remediation goals provide maximum source reduction and protect Silver Bow Creek and uncontaminated groundwater by minimizing migration of contaminants with the groundwater. Cleanup levels for groundwater are [Maximum Contaminant Levels] (MCLs) and non-zero [Maximum Contaminant Level Goals] (MCLGs) established by the Safe Drinking Water Act or risk-based levels developed in the absence of MCLs or MCLGs. Attainment of these cleanup levels at groundwater points of compliance will be protective of human health and the environment and will ensure that uncontaminated aquifers and adjacent surface waters are protected for potential beneficial uses." (ROD page 44). "A sampling program for monitoring the remedial action and determining compliance with performance standards shall be implemented during remedial action." (ROD page 45). The cleanup levels for any water to be reinjected into the aquifer are based on non-degradation criteria and must be no greater than the average concentration of groundwater contamination in the area of recharge." (ROD, page 42).
- Surface Water. "…instream contaminant concentrations at the Point of Compliance must be reduced to the larger of either Gold Book levels [now Circular DEQ-7 Numeric Water Quality Standards] or one-half of the mean instream concentrations immediately upstream of the Site. This takes into account that there may be other sources of contaminants upstream of the Site. However, as all sources of contaminants are reduced or eliminated, instream contaminant levels from Montana Pole sources will approach the Gold Book levels. Therefore the ultimate cleanup levels which are to be achieved in the stream are Gold Book levels [now Circular DEQ-7 Numeric Water Quality Standards], MCLs and non-zero MCLGs." (ROD pages 41 and 42).
- Treated Water Discharge to Silver Bow Creek. "The cleanup levels for treated water discharges to Silver Bow Creek are also based on MCLs, non-zero MCLGs and the I-Classification standard… Additionally, any runoff from the Site to Silver Bow Creek, for example, from precipitation or snow melt, must meet the same surface water standards identified for treated water discharge. Runoff not meeting those standards must be captured and treated along with extracted groundwater prior to discharge." (ROD pages 42 and 43).
- Supplemental Engineering and Institutional Controls. Based on pages 46 to 47 of the ROD, objectives included the following: 1) prevent unauthorized access to contaminated media or to remedial action areas; 2) include adequate zoning restrictions, conservation easements, and other controls to prevent any future residential use of the Site; and 3) prevent any water well drilling in the contaminated groundwater plume and adjacent areas to prevent additional receptors of contaminated groundwater or an expansion of the plume.

Specific performance standards stated in the ROD for soil and sediments were as follows (from ROD pages 43 and 44):

> *The specific performance standards which will be used to ensure attainment of the remediation levels for these contaminated media [soils and sediments] are:*
>
> - *Excavation of accessible soils and associated LNAPLs with contamination levels in excess of the cleanup levels specified in [ROD] Table 23. Depth of excavation, particularly at and below the groundwater table, will be based on field judgment and technical practicability, as determined by the lead agency in consultation with the*

support agency. LNAPLs at the groundwater table will be recovered to the maximum extent practicable as determined by the agencies.

- *Soils below the depth of excavation with contaminant levels above cleanup levels specified in [ROD] Table 23 will be bioremediated in place. Biotreatment may include nutrient addition via irrigation, and tilling on routine intervals. After it has been determined by the lead agency, in consultation with the support agency, that in-place bioremediation of these soils is no longer effective or practicable and contaminant levels have plateaued, or it is determined by the agencies that these areas would be effectively addressed by the in-situ bioremediation implemented under the groundwater actions, these areas will be backfilled. Residual contamination will be further treated by in-situ bioremediation as outlined under Performance Standards for Groundwater.*
- *Treatment of excavated and previously excavated soils to achieve cleanup levels specified in [ROD] Table 23. Soils excavated from near Silver Bow Creek which contain tailings materials with elevated metals concentrations will be biologically treated and disposed in an appropriate Butte mine waste repository. All contaminated soils north of the active railroad bed are considered tailings material.*
- *Backfill of treated soils into excavated areas if possible, filling of remaining excavations with clean fill, replacement of all clean soils, surface grading and revegetation or covering with suitable material compatible with existing or future land uses.*
- *Remediation of inaccessible contaminated soils (consisting primarily of those soils underlying Interstate 1-15/90 and any soils under the EPA water treatment plant) by a two phased approach. First, enhanced LNAPL recovery via extraction wells and recovery trenches using hydraulic gradients and soil flushing to remove hazardous substances from these inaccessible soils. Adjustment of pH, use of surfactants and other methods should be considered to maximize recovery of hazardous substances. After it has been determined by the lead agency, in consultation with the support agency, that recovery of hazardous substances from these areas by these methods is no longer effective or practical and contaminant levels have plateaued, these areas will be addressed by in-situ bioremediation as outlined under Performance Standards for Groundwater.*
- *Implementation of engineering and institutional controls during the remedial action to prevent access to contamination and to limit the spread of contamination.*
- *Attainment of all ARARs identified in [ROD] Appendix A for the remediation of soils.*

According to the 1993 ROD, compliance with cleanup levels described in Table 23 of the ROD must be met for all excavated soils. As stated above, other performance standards must be achieved for contaminated soils below the depth of excavation or for soils not accessible to excavation (such as under the MPTP WTP and under the Interstate).

Specific performance standards stated in the ROD for groundwater and discharge of treated water were as follows (from ROD pages 44 and 45):

- *Containment of contaminated groundwater and LNAPL using hydraulic and/or physical barriers (as determined during remedial design) to effectively prevent the spread of contaminated groundwater and LNAPL and limit releases of contamination into Silver Bow Creek. Releases into Silver Bow Creek must be reduced in order to achieve cleanup levels identified in [ROD] Table 26 for Silver Bow Creek. Migration of contaminated*

groundwater must be limited in order to maintain groundwater cleanup levels ([ROD]Table 25) at groundwater points of compliance;

- *Treatment of extracted groundwater to cleanup levels in [ROD] Table 27 prior to discharge to Silver Bow Creek. Control and treatment, if necessary, of any contaminated runoff prior to discharge to Silver Bow Creek to meet the same cleanup levels (as noted on ROD page 42, the cleanup levels for any water to be reinjected into the aquifer are based on non-degradation criteria and must be no greater than the average concentration of groundwater contamination in the area of recharge);*
- *Treatment of the contaminated groundwater aquifer and contaminated soils not recovered by excavation by enhanced in-situ bioremediation. In-situ treatment may include the reinjection of treated groundwater and the addition of oxygen and nutrients to promote the biodegradation of contaminants, in-situ treatment of the site groundwater will continue until contaminant levels have plateaued and it is no longer effective or practical to continue treatment, as determined by the lead agency in conjunction with the support agency;*
- *Attainment of all ARARs identified in [ROD] Appendix A for groundwater remediation;*
- *Monitoring of groundwater wells within or proximate to the contaminated groundwater plume for contaminants of concern for groundwater; and*
- *Implementation of institutional controls to prevent access to or impacts upon contaminated groundwater at the site.*

The ROD identifies the southern bank of Silver Bow Creek as a point of compliance for groundwater. Page 42 of the ROD states the following:

> "Along Silver Bow Creek, this [point of compliance] boundary is to be the south bank of the creek. Using this boundary as the point of compliance for attainment of the groundwater remediation levels is protective of any offsite groundwater uses and protective of the water quality goals for the stream…Because impending zoning changes and other institutional controls will prevent use of groundwater on the site for drinking water purposes, it will not be necessary to attain the remediation levels throughout the contaminated plume itself, as anticipated in the Proposed Plan."

However, if appropriate controls are not implemented, the ROD directs that the point of compliance should be viewed as throughout the plume. Silver Bow Creek was subsequently reconstructed as part of the Silver Bow Creek/Butte Area Superfund Site remediation subsequent to the ROD, and the reconstructed Silver Bow Creek in the vicinity of the MPTP site was designed to be at a high enough elevation to not receive groundwater discharge under conditions of MPTP remedy extraction. The third FYR (June 2011) recommended that points of compliance for groundwater be clarified to reflect the current configuration of Silver Bow Creek, the current PCP plume distribution, and the updated conceptual site model. The *Groundwater and Surface Water Monitoring Plan* (Tetra Tech, January 2013) incorporated updated compliance points for current monitoring (illustrated on Figure 3); DEQ plans to finalize the compliance points once system equilibrium is established after WWTP dewatering (which has occurred periodically from 2009 to 2016) is completed.

With respect to compliance points for surface water, Page 43 of the ROD states that "surface water cleanup levels must be achieved at all points within Silver Bow Creek." Cleanup levels for Silver Bow Creek are Gold Book levels, MCLs and non-zero MCLGs as shown on ROD Table 26 (or one-half of the mean instream concentrations immediately upstream of the Site). Prior to the

relocation of Silver Bow Creek, the compliance sampling locations were SW-01 (upstream of the MPTP site), SW-02 (immediately downstream of the MPTP site), and SW-03 (further downstream at United States Geological Survey [USGS] gauging station SS07). Locations SW-01 and SW-02 were eliminated when Silver Bow Creek was reconstructed. Current surface water monitoring compliance points (in effect during this entire FYR period) are SW-09 (upstream of the MPTP site), SW-05 (immediately downstream of the MPTP site), and SW-03 (further downstream at USGS gauging station SS07), and these locations are illustrated on Figure 3.

ROD Cleanup Levels

Cleanup levels that were defined in the 1993 ROD are presented in the following tables:

- Table 1: Soil Cleanup Levels and Corresponding Risks (ROD Table 23)
- Table 2: Pathway Risk Estimates Corresponding to Soil Cleanup Levels (ROD Table 24)
- Table 3: Groundwater Cleanup Levels and Corresponding Risks (ROD Table 25)
- Table 4: Surface Water Cleanup Levels and Corresponding Risks (ROD Table 26)
- Table 5: Discharge to Surface Water Cleanup Levels and Corresponding Risks (ROD Table 27)

"B2 PAHs" refer to PAHs that are probable carcinogens, "Total D PAHs" refer to PAHs that are not classifiable with respect to cancer impacts, and "Dioxin TCDD" refers to 2,3,7,8-tetrachlorophenol dibenzo-p-dioxin. Units in these tables are in micrograms per kilogram (µg/kg) and micrograms per liter (µg/L).

{this space intentionally left blank}

Table 1: ROD Table 23
(Soil Cleanup Levels and Corresponding Risks)

Media	Contaminant	Cleanup Level (µg/kg)	Basis	Cancer Risk (recreational use for soil)	Noncancer Health Hazard Quotient
Soils	Pentachlorophenol[a]	34,000	Risk	1.0×10^{-6}	<1
	B2 PAHs (TEF)[bc]	4,200	Risk	1.0×10^{-6}	<1
	Dioxin TCDD (TEF)[bd]	0.20	Risk	1.0×10^{-6}	<1

a Levels correspond to an excess cancer risk of 1 x 10-6 and are based on data for the dermal exposure pathway as presented in the Baseline Risk Assessment Report (Camp Dresser & McKee [CDM], 1993).

b Levels correspond to an excess cancer risk of 1 x 10-6 and are based on data for the soil ingestion exposure pathway as presented in the Baseline Risk Assessment Report (CDM, 1993).

c Sum of individual B2 PAH (benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene) concentrations multiplied by their corresponding toxicity equivalence factor (TEFs) as shown on Table 28 of the ROD.

d Sum of individual chlorinated dibenzo-p-dioxins and -dibenzofurans concentrations multiplied by their corresponding toxicity equivalence factor (TEF) as shown on Table 29 of the ROD.

Table 2: ROD Table 24
(Pathway Risk Estimates Corresponding to Soil Cleanup Levels)

Recreational Soil Pathway Cancer Risks

		Risk		
Chemical	Cleanup Level (µg/kg)	Ingestion	Dermal	Total COC
Pentachlorophenol	34,000	1.33×10^{-7}	1.00×10^{-6}	1.14×10^{-6}
Dioxins/Furans (TEFs)	0.2	9.83×10^{-7}	7.36×10^{-7}	1.72×10^{-6}
B2 PAH (TEFs)	4,200	1.00×10^{-6}		1.00×10^{-6}
Total Pathway		2.12×10^{-6}	1.74×10^{-6}	
			Total:	3.86×10^{-6}

Industrial Soil Pathway Cancer Risks

		Risk		
Chemical	Cleanup Level (µg/kg)	Ingestion	Dermal	Total COC
Pentachlorophenol	34,000	8.56×10^{-7}	3.58×10^{-6}	4.44×10^{-6}
Dioxins/Furans (TEFs)	0.2	6.29×10^{-6}	2.84×10^{-6}	9.13×10^{-6}
B2 PAH (TEFs)	4,200	6.42×10^{-6}		6.42×10^{-6}
Total Pathway		1.36×10^{-5}	6.42×10^{-6}	
			Total:	2.00×10^{-5}

Table 3: ROD Table 25
(Groundwater Cleanup Levels and Corresponding Risks)

Media	Contaminant	Cleanup Level (µg/L)	Basis	Cancer Risk (drinking use for ground water)	Noncancer Health Hazard Quotient
Groundwater	Pentachlorophenol	1.0	MCL	1.7×10^{-6}	NA
	Benzo(a)pyrene	0.2	MCL	2.1×10^{-5}	NA
	Benzo(a)anthracene	1.0	risk	1.0×10^{-6}	NA
	Benzo(b)fluoranthene	0.2	risk	2.1×10^{-5}	NA
	Benzo(k)fluoranthene	1.0	risk	1.0×10^{-6}	NA
	Chrysene	1.0	risk	1.0×10^{-6}	NA
	Dibenzo(a,h)anthracene	0.2	risk	2.1×10^{-5}	NA
	lndeno(1,2,3-CD)pyrene	1.0	risk	1.0×10^{-6}	NA
	Benzo(g,h,i)perylene	1.0	risk	1.0×10^{-6}	NA
	Total D PAHs[a]	360	hazard quotient	NA	0.9
	Dioxin TCDD (TEF)[b]	3.0×10^{-5}	MCL	6.2×10^{-5}	<1
	2,4,6-trichlorophenol	6.5	risk	1.0×10^{-6}	NA
	2-chlorophenol	45	hazard quotient	NA	0.9
	2,4-dichlorophenol	27	hazard quotient	NA	0.9
	2,3,5,6-tetrachlorophenol	267	hazard quotient	NA	0.9

a Sum of individual D PAH (acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, pyrene) concentrations.

b Sum of individual chlorinated dibenzo-p-dioxins and -dibenzofurans concentrations multiplied by their corresponding toxicity equivalence factor (TEF) as shown on Table 29 of the ROD.

{this space intentionally left blank}

Table 4: ROD Table 26
(Surface Water Cleanup Levels and Corresponding Risks)

Media	Contaminant	Cleanup Level (μg/L)	Basis	Cancer Risk (drinking use for surface water)	Noncancer Health Hazard Quotient
Surface Water	Pentachlorophenol	1.0	MCL	1.7×10^{-6}	<1
	Benzo(a)pyrene	0.2	MCL	2.1×10^{-5}	NA
	Benzo(a)anthracene	1.0	Risk	1.0×10^{-6}	NA
	Benzo(b)fluoranthene	0.2	Risk	2.1×10^{-5}	NA
	Benzo(k)fluoranthene	1.0	Risk	1.0×10^{-6}	NA
	Chrysene	1.0	Risk	1.0×10^{-6}	NA
	Dibenzo(a,h)anthracene	0.2	Risk	2.1×10^{-5}	NA
	lndeno(1,2,3-CD)pyrene	1.0	Risk	1.0×10^{-6}	NA
	Benzo(g,h,i)perylene	1.0	Risk	1.0×10^{-6}	NA
	Total D PAHs[a]	360	hazard quotient	NA	0.9
	Dioxin TCDD (TEF)[b]	1.0×10^{-5}	aquatic criteria	2.0×10^{-5}	<1
	2,4,6-trichlorophenol	6.5	Risk	1.0×10^{-6}	NA
	2-chlorophenol	45	hazard quotient	NA	0.9
	2,4-dichlorophenol	27	hazard quotient	NA	0.9
	2,3,5,6-tetrachlorophenol	267	hazard quotient	NA	0.9

a Sum of individual D PAH (acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, pyrene) concentrations.

b Sum of individual chlorinated dibenzo-p-dioxins and -dibenzofurans concentrations multiplied by their corresponding toxicity equivalence factor (TEF) as shown on Table 29 of the ROD.

{this space intentionally left blank}

Table 5: ROD Table 27
(Discharge to Surface Water Cleanup Levels and Corresponding Risks)

Media	Contaminant	Cleanup Level (µg/L)	Basis	Cancer Risk (drinking use for surface water)	Noncancer Health Hazard Quotient
Discharge to Surface Water	Pentachlorophenol	1.0	MCL	1.7×10^{-6}	<1
	Benzo(a)pyrene	0.2	MCL	2.1×10^{-5}	NA
	Benzo(a)anthracene[c]	1.0	Risk	1.0×10^{-6}	NA
	Benzo(b)fluoranthene	0.2	Risk	2.1×10^{-5}	NA
	Benzo(k)fluoranthene	1.0	Risk	1.0×10^{-6}	NA
	Chrysene	1.0	Risk	1.0×10^{-6}	NA
	Dibenzo(a,h)anthracene	0.2	Risk	2.1×10^{-5}	NA
	lndeno(1,2,3-CD)pyrene	1.0	Risk	1.0×10^{-6}	NA
	Benzo(g,h,i)perylene	1.0	Risk	1.0×10^{-6}	NA
	Total D PAHs[a]	360	hazard quotient	NA	0.9
	Dioxin TCDD (TEF)[b]	1.0×10^{-5}	aquatic criteria	2.0×10^{-5}	<1
	2,4,6-trichlorophenol	6.5	Risk	1.0×10^{-6}	NA
	2-chlorophenol	45	hazard quotient	NA	0.9
	2,4-dichlorophenol	27	hazard quotient	NA	0.9
	2,3,5,6-tetrachlorophenol	267	hazard quotient	NA	0.9
	Arsenic	48	aquatic criteria	NA	NA
	Cadmium	1.1	aquatic criteria	NA	NA
	Chromium[d]	11	aquatic criteria	NA	NA
	Copper	12	aquatic criteria	NA	NA
	Lead	3.2	aquatic criteria	NA	NA
	Zinc	110	aquatic criteria	NA	NA

a Sum of individual D PAH (acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, pyrene) concentrations.

b Sum of individual chlorinated dibenzo-p-dioxins and -dibenzofurans concentrations multiplied by their corresponding toxicity equivalence factor (TEF) as shown on Table 29 of the ROD.

c Cancer Risk for Benzo(a)anthracene listed in ROD as 1.0×10^{-7} but that is inconsistent with other tables and is assumed to be an error, the assumed value of 1.0×10^{-6} is presented here.

d The basis indicated for Chromium is "aquatic criteria"; however, the standard of 11 µg/L correlates to the DEQ-7 aquatic standard for Chromium VI, and there is no aquatic standard for Chromium. In practice, the analysis of effluent is performed for Chromium and the results are well below the 11 µg/L level. If values for Chromium higher than 11 µg/L are detected in the effluent (not the case to date), it would then be appropriate to analyze for the Chromium VI concentration and compare that to the standard of 11 µg/L.

{this space intentionally left blank}

Status of Implementation

The MPTP cleanup is being implemented in a number of phases, which are described below.

Phase 1

The design for Phase 1 of the Remedial Action was finalized in June 1996 (CDM, 1996). Construction occurred from May 1996 to November 1997. The primary remedy components completed during Phase 1 of the remedial action consisted of construction of the LTU and 13 soil staging and pretreatment piles (SSPs), building an addition to the previous WTP, construction of two groundwater recovery trenches that form the current remedy extraction system (the NCRT and the NHRT), and excavation of the north-side contaminated soils. The NCRT and NHRT were installed to replace the previous EPA groundwater recovery system (which included sheet piling, extraction wells, and associated piping). The previous EPA extraction system and sheet piling was removed in cooperation with the activities associated with the LAO removal action for the Superfund site adjacent to MPTP. The MPTP Phase 1 construction activities are summarized in the *Phase 1 Construction Report* (CDM, August 2001). The groundwater recovery system installed in Phase 1 continues to operate.

Phase 2

Phase 2 of the remedial action consisted of the removal and disposal of hazardous and non-hazardous waste debris remaining on-Site. The design for Phase 2 of the Remedial Action was finalized in December 1998 (CDM, 1998). Construction occurred from March 1999 to May 1999. Off-site disposal methods included incineration and/or placement in hazardous and non-hazardous waste landfills. Metal debris was pressure washed and recycled. Phase 2 remedial actions are summarized in the *Remedial Action Report, Montana Pole and Treatment Plant Site Phase 2 – Debris Removal* dated September 26, 2000.

Phase 3

Phase 3 of the remedial action consisted of off-loading Phase 1 treated soils from the LTU in 1999 with placement on the north side of the Site between the NHRT and NCRT (see Figure 4), excavating south-side contaminated soils, placing an approximate 132,000 cubic yards of contaminated soil on the LTU, installing the north and south infiltration systems to promote in situ treatment (see Figure 5), and relocating sewer and potable water lines. The design for Phase 3 of the Remedial Action was finalized in July 1999 (CDM, 1999). Construction occurred from October 1999 to December 2000, and is described in the *Phase 3 Construction Report* (CDM, 2001). The south-side infiltration system was operated through November 2002. Since that time, the south-side infiltration system has been used periodically to maintain adequate groundwater levels to operate the recovery trench pumps and to aid in flushing contaminated soils remaining beneath the interstate. The north-side infiltration system was operated briefly in the fall of 2000, but has not been used since 2000.

Phase 4

Phase 4 of the Remedial Action is ongoing and involves continued capture and treatment of contaminated groundwater and biological treatment of contaminated soils. Phase 4 includes off-loading the LTU as surface soil lifts are remediated to PCP and PAH concentrations below the ROD limits set for the Site (the treated soils have not met dioxin cleanup levels). These treated soils have been placed on-Site, generally in the areas from which they were excavated (see Figure 4 for approximate placement areas of LTU offloads).

Phase 4 Remedial Action construction began in April 2001 with the offload of approximately 27,000 cubic yards of treated soils from the LTU. In 2004, eight of the thirteen SSPs were determined to have met the PCP and PAH cleanup standards for the Site and were dismantled, and those treated soils were placed over the south-side in situ system. The covers, liners, piping, and associated equipment were removed from each of the eight soil staging and pretreatment piles, cleaned, and disposed in either a solid waste landfill or segregated and sized appropriately for shipment to a hazardous waste incinerator.

In 2005, approximately 29,000 cubic yards of treated soils were removed from the LTU, and in 2007 approximately 32,000 cubic yards of treated soil were removed from the LTU. The soils were backfilled on-Site south of the Interstate. In 2007, the remaining soil staging and pretreatment piles were dismantled and 8,000 cubic yards of soil were moved from the piles and placed on the LTU for final treatment.

Work in 2009 associated with modifications of the NHRT and the sewer realignment project added approximately 2,000 cubic yards of excavated soil, which was placed on the western portion of the LTU. A small volume of soil excavated during the Interstate highway bridge replacement project was placed on the LTU in June 2010. In 2011, the collection pipe located between the NHRT manhole #2 and the west-end cleanout was cleaned, and a very small volume of solid material and an estimated 15,000 gallons of water removed during the cleanout were transferred into a vacuum collection truck and then placed on the LTU for bioremediation. In addition, approximately 200 cubic yards of soil from highway pier drilling was removed by the Montana Department of Transportation (MDT) contractor and placed on the LTU as part of the MDT bridge replacement project that occurred in 2010 and 2011. Lastly, 182 linear feet of drill cuttings (approximately 2.3 cubic yards) from five groundwater monitoring well borings that occurred in conjunction with the MDT bridge replacement activities were placed on the LTU.

Including the sand layer, the volume of contaminated soil that remains on the LTU is estimated at 53,000 cubic yards; the sand layer is approximately 6 inches thick (15 percent by volume). This estimated volume does not include any possible contaminated soil under the LTU liner.

The next and final off-load is currently being designed and will include all remaining soil on the LTU. The approximate conceptual location for the final soils to be off-loaded is illustrated on Figure 4. The remaining soil in the LTU is expected to be placed on the southern part of the Site, in consolidated areas of previously offloaded soils.

Phase 5

Phase 5 addresses the contaminated soils beneath the Interstate, which traverses the Site in an east-west direction and partitions the Site into northern and southern sections (see PCP plume maps in Attachment 4). PCP in carrier oil beneath the Interstate is considered a source ("hot spot") that contributes to ongoing contamination in groundwater. The plume of PCP-contaminated groundwater that emanates from under the highway appears to be captured by the remedy extraction at the NHRT; this capture is not clearly indicated by water level maps (such as those in Attachment 4), but is suggested by several lines of evidence. The PCP plume maps in Attachment 4 illustrate that the NHRT intercepts the width of the PCP plume that flows towards the NHRT from the south. The NHRT includes a physical barrier on the downgradient (north) side, and water levels measured at piezometers at the two ends of the NHRT are higher than water levels in the trench, indicating flow to the trench. Additionally, PCP concentrations extracted at the NHRT are much higher than PCP concentrations at the NCRT which is located further

downgradient. Remaining PCP impacts in groundwater between the NHRT and NCRT are likely due to source material that was not excavated between the two groundwater recovery trenches, such as beneath the water treatment building.

In 2001, a preliminary remedial alternatives report (CDM, 2001) was prepared to evaluate various potential remediation methods including surfactant flushing, soil vapor extraction, and hydraulic control. The DEQ, the MDT, and the EPA extensively evaluated the vertical and horizontal extent of remaining contaminated soils, and the technical and economic feasibility of excavating and remediating these remaining contaminated soils. Based on the results of these evaluations and preparation of preliminary construction schedules, DEQ concluded, and EPA concurred, that it was not economically or technically reasonable to pursue excavation of these soils during MDT's Interstate bridge removal project.

In March 2009, Tetra Tech submitted a report titled "*Final Treatability Study Workplan, Montana Pole and Treating Plant Site – Phase 5*" (Tetra Tech, 2009), which evaluated areas of residual soil contamination including the area beneath the Interstate. That effort incorporated a literature review of three in situ treatment technologies: in situ chemical oxidation (ISCO), in situ soil flushing, and in situ bioremediation. Two technologies were retained at that time for further evaluation: 1) ISCO using Modified Fenton's Reagent; and 2) In Situ Soil Flushing.

The Third Five-Year Review Report (June 2011) indicated that the 2009 treatability study for Phase 5 would be revisited after MDT's bridge reconstruction activities were completed. MDT began construction activities for the replacement of the existing Interstate bridges that bisected the MPTP site in April 2010, and ended in late 2011.

Subsequently, options for potentially reducing the elevated concentrations of PCP in soils and groundwater beneath the Interstate (and associated slope north and south of the Interstate) were addressed in the *Draft Memorandum*[2]*: "Feasibility Level Analysis" for In Situ Treatment Beneath Interstate 15/90*. (Tetra Tech, October 29, 2013), which included the following:

- Conceptual approaches and approximate costs for full-scale implementation were developed for three potentially feasible alternatives: 1) Bioventing with a vertical well approach; 2) Bioventing with a horizontal well approach; and 3) ISCO using ozone with a horizontal well approach. Bioventing involves increasing air flow in the subsurface to facilitate aerobic degradation of the PCP and the associated carrier oil, and ISCO involves delivery of oxidants into the subsurface to oxidize (destroy) the PCP contamination and associated carrier oil in the treatment zone.
- The approach ranked best was bioventing with a horizontal well approach, and that approach had an estimated cost of $2.2 million (the estimated costs of the other alternatives ranged from $1.4 million to $3.4 million).

Reducing the concentration of PCP within this hot spot could result in some unquantifiable but potentially significant reduction in the overall time required for groundwater remediation using the existing on-Site groundwater collection and treatment system. Treatment of impacted soils beneath the Interstate is still being evaluated in the long term. However, DEQ has no immediate plans to implement any of the alternatives listed above, primarily over concerns that any of these options could potentially upset the operation of the MPTP treatment plant, potentially resulting in

[2] This document has not been finalized, and is subject to change. The draft document is referenced here because information contained in the draft document is considered within this FYR.

undesired discharges to Silver Bow Creek. Additionally, there is no guarantee that the more aggressive remediation would allow the treatment plant operation to be discontinued, due to incomplete remediation under the Interstate, and/or other suspected remaining sources on-Site such as: 1) beneath and near the treatment plant building; 2) an area near the railroad tracks northeast of the eastern end of the NCRT; and 3) an area north of the railroad tracks north of the western end of the NCRT.

Phase 6

Phase 6 is currently in the planning state, and will consist of removal and disposal of the soil treatment facilities on the south side of the Site, final engineering controls (soil cover, storm water management), re-vegetation of all disturbed areas, and implementation of appropriate institutional controls to maintain protectiveness of the remedy.

- In conjunction with these efforts, modeling was performed to estimate the floodplains at the Site, as described in *Grove Creek and Silver Bow Creek Floodplain Mapping near the Montana Pole Treatment Plant, Butte, Montana* (Tetra Tech, January 2016). The calculated floodplain in the vicinity of the MPTP site is included in Figure 6. Comparison of the floodplain (Figure 6) to the approximate locations where LTU offloads were placed (Figure 4) indicates that the previous LTU offloads were not placed within the illustrated floodplain. Design of the final LTU offload will need to consider the modeled floodplain locations and potential storm water management approaches to insure the soils with dioxins are not within areas where flooding is expected.
- An update to storm water management planning and documentation is currently underway, and needs to consider locations of soils containing dioxins above ROD cleanup standards (previous and planned).
- The final LTU offload is currently expected in 2017 or 2018, but that timing will depend on completion of a planned decision document and is therefore subject to change. It is currently anticipated that the offloaded soils will be placed on the southern part of the Site, in some places on top of previously offloaded soils (see Figure 4). In conjunction with that effort, it is expected that the liner below the LTU soils will be cut and transported off-Site for disposal. Additional confirmation sampling of the soils will be conducted in the area once the liner is removed.
- The planned approach for final cover of the offloaded soils on the southern part of the Site is still being designed and will comply with ARARs, specifically the substantive requirements for a corrective action management unit (CAMU) in order to dispose of the soil containing an FO32 hazardous waste. The cover will include a minimum six-inch lime rock layer (a local standard to indicate contaminated soil below) covered by at least 24 inches of clean soil and vegetated or covered with another type of low permeability material. The clean soil for cover is expected to be obtained from soils that were stockpiled on-Site during the Interstate bridge project in 2010 and 2011. The soils contains large rocks, and will need to be screened prior to placement as cover (the remaining rocks will also need to be managed). There is no current plan to enhance the cover on soil located on the north side of the Site that was previously offloaded from the LTU, but that is subject to change (to be addressed in a forthcoming decision document). Those areas do not have the lime layer and do not have 24-inches of clean soil; however, the northern side of the Site is expected to continue to have strict access restrictions because the WTP will

continue to operate for many years in to the future, unlike plans for the southern part of the Site. Sampling to further characterize the present condition of the north-side soils is planned.

Phase 6 is expected to be completed within the next five-year period. It is expected that the final land use for the south side of the Site will be determined in conjunction with Butte-Silver Bow (BSB), with certain constraints on land use specified by EPA and DEQ consistent with the MPTP ROD. In 2015 and early 2016 a potential relocation of the County shops was being considered for the southern portion of the Site after completion of the final LTU offload, but at the time of the FYR Site visit in March 2016 it appeared that another site would be selected, in part due to concerns among various stakeholders.

Additional Items Pertaining to Remedy Implementation

The following additional items also pertain to implementation status of the remedy:

- Controlled Ground Water Area (CGA) Final Order (2009). A CGA that addresses requirements of the ROD was established on October 30, 2009 for a larger area of impacted groundwater associated with multiple sites; the MPTP site represents one small component of the CGA. The location of the CGA is illustrated on Figure 7. Key elements of the CGA pertaining to the MPTP contamination (a subset of the items in the Final Order) include the following: 1) The restrictions apply to both the alluvial and bedrock aquifers; 2) New groundwater wells are only allowed in the restricted area after "review and approval of the Butte-Silver Bow Board of Health, acting as the Butte Silver Bow Water Quality District Office, the USEPA, and MDEQ". Superfund or other environmental monitoring/treatment wells necessary for environmental cleanup purposes are allowed; and 3) An existing well used for irrigation or industrial use may be replaced at the well owner's expense, but only if the replacement irrigation well complies with requirements of Montana Code Annotated (MCA) Title 85, Chapter 2, Parts 3 and 4 as applicable. Also, the owner must supply data to the Butte Silver Bow Water Quality District indicating that the uses will not be detrimental to the environment or to human health. The CGA does not explicitly address new or increased pumping rates at existing infrastructure, such as from the dewatering system used for construction at the WWTP. Therefore, in 2016 DEQ amended the Construction Dewatering General Permit, and associated coordination, to address the potential for any new withdrawals of groundwater that could spread contamination from any nearby DEQ sites (such as Superfund sites).
- Power Pole Excavation (2011-2012). During July 2011, soils were sampled near three power poles north of the MPTP in an area suspected to be contributing to localized groundwater contamination, which was an issue identified in the previous FYR (June 2011). The purpose of this limited sampling was to determine soil removal boundaries and to estimate the volume of PCP-contaminated soil for removal. Soil samples were collected at multiple depths from 17 boreholes. The maximum depth of boreholes was 15 feet below ground surface. Analytical results were compiled and used in defining the extent of soil removal. Beginning in December 2011, approximately 5,100 cubic yards of contaminated mine waste material was excavated and transported to the Butte Mine Waste Repository. Post-excavation samples were taken from the sidewalls of each excavation area. None of the pre-excavation or post-excavation soil samples exceeded the Site soil cleanup standard of 34 milligrams per kilogram (mg/kg) for PCP. This work was completed by January

2012, with revegetation conducted in the spring of 2012. A detailed description of the work is presented in *Construction Report: Power Pole and Soil Removal and Transport to the Butte Mine Waste Repository, Butte, Montana* (Tetra Tech, June 2012).

- Update of Monitoring Plan (2013). An updated *Groundwater and Surface Water Monitoring Plan* (Tetra Tech, January 2013) was prepared to update compliance locations, which was recommended in the previous FYR, and to streamline Site monitoring. The 2013 monitoring plan revision incorporates updated compliance locations for current use, and references a "forthcoming document" addressing compliance locations. That document, currently in draft form, is titled *Draft Points of Compliance Analysis for the Montana Pole and Treating Plant, Butte-Silver Bow, Montana, Revision 1* (Tetra Tech, March 13, 2013)[3]. As mentioned earlier DEQ plans to finalize the compliance points after WWTP dewatering (which has occurred periodically from 2009 to 2016) is completed and the groundwater system returns to an equilibrium condition.

- Timeframe Estimate for Treatment Plant Operation (2016). In January 2016 a rough estimate of the potential timeframe for continued treatment plant operation at the MPTP site was prepared at the request of DEQ, assuming that the remedial action continues in the current configuration. This is described in *Draft Memorandum: Montana Pole and Treating Plant (MPTP) Cleanup Time Estimate* (Tetra Tech, January 28, 2016)[4]. The analysis assumes there is a continuing source of PCP beneath the Interstate that will slowly be eliminated over time, primarily through groundwater transport of dissolved mass. The vast majority of the mass flux from the source beneath the Interstate is captured by the NHRT. The NHRT concentrations have generally been variable (but not clearly increasing or decreasing) in recent years (discussed later), consistent with a conceptual model that includes relatively consistent flux of mass each year (with some variability) emanating from a continuing source area beneath the interstate. Based on the calculated mass of PCP remaining beneath the interstate in 2015, and calculated PCP mass removal rates at the NHRT, the analysis concludes it is likely to take 56 to 123 years to exhaust the source. While the mass flux from that source area continues, it is prudent to assume that capture of groundwater will need to continue, since the attenuation mechanisms between the NHRT and the compliance points are minor (dilution from net recharge and dispersion) or highly uncertain (biodegradation). However, the potential for more aggressive remediation beneath the Interstate continues to be evaluated, which could change this time frame estimate in the future.

- Continued Monitoring of PCP in Groundwater North of Silver Bow Creek. After WWTP dewatering began in 2009, monitoring for PCP at existing and new wells north of Silver Bow Creek was initiated and results indicated PCP concentrations in groundwater above the ROD cleanup level of 1µg/L. The dewatering provides a potential for PCP impacts to be pulled beneath Silver Bow Creek, but there is also a possibility that PCP impacts were already present in groundwater north of Silver Bow Creek prior to the dewatering that began in 2009. During the RI, there was PCP detected north of Silver Bow Creek in 1990 using a screening analytical method (21.1 µg/L at GS-25 and 14.2 µg/L at GS-18), but

[3] This document has not been finalized, and is subject to change. The draft document is referenced here because information contained in the draft document is considered in this FYR.
[4] This document has not been finalized, and is subject to change. The draft document is referenced here because information contained in the draft document is considered in this FYR.

when those same wells were sampled in 1991 and analyzed with EPA Method 8040 all results were below the detection level of 1 µg/L. The RI (1993) and ROD (1993) interpreted that PCP was present in groundwater north of Silver Bow Creek at the time of those documents, but there is uncertainty regarding that conclusion. There were no PCP data for groundwater wells north of Silver Bow Creek in the years immediately prior to the WWTP dewatering that started in 2009. During the current five year period, there was continuation of groundwater monitoring for PCP north of Silver Bow Creek.

- Higher Pumping at NCRT to Mitigate WWTP Dewatering. To mitigate the potential for groundwater with PCP to be pulled beneath Silver Bow Creek by WWTP dewatering, a mitigation strategy was employed during the last five years. When dewatering occurs, the extraction rate is increased at the NCRT to increase the capture zone extent of the MPTP remedy and reduce potential for the WWTP extraction to capture PCP impacted groundwater from south of Silver Bow Creek
- Evaluation of Sampling and Analysis Approach for Dioxin Toxicity Equivalent (TEQ) in Groundwater in Conjunction with Potentially Lower Standard. In late 2015 and early 2016, Tetra Tech evaluated sampling and analysis methods for dioxin TEQ in groundwater as they relate to the potential for implementing a lower DEQ-7 standard of 2 picograms per liter (pg/L), compared to the ROD cleanup standard of 30 pg/L. A detailed email message on this topic (and associated data tables summarizing the evaluation) is included as Attachment 5 of this FYR. A key finding from that evaluation is that analysis of previous dioxin analytical results for laboratory control samples calls into question the ability to assess dioxin TEQ results versus the DEQ-7 standard. Average dioxin TEQ for laboratory method blanks (laboratory-grade distilled water using clean, laboratory-grade glassware) from 2009 to 2015 using the DEQ-7 methodology (2.04 pg/L) is greater than the Montana DEQ-7 dioxin standard for groundwater (2.0 pg/L). DEQ is examining how best to evaluate dioxin TEQ results versus the DEQ-7 standard given this issue. Further discussion regarding the groundwater standard for dioxin TEQ is provided in Section V of this FYR.

IC Summary Table

Table 6 summarizes planned and/or implemented ICs. Additional information regarding the ICs is provided after the table.

{this space intentionally left blank}

Table 6: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Groundwater use	Yes	Yes	Entire MPTP property (also includes other Superfund Sites beyond MPTP property)	Only allow new groundwater wells (or replacement of irrigation or industrial wells) if specific provisions are met	Final Order: Controlled Ground Water Area No. 76G-30043832, October 30, 2009 Amended (in 2016) Montana Construction Dewatering General Permit MTG070000 for groundwater withdrawals (to require identification of any Remediation Division sites near dewatering operations)
Restricting residential use of property[5]	Yes	Yes	Entire MPTP property	Prevent residential use of the property within the fence line (and anywhere else needed)	Current zoning largely precludes residential uses of the Site. Deed restrictions prohibiting residential development of Site property owned by ARCO, as well as other restrictions, are in place (see the detailed description below). Permanent and enforceable ICs have not yet been established to prevent future residential use of the entire property (see text below this table for additional information), which is identified as an issue in this FYR.
Restrict land use where waste has been left in place above levels that allow for unlimited use/unrestricted exposure	Yes	No	Where waste has been left in place above levels that allow for unlimited use/unrestricted exposure due to dioxins	Prevent contact with waste left in place (e.g., dioxins)	These ICs are not yet established. Deed restrictions prohibiting the interference with remedy components are in place at Site property owned by ARCO (see the detailed description below). Similar restrictions for appropriate areas within the rest of the Site are needed, which is identified as an issue in this FYR.

[5] The 2011 FYR indicated that when these institutional controls are implemented, DEQ will also include a requirement that any structures constructed on the Site have proper DEQ-approved indoor air mitigation systems, as appropriate

Additional information regarding ICs includes the following:

- *ICs regarding Groundwater Use*. DEQ has amended the Montana Construction Dewatering General Permit MTG070000 for groundwater withdrawals to require the identification of any nearby Remediation Division sites including Abandoned Mine Land (AML), Leaking Underground Storage Tank (LUST), and Federal or State Superfund sites, and if any sites are identified, the applicant must take samples to show that the contaminants are not in the water above the required reporting value or cease discharge. See http://deq.mt.gov/Water/WPB/MPDES/ConstructionDewatering, under "General Permit", Section "Eligibility and Application Processes" Part I.B.2 and under "Special Conditions" in Part II.C.4, as well as on the application "Notice of Intent" form under Section F (Proximity to Contaminated Sites). DEQ's Water Protection Bureau has also agreed to coordinate with the Remediation Division when a Construction Dewatering permit identifies a nearby Remediation Division site, so that the Remediation Division can address the potential for dewatering to spread a groundwater plume. The Water Protection Bureau will contact designated personnel in the Remediation Division when the sites are identified, and then these points of contact will forward the information to the project officer for the Remediation Division site. The revised Construction Dewatering General Permit and the coordination between the departments should address the potential for any new withdrawals of groundwater that could spread contamination from any nearby DEQ sites, such as Superfund sites.

- *ICs Regarding Land Use – Oaas/Montana Pole and Treating Plant Properties Deed Restriction (Planned)*. The deed restriction will at a minimum prohibit the following: (1) installation of drinking water wells or other non-monitoring wells; (2) groundwater withdrawals that may affect the groundwater plume; (3) residential use of the Site; (4) any excavation in the Corrective Action Management Unit (CAMU) without a DEQ-approved work plan to protect the cap and properly manage the contamination; (5) any activity that would disturb the cap or spread the contamination; (6) any activity that would negatively impact the WTP; (7) notice to DEQ of any proposed transfers. DEQ will evaluate the need for requiring a vapor intrusion mitigation system on any future structures prior to placing the deed restriction on these properties.

- *ICs Regarding Land Use - ARCO Properties Deed Restriction.* As required by the 1996 Consent Decree, ARCO has placed deed restrictions (Covenants) on its parcels. The Covenants prohibit: (1) mining use; (2) industrial, commercial, residential, or agricultural (including grazing) use or development of the Site; (3) any development or action that would disturb the remedial actions taken at the Site; (4) all use, construction and/or drilling of water wells for any purpose. DEQ, EPA, and Atlantic Richfield have the authority to enforce the Covenant. The Covenant burdening ARCO properties within the MPTP site predated Section 75-10-727, MCA, and should be evaluated to ensure that the restrictions will remain in place for the necessary timeframe regardless of ownership changes or other considerations. Further, the Covenant does not require that DEQ and EPA review and approve or deny proposed amendments. If a property is transferred to a party that is not subject to the Consent Decree, the Agencies should consider whether a deed restriction pursuant to Section 75-10-727, MCA, is necessary.

The ARCO properties deed restriction (last bullet above) applies to portions of the MPTP Site. DEQ will evaluate if ICs are necessary for all properties within the MPTP site and work to implement appropriate ICs for the entire property within the fence line (and anywhere else needed) as appropriate to ensure a protective remedy.

Systems Operations / Operations & Maintenance

Significant modifications to the treatment system operation since the last FYR, and related issues or updates regarding the treatment system, are listed below. Other minor repairs were also conducted but are not detailed herein.

- In June 2011, 400,000 gallons of water were pumped from the retention pond to prevent overflowing; the water was treated at the WTP. In addition, approximately 1.5 million gallons of water was pumped from the retention pond to the south-side infiltration system to increase biological activity and respond to a complaint received by the BSB Health Department regarding odors from the retention pond.
- The WTP treated higher flow rates in 2011 due to a combination of significant amounts of rain and increased pumping at the NCRT to mitigate effects of dewatering at the WWTP on the MPTP remedy.
- In May 2012, a power surge damaged a pump in the NCRT. The pump was replaced in July 2012.
- In October 2012, approximately 1,150 gallons of LNAPL were removed from the on-Site storage tank for off-Site incineration. This was LNAPL collected in 2009 and earlier (i.e., collected prior to the period included in this FYR); no LNAPL has been collected since 2009.
- In May and June, 2013, the WTP treated higher flow rates due to increased pumping at the NCRT to mitigate the dewatering effects at the WWTP.
- In November 2013, the GAC in the two primary tanks was replaced, due to PCP concentrations detected at the sample port located between the primary and secondary treatment trains and slight exceedances of the PCP effluent standard in September and October 2013. Following the GAC replacement, the flow direction through the trains was changed and the former secondary treatment train became the new primary treatment train, and the former primary treatment train (with new GAC) became the new secondary treatment train.
- In December 2013, the NHRT pump motor failed after 18 years, and recovery from this trench stopped. The flow rate in the NCRT was increased from 205 gallons per minute (gpm) to 305 gpm to maintain the total recovery flow. The NHRT pump was replaced with a new pump within approximately 4 days. Subsequently, in February 2014 the NCRT pump failed, and it was replaced with a new pump within approximately 3 days.
- Piping from the NHRT and NCRT to the WTP was reconfigured (simplified) in 2014. The piping reconfiguration did not change the Site remedy; it only resulted in bypassing the oil/water separation building, which was no longer necessary as a part of the water treatment system. The changes reduced the complexity of the WTP, reduced heating costs, and eliminated the cost of maintaining and replacing pumps that are, as a result of the upgrade, no longer needed.

- From October 2014 through April 2015, and again from January 2016 through April 2016, the WTP treated higher flow rates due to increased pumping at the NCRT to mitigate the dewatering effects at the WWTP.
- The maximum sustainable pumping rate in the NHRT decreased during the FYR period. The sustainable NHRT pumping rate has decreased from 135 gpm in 2009 to about 60 to 90 gpm in 2015 and early 2016. Perforated piping and gravels in the NHRT may be partially clogged, thus reducing the sustainable pumping rate.
- Since April 2010, approximately 25 gpm of treated WTP water has been discharged by gravity flow to the west side infiltration area near the west end of the NHRT because it is believed to augment the capture zone of the NHRT on the west and may also add oxygenated water to the aquifer, which should stimulate biological reactions and increase in situ treatment rates for PCP.
- The staff at the MPTP treatment plant was expanded to add a second person, starting in 2014, based on overall labor needs as well as a need to have better coverage for alarms or emergencies.
- An energy efficiency evaluation was performed in 2014.

Additionally, a temporary improvement was implemented regarding storm water management on the extreme southern portion of the Site in 2014. Specifically, the Hollow Contracting facility just south of the Site built up the height of their property, resulting in increased potential for storm flow to enter the MPTP site from the south across Greenwood Avenue. This was exacerbated by a clogged culvert on that property to the south. To address potential storm flow onto the MPTP site over Greenwood Avenue, a "divot" was placed in the on-Site road adjacent to Greenwood Avenue using a loader bucket on the Site tractor, to direct flow of water into an on-Site drainage ditch. The treatment plant operator indicates that no storm water leaves the Site, even during large storms such as occurred in 2011.

Comprehensive quarterly and annual reports are prepared to document remedy implementation and performance. Costs are discussed later in this FYR (in the Site Inspection section).

III. Progress Since the Last Review

This section presents the conclusions of the previous FYR (June 2011) and summarizes progress of recommendations from that review.

Protectiveness Statement from the Previous (Third) Five-Year Review

The protectiveness statement from the third FYR (June 2011) stated the following:

> *The remedy at OU 1 currently protects human health and the environment because exposure pathways that could result in unacceptable risk are being controlled by soil containment, hydraulic capture of impacted groundwater, access controls, and a Controlled Ground Water Area (an institutional control). However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure long-term protectiveness:*
>
> - *Document that the Controlled Ground Water Area has been modified to address large withdrawals of water from existing infrastructure in the vicinity of the Site.*

- *Characterize and remove potential sources of PCP beneath power poles north of the NCRT.*
- *Update site information to account for the current PCP plume distribution and the reconstruction of Silver Bow Creek that occurred after the ROD was completed.*
- *Implement permanent and enforceable ICs to prevent future on-site residential use.*
- *Treated soils are expected to contain dioxins above the current ROD cleanup levels, and appropriate management of these soils will be evaluated and the administrative record/ROD will be updated once EPA has finalized the revised interim preliminary remediation goals (PRGs) for dioxin and dioxin-like compounds. Re-evaluate appropriate cleanup standards for dioxin and dioxin-like compounds in groundwater at that time as well.*

Status of Recommendations from the Previous (Third) Five-Year Review

The previous FYR included five recommendations, which are listed in Table 7 along with a summary of actions taken.

The status for several of the items in Table 7 is identified as "partly completed" or "underway", and further details include the following:

- With respect to compliance locations, a monitoring plan revision in 2013 implemented revised compliance points for current monitoring, but DEQ will finalize compliance points once system equilibrium is established after WWTP dewatering is completed.

- With respect to developing and implementing permanent ICs to prevent future on-Site residential use and restrict land use where waste has been left in place above levels that allow for unlimited use/unrestricted exposure, there have been discussions between stakeholders but there has been no final resolution. DEQ prefers to finalize these ICs in conjunction with final design of the LTU offload and protective cap. Once the design is finalized, a final determination of land use will be made so the ICs can be customized as needed.

With respect to an updated standard for cadmium and benzo(a) pyrene (and potentially other parameters), final documentation of a changed ARAR will be noted in the appropriate decision document.

Table 7: Actions Taken Since the Last Five-Year Review

Recommendation from Previous Review	Party Responsible	Status/Action Taken Since Previous Review	Milestone Date	Still an Issue?
Modify the existing Controlled Ground Water Area established in October 2009 to address significant increases in groundwater withdrawals from existing infrastructure that are planned in the vicinity of MPTP.	Butte-Silver Bow County Health Department, as sponsor of the original Controlled Ground Water Area; DEQ	Completed DEQ has amended the Montana Construction Dewatering General Permit MTG070000 for groundwater withdrawals to require the identification of any Remediation Division sites (see discussion after Table 6 of this FYR for full details)	2016 (specific date of amendment not identified)	No
Remove PCP contaminated soil beneath power poles.	DEQ	Completed	January 2012	No
Clarify the points of compliance for groundwater to reflect the current configuration of Silver Bow Creek, the current PCP plume distribution, and the updated conceptual site model.	EPA, DEQ	Partly Completed* Monitoring plan revision in 2013 implemented revised compliance points for current monitoring, but DEQ will finalize compliance points once system equilibrium is established after WWTP dewatering is completed	January 2013 Monitoring Plan Finalize by September 2017	Yes
Develop and implement permanent ICs to prevent future on-Site residential use and restrict land use where waste has been left in place above levels that allow for unlimited use/unrestricted exposure.	DEQ, EPA, Butte Silver Bow County	Underway*	Estimated completion by September 2018 after final design for the LTU offload and cap placement	Yes
Through the appropriate decision document, adopt the August 2010 DEQ-7 chronic value for cadmium as a cleanup standard. The revised chronic standard does not require a change to the selected remedy because it meets the modified chronic value for cadmium, as well as the standard identified in the ROD.	DEQ, EPA	Underway* (now using the current DEQ-7 standard for cadmium and benzo(a) pyrene per the January 2013 Groundwater and Surface Water Monitoring Plan)	January 2013 Monitoring Plan Documentation in decision document expected by September 2017	Yes

**See text below for discussion of items that are "partly completed" or "underway"; included as part of an issue identified in this FYR.*

Although not included as a specific recommendation in the previous FYR, the protectiveness statement in the previous FYR stated the following:

> *"Treated soils are expected to contain dioxins above the current ROD cleanup levels, and appropriate management of these soils will be evaluated and the administrative record/ROD will be updated once EPA has finalized the revised interim preliminary remediation goals (PRGs) for dioxin and dioxin-like compounds. Re-evaluate appropriate cleanup standards for dioxin and dioxin-like compounds in groundwater at that time as well."*

An update to the administrative record (expected to be a decision document) suggested in that protectiveness statement has not yet occurred, because there has been a desire to develop more clarity on future land use prior to updating the administrative record, and because EPA has not fully finalized the revised interim PRGs for dioxin and dioxin-like compounds (the non-cancer risk revision was released in 2012 but the cancer risk revision is still forthcoming). More specifically, EPA released the final non-cancer dioxin reassessment and published an oral non-cancer toxicity value, or reference dose (RfD) for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). This reference dose was approved for immediate use at Superfund sites to ensure protection of human health, and has been used to determine a revised dioxin PRG. An EPA Superfund website (last updated January 25, 2016) identifies that the forthcoming cancer risk update for dioxins is not expected to change cleanup decisions, and therefore is not a reason to delay a decision document:

"dioxin-contaminated sites cleaned up based on the 2012 non-cancer RfD are not expected to need additional cleanup when a new EPA cancer toxicity value for TCDD is published in EPA's Integrated Risk Information System (IRIS). This is because we anticipate that dioxin cleanup levels based on the 2012 non-cancer RfD will be within the cancer risk range currently used by EPA's Superfund cleanup program." (https://www.epa.gov/superfund/risk-assessment-dioxins-superfund-sites).

The ongoing lack of an appropriate decision document regarding the placement of soil with dioxins on-site is an issue identified in this FYR.

With respect to groundwater standards for dioxin TEQ mentioned in the protectiveness statement of the previous FYR, an updated evaluation of the cleanup standards for dioxin TEQ is included in Section V of this FYR, and updates regarding that standard should be incorporated into the anticipated decision document. This is included as part of an issue identified in this FYR.

IV. Five-Year Review Process

Community Notification, Involvement, and Site Interviews

A public notice was published in the Montana Standard on the following dates:

- February 29, 2016
- March 1, 2016
- March 6, 2016
- April 14, 2016
- April 17, 2016

A copy of the newspaper announcement is included in Attachment 2. These notices stated that a FYR was being conducted and provided contact information for DEQ and EPA. An open house with the community occurred on April 27, 2016.

The Five-Year Review report will be made available at the Site information repositories. Site information repositories are the Montana Tech Library (1300 West Park Street, Butte, MT 5970), Montana DEQ Waste Management and Remediation Division (1225 Cedar Street, Helena, Montana 59601), and the U.S. EPA Region 8 Montana Office (Federal Building, Suite 3200, 10 West 15th Street, Helena, Montana 59626). The Five-Year Review report will also be provided to the Citizens Technical Environmental Committee (CTEC) and also will be placed on EPA's website; a link to this website will be placed on DEQ's website.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date. In each case the interviewee was told that his or her comments would be included in the Five-Year Review report, and all indicated that was acceptable. The following people were interviewed and represent a mixture of nearby residents and public officials:

- Ed Fisher Resident of Boulevard Neighborhood
- Bob O'Bill, Resident of Boulevard Neighborhood
- Joe Griffin, Citizen's Advocate (formerly with DEQ)
- Julia Crane, BSB Planning Department
- Bill Macgregor, Vice President of CTEC
- Dr. John Ray, Concerned Citizen and CTEC Board Member
- Travis Dunkle, Tetra Tech (Treatment Plant Operator)
- Jon Sesso, BSB Director of Planning
- Ian Magruder, Consultant for CTEC
- Trevor Selch, Fisheries Pollution Biologist with Montana Fish, Wildlife and Parks
- Dave Palmer, County Commissioner
- Dan Foley, County Commissioner
- Carl Hafer, Butte Resident

Attachment 6 includes interview summary forms from these interviews, and key themes or items identified from these interviews are summarized below.

- Many of those interviewed recognize that significant improvements and progress have been accomplished over the course of the remedy. However, many of those interviewed (and in some cases the same individuals) believe the soil remedy has taken too long and/or believe that estimates previously provided regarding soil remedy duration were inaccurate. Some indicated that the effectiveness of the remedy cannot be fully assessed until future land use is resolved.
- Most of those interviewed identified that odor and/or dust associated with the LTU operation had previously been a very significant issue in the community, but none of those

interviewed identified odors or dust as an issue within the last five years. This corresponds to reduced activity at the LTU over the last five years (i.e., discontinuation of tilling and less frequent application of irrigation water with the intention to reduce the volume of water stored in the LTU retention pond). Those that discussed this issue during the interviews were notified that there is a final offload being planned for the LTU which could result in short-term odors or other impacts. Several of those interviewed indicated a need for timely notification of those potentially impacted before such activities are initiated.

- Some of those interviewed question if the Site will be completely safe given the planned use of engineering and institutional controls to address soils with dioxins left on-Site. There are concerns that dioxins represent a perpetual threat, and therefore there needs to be confidence that the engineering controls (such as cover and storm water management) and ICs will be effective for an indefinite period, and that these controls will be adequately monitored. The members of the BSB Planning Department that were interviewed indicated they believe DEQ needs to more strongly convince the public that the remaining dioxin on-Site will not be a threat with proper engineering and institutional controls.
- Some of those interviewed discussed potential alternatives to leaving soil with dioxins on-Site. Some community members feel that White Rot Fungi, which was discussed during the RI/FS process, could have been added to the LTU to try to treat dioxins. A few mentioned incineration, but all who discussed incineration presumed it would "blow the Site budget" and acknowledged it would be difficult to get local approval for on-Site incineration, and furthermore that the risk of digging up so much soil already placed on the Site and incinerating that soil (on-Site or off-Site) might exceed the risk of the soils left on-Site. For example, during Dr. Ray's interview he indicated he conceptually prefers incineration but realizes this is a "cash-out" site and that incineration would likely blow the budget; accordingly, he believes leaving soil with dioxin on-Site is the more likely outcome.
- Some of those interviewed indicated they felt well informed about the Site, but others indicated they did not feel well informed and/or believed communication about the remedy needs to be improved. The most common suggestion was to have regular community meetings (though some indicated such meetings are not useful). Some suggested quarterly meetings, so that issues raised in one meeting could be discussed in other meetings. Other suggested less frequent meetings such as semi-annual or annual. Others suggested regular updates distributed via email and posted on a website (some mentioned that there may be a few members of the community who do not have email or internet). Additionally, some recommended more direct personal outreach to residents near the Site, and others recommended more frequent informal communication between DEQ and BSB.
- Some of those interviewed indicated that even when there is communication about the Site, there is a feeling that that the community is being "talked at" rather than "talked with", such that the community does not have an active voice in the process. One individual suggested that including a trained third-party facilitator at public meetings could lead to enhanced collaboration.

- Most of those interviewed indicated that future land use is an issue that is of great concern, and all were aware of the recent efforts to potentially move the County shops to the southern portion of the Site. BSB Planning Department members who were interviewed indicated that the MPTP site is a large parcel of land that can be an integral part of the community.
- Residents of the neighborhood closest to the MPTP are concerned about how property values might be impacted by future land use at the Site. Additionally, they are concerned how future land use at the Site could impact quality of life in their neighborhood. There is a feeling among nearby residents that when it comes to future land use decisions the neighborhood should "get a break" with respect to what they want, since they had to put up with so much over the years. Those residents prefer a park in the portion of the Site near their residences, where the LTU is located.
- Many indicated that DEQ, EPA, and BSB do not appear to be working effectively together regarding plans for future land use at the Site.
- The nearby residents interviewed questioned why the LTU needs to be dug up and moved prior to covering those soils, rather than just leaving it in place and covering it up. They also noted that moving the LTU soils requires demolishing buildings on the west side of the property where soils will be placed, and they think those buildings could potentially be beneficially utilized if the LTU soils were left where they are.
- Some of those interviewed noted that the CGA works properly, but one individual noted that the CGA is not easily managed within the local government system.
- Some of those interviewed asked if a draft copy of the FYR could be provided for their review.
- One individual questioned why the sheet piling at the north end of the MPTP site, that was associated with a previous phase of the remedy, was removed.
- One individual stated he believes the FYR should be conducted by a third party, and not by DEQ and their contractor.

Additional written comments were also received from Dr. John Ray during the performance of the five-year review, and from Dr. Ray and others at other times within the last five years. These concerns are included in Attachment 7, and are addressed in summary form in the Responsiveness Summary contained in Attachment 7.

Clarification is provided below regarding several of the items listed above:

- Regarding the removal of the sheet pile that was associated with a former phase of remedial action, the sheet pile served as a barrier to contain the transport of free oils. Once those oils were removed, the barrier was also removed. The dissolved phase in the groundwater would be captured and treated by the WTP. Therefore, removing the sheet pile likely did not have a negative impact on the overall groundwater remedy.
- Regarding the potential application of White Rot Fungus for treatment of dioxins in soil, this remedial technology was not included in the ROD. There has been some research into the feasibility of this technology over the course of the remedy, and the findings indicate

that it is not likely to be feasible (this can be discussed further in the forthcoming decision document pertaining dioxins in soils).

- The potential option to not offload the remaining soils from the LTU has been considered and is not considered feasible for several reasons including (but not limited to) future land use restrictions that would be required in that potion of the Site, potential impacts from flooding in that location, and potential long-term impacts to groundwater that could arise if the liner is not removed and disposed off-Site.

Site Inspection

An inspection of the Site was conducted March 1, 2016. The following individuals were in attendance:

- Lisa DeWitt, Montana DEQ (Project Manager)
- David Bowers, Montana DEQ (Project Manager)
- Jeni Flatow, Montana DEQ (Public Information Officer)
- Rob Greenwald and Jennifer Abrahams, Tetra Tech (FYR support to DEQ)[6]
- Kathie Roos and Spencer Savage, Tetra Tech (Remediation Contractor for DEQ)
- Tom Bowler and Travis Dunkle, Tetra Tech (Groundwater Treatment Plant Operators)

EPA was not present at the time of the inspection. The purpose of the inspection was to evaluate the implementation and performance of a remedy in order to assist in the determination regarding if the remedy is and will continue to be protective of human health and the environment. The inspection considered the condition of the WTP and associated components, fencing, monitoring wells, the LTU, and Site capping. A completed Site Inspection Checklist is included in Attachment 1. On the basis of this inspection, the Site is well maintained and no significant issues were identified with respect to routine Site operations at the WTP. The NHRT extraction rate has declined in recent years, probably due to clogging, but it is believed that capture is still sufficient at the NHRT given continued low concentrations observed at the NCRT further down-gradient. Pumps in the NHRT and NCRT experience degradation, but the inspections, maintenance and replacements have kept the system operating with very limited interruption. With respect to the LTU, it was discussed that the final LTU offload and cover is still being designed, along with improvements to the storm water management system. It was also noted that a former house on the south side of the Site was demolished in 2015.

Costs were also discussed during the Site inspection. Approximately $28M to $29M remains in the cash-out fund, which was originally $36M. Approximately $25M has been spent to date. The remaining value in the cash-out fund is much greater than $11M (calculated as $36M - $25M) which reflects stewardship of the fund by DEQ, including investments that have allowed the present value to be higher than would have been the case without investment. Routine annual operations and maintenance (O&M) costs for the MPTP site are approximately $850K/year. The *Draft Memorandum*[7]*: Montana Pole and Treating Plant (MPTP) Cleanup Time Estimate* (Tetra

[6] This FYR support was funded by EPA through DEQ, whereas other Tetra Tech site support is funded by DEQ from the cash-out funding.

[7] This document has not been finalized, and is subject to change. The draft document is referenced here because information contained in the draft document is considered within this FYR.

Tech, January 28, 2016) estimated that pump and treat (P&T) will likely need to continue for more than 50 additional years, due to continuing sources of groundwater contamination (especially under the Interstate). For that reason, continued preservation and careful management of the cash-out fund is needed to provide funding for future years, and any activity that reduces the fund balance in the short-term must consider those long-term funding needs.

Data Review

Site documents reviewed as part of the FYR are listed in Appendix A. Data for the last five years were reviewed as part of this FYR. Any data not available from the documents listed in Appendix A were obtained from the Site Operator. The data review is summarized below for the following items:

- Soils (LTU Sampling)
- MPTP Water Treatment Plant
    - Groundwater Extraction Rates
    - Treatment Plant Influent and Effluent Concentrations
- Product Recovery
- Groundwater
- Surface Water

Data are provided in tables and/or on figures to support these summaries. Note that residential well sampling was discontinued in 2009 due to lack of any significant PCP detections, so no residential data were collected in this five-year period. No future residential sampling is currently contemplated; any future decision document should address if future residential sampling is needed. Also, metals sampling in surface water was discontinued after 2011 (not required by the ROD and values were either non-detect or low).

Soils (LTU Sampling)

No soil was offloaded from the LTU in the last five years. The last LTU offload was in 2007. Soil remaining in the LTU has been sampled on an annual basis starting in 2007. Soil in the LTU is sampled using composite samples from each of the 10 zones (see Figure 8). The two most recent soil sampling events were conducted in September 2012 and October 2013. In 2013, 10 soil samples from 5 LTU zones (two samples from each of the LTU zones 2, 3, 4, 5, and 6 — one shallow soil sample [0 to 24 inches] and one deep soil sample [24 to 36 inches]) were collected and analyzed for PCP. In 2012, samples were collected from all 10 LTU zones (20 soil samples) and analyzed for PCP. Additionally, 10 soil samples (one composite soil sample [0 to 36 inches] from each of the 10 LTU zones) were collected and analyzed for dioxin in both 2012 and 2013. The aliquots from the various depths were homogenized, and representative samples from each depth were analyzed for PCP or dioxin, as appropriate. Results are summarized in the following tables in Attachment 3:

- Table A3-1: LTU soil results after 2007 offload for PCP and dioxins
- Table A3-2: LTU soil results after 2007 offload for PAHs

Observations regarding these data include the following:

- For PCP, the average concentration of the soil remaining in the LTU in 2012 was below the ROD cleanup level of 34 mg/kg, and the average PCP concentration in 2013 was also below the cleanup level and is likely biased high because the zones below cleanup levels in 2012 were not included in the 2013 sampling event.
- For dioxins, the average dioxin TEQ concentration in the 2012 and 2013 sampling events is above the ROD cleanup level of 0.2 µg/kg, with an average concentration between 2.5 and 3.0 µg/kg. This is consistent with dioxin TEQ concentrations in previous sampling in 2007 (average of 2.3 µg/kg), and is also generally consistent with average dioxin TEQ concentration of soils previously offloaded (1.8 µg/kg for soil offloaded in 1999-2000, 0.9 µg/kg for soil offloaded in 2001, 1.9 µg/kg for soil offloaded in 2005, and 0.7 µg/kg for soil offloaded in 2007).
- For PAHs, all sections of the LTU met the cleanup goal of 4.2 mg/kg in both the 2007 and 2011 sampling events.

Therefore, the planned final LTU offload will contain soil that meets ROD cleanup standards for PCP and PAHs, but does not meet ROD cleanup standards for dioxins, similar to previous LTU offloads.

MPTP Water Treatment Plant

Groundwater Extraction Rates

Extraction rates over time at the NCRT and NHRT, and the total combined rate, are summarized on Figure 9. Observations from this figure include the following:

- In the last five years there has been more variability in the extraction rates, caused by periodic increases of extraction at the NCRT to mitigate WWTP dewatering.
- The extraction rate from the NHRT has declined in the last five years, from approximately 125 gpm in 2012, to approximately 100 gpm in 2014, to approximately 70 gpm or less in early 2015, with an increase to about 90 gpm in the later portion of 2015. Rates as low as 60 gpm have occurred in early 2016.

The plant operator believes that perforated piping and gravels in the NHRT may be partially clogged, thus reducing the sustainable pumping rate at the NHRT, and also believes that WWTP plant dewatering has had a negative impact on the NHRT extraction performance.

Treatment Plant Influent and Effluent Concentrations

Data regarding MPTP treatment plant influent and effluent are provided on the following tables in Attachment 3:

- Table A3-3: PCP (monthly in 2015, annual summary for other years)
- Table A3-4: Dioxin TEQ (annual)
- Table A3-5: Metals, PAHs, chlorophenols and anions (2015)

With respect to treatment plant influent, data are provided for the effluent of each of the two extraction trenches (NCRT and NHRT) as well as the combined influent. Additionally, a summary of extracted PCP concentrations over time at the NCRT and the NHRT is illustrated on Figure 10. Observations from these tables and figure include the following:

- As illustrated on Figure 10, extracted concentrations of PCP have always been lower at the NCRT versus the NHRT, and concentrations of PCP at both extraction trenches declined until approximately 2005 until stabilizing (i.e., variable, but not clearly increasing or decreasing after approximately 2005).
- Based on Table A3-3, in the last five years, the PCP concentrations at the NHRT generally ranged between approximately 100 µg/L and 380 µg/L, but in 2015 the PCP concentrations at the NHRT were typically between 100 µg/L and 200 µg/L. In the last five years the PCP concentrations at the NCRT generally ranged between approximately 1 µg/L and 10 µg/L. The PCP cleanup goal for Site groundwater is 1 µg/L.
- As illustrated on Figure 10, there was a sharp decline in PCP concentrations in the water extracted at the NHRT during the Phase 1 WWTP dewatering in 2009 and early 2010. PCP concentrations decreased from 236 µg/L on August 10, 2009, shortly before dewatering began, to a low of 28.6 µg/L on January 27, 2010, near the end of dewatering, and then rebounded back to approximately 200 µg/L two months after the WWTP dewatering was terminated. There was also a decline in the NCRT concentrations during the same period. This reduction in PCP concentrations is likely a function of the groundwater elevation being drawn down to below the smear zone during the period of increased pumping. There has not been a similar extreme response in PCP concentrations at the NHRT during more recent events of WWTP dewatering (the duration of dewatering may be a factor).
- Based on Table A3-3, the PCP concentration in the plant effluent met the standard of 1 µg/L in each sampling event in 2015. In other years the effluent standard was nearly always met except for infrequent exceptions, summarized below:
    - In January 2014 two successive weekly effluent samples exceeded the standard of 1 µg/L, which was likely caused by leaks in the potable water line south of the primary WTP building. Groundwater mounding from leaks in this area apparently caused contact of groundwater with contaminated vadose zone soils under the Interstate and/or other remaining source areas and flushed high concentrations of co-mingled organic contaminants that could not be adsorbed by the carbon at the WTP, resulting in concentrations that exceeded cleanup levels as noted above. PCP concentrations in the influent and effluent declined after the leaks were repaired.
    - In September and October 2013, four successive weekly effluent samples exceeded the standard of 1 µg/L, apparently due to a need for GAC change out.
    - In June 2012, one effluent sample at 1.03 µg/L very slightly exceeded the standard of 1 µg/L, but all other weekly samples in 2012 met the standard.
    - In April 2011 two weekly effluent samples exceeded the standard of 1 µg/L, and in June 2011 one weekly effluent sample exceeded the standard of 1 µg/L. It is believed that the early April exceedances were due to carbon backwashing procedures which were subsequently modified, and that the June exceedance was

due elevated concentration of PCP in the retention pond water in June (356 µg/L) that was processed through WTP to keep the retention pond from overflowing.

In summary, the WTP has, with the exceptions noted above, consistently met effluent standards for PCP.

- Based on Table A3-4, the dioxin TEQ effluent concentration in the last five years has been below 1 pg/L, well below the ROD discharge limit of 10 pg/L. The concentration of dioxin TEQ in water extracted from the NHRT exceeded 10 pg/L in three of the last five years, and the concentration of dioxin TEQ in water extracted from the NCRT exceeded 10 pg/L in one of the last five years. The concentration of dioxin TEQ in the combined influent exceeded 10 pg/L in one of the last five years. The conceptual model of the Site is that dioxin is not mobile in groundwater. It is possible that some dioxins are adhered to very fine particles and thus may at times be detected in liquid matrix samples that exhibit relatively high turbidity, and it is also possible that some dioxins are introduced to the trenches in sheens of oils, though in recent years observations of sheens have been limited to just a few instances at the NHRT and are not commonplace. A discussion of dioxin standards is included in Section V.
- Based on Table A3-5, concentrations of PAHs and chlorophenols (other than PCP) are typically non-detect in plant influent, and none of the detected values in 2015 are above cleanup standards in the combined plant influent. A review of annual reports indicates that all of the effluent values for these parameters were non-detect in every sampling round over the last five years, except for minor detections for a few of these parameters in 2014 (all were below ROD cleanup standards except for benzo(b)fluoranthene at 0.23 µg/L versus a ROD standard of 0.2 µg/L; however, the same parameter was non-detect in the pre-treated sample from each extraction trench and non-detect in the combined influent to the treatment plant).
- Based on Table A3-5, effluent concentrations for each of the metals is consistently well below the ROD cleanup standard, and below aquatic and chronic aquatic life standards in the current Montana DEQ-7 standards (adjusted for hardness). These results are similar to effluent results for the other sampling rounds in the last five years.

Product Recovery

As summarized on Table 8, the last time mobile product was recovered as part of the treatment process was in 2009, and as noted earlier, in 2014 the system was re-piped to bypass the oil/water separator building. However, within the last two years there have been several observations of minor oil sheens in the NHRT. An oil sheen was first noted in the NHRT on October 20, 2014. A minor amount (0.01 inch) of floating product (free oil) was measured for approximately one week (October 21 to October 27, 2014). Absorbent pads were used to remove floating oil from the trench. This is the first time measureable oil was observed in the NHRT since February of 2009. The temporary presence of minor amounts of oil occurred during non-routine operation of the WTP to compensate for groundwater pumping and construction dewatering that was occurring at the BSB WWTP. Similar oil sheens were noted during the second quarter of 2015 (first observed on May 22, 2015), and the fourth quarter of 2015 (November 24, 2015, and December 22, 2015). No WWTP dewatering was occurring at the time of the last two observations.

When coupled with the observation that floating product (free oil) was not detected in any monitoring well during any sampling conducted in calendar years 2010 through 2015, these observations suggest that significant ongoing transport of free-phase light oil is not a major concern at MPTP, but some residual oils are still present near the NHRT, primarily below the Interstate.

Table 8: Product Recovery over Time

Year	Gallons of Free Oil Recovered
2000	967
2001	1,367
2002	2,104
2003	570
2004	523
2005	511
2006	461
2007	3
2008	46
2009	6
2010	0
2011	0
2012	0
2013	0
2014	0
2015	0

Groundwater

PCP in Groundwater

Interpreted PCP plume maps for February 2015 and July 2015 (from Site reports) are included in Attachment 4. A summary of PCP concentrations in groundwater at selected monitoring wells is presented in Table A3-6 in Attachment 3. Those monitoring locations include the current "compliance" monitoring wells identified on Figure 3, as well as two wells with historically elevated PCP concentrations (MW-11-04 located just down-gradient of the NHRT, and INF-04 located between the NHRT and the NCRT). Observations from the plume maps and data table include the following:

- The PCP plume south of Silver Bow Creek is approximately 750 feet wide by 1,500 feet long and oriented along the principal direction of groundwater flow (southeast to northwest).
- The 2015 plume maps indicate several areas of elevated PCP concentrations south of Silver Bow Creek, including the following:
    - South of the Interstate, from near INF-13 (454 µg/L in February 2015) to the Interstate at locations such as MW-X-01 and INF-10 (generally 60 µg/L or less),

and also due west of the LTU such as at GW-05 and INF-16 (generally 60 µg/L or less). The sources of these continuing impacts are not known.

- Immediately downgradient (north) of the Interstate at MW-11-01 and MW-11-02 (approximately 300 µg/L), presumably extending to the NHRT. These impacts likely result from remaining potential sources beneath the Interstate.
- Between the NHRT and the NCRT, such as MW-11-04 just down-gradient of the NHRT (approximately 1,000 µg/L in July 2015) and at locations closer to the NCRT such as MW-11-05 (approximately 200 µg/L in July 2015) and INF-04 (approximately 50 µg/L in July 2015). These impacts may result from remaining sources in inaccessible areas beneath the treatment plant building and vicinity.
- One small area at monitoring well MW-I-01 (383 µg/L in July 2015) north of the NCRT and adjacent to the Burlington Northern railroad tracks. This well continues to have elevated concentrations despite the excavation of soils beneath power poles in 2011-2012, which may indicate a continuing source of PCP impacts beneath the railroad tracks.
- Over time there has been some decline in PCP concentrations at individual wells. For instance, on Table A3-6 in Attachment 3, long-term concentration declines for PCP are evident at wells G-14R-98 and HCA-21, and these trends likely reflect positive impacts from the overall groundwater remedy.

The potential presence of continuing sources of groundwater impacts is included as part of an issue identified in this FYR.

- The PCP plume maps also illustrate the presence of PCP north of Silver Bow Creek and the HCC. As discussed in the "Status of Implementation" section, the recent WWTP dewatering that began in 2009 provides a potential for PCP impacts to be pulled beneath Silver Bow Creek, but there is also a possibility that PCP impacts were already present in groundwater north of Silver Bow Creek prior to the dewatering that began in 2009. The RI (1993) and ROD (1993) interpreted that PCP was present in groundwater north of Silver Bow Creek at the time of those documents, but there is uncertainty regarding that conclusion. There were no PCP data for groundwater wells north of Silver Bow Creek in the years immediately prior to the WWTP dewatering that started in 2009.

Despite declining PCP concentrations at some specific monitoring locations over time, relatively stable concentrations of PCP at the NHRT and NCRT (Figure 10) indicate that the overall PCP concentrations in groundwater are generally stable. The higher PCP concentrations extracted at the NHRT compared to the NCRT (Figure 10) suggest that continuing sources up-gradient of the NHRT likely contribute more dissolved mass of PCP to groundwater on an ongoing basis than remaining sources down-gradient of the NHRT.

Dioxin TEQ in Groundwater

Dioxin TEQ concentrations in groundwater from 2001 to 2015 are summarized in Table A3-7 in Attachment 3. For the small number of monitoring wells with dioxin TEQ concentrations above the ROD cleanup standard of 30 pg/L, there are no obvious trends in concentration over time at any particular well location, and there is no discrete "dioxin plume" or plume boundary that can be inferred from the data. A detailed discussion of dioxin concentrations in groundwater is

presented in Attachment 5. Analysis of previous dioxin analytical results for laboratory control samples calls into question the ability to assess dioxin TEQ results versus the DEQ-7 standard. Average dioxin TEQ for laboratory method blanks (laboratory-grade distilled water using clean, laboratory-grade glassware) from 2009 to 2015 using the DEQ-7 methodology (2.04 pg/L) is greater than the Montana DEQ-7 dioxin standard for groundwater (2.0 pg/L). DEQ is examining how best evaluate dioxin TEQ results versus the DEQ-7 standard given this issue. Turbidity is expected to be measured in future sampling events, which will allow for a long-term relationship to be established between dioxin TEQ results and turbidity values at specific wells.

PAHs and Other Chlorophenols in Groundwater

These parameters are analyzed annually at a select group of monitoring wells, and the data from 2015 are presented on Table A3-10 in Attachment 3. Other than PCP, none of these constituents had concentrations in groundwater that exceed the ROD standards (consistent with data from previous years). These results are also consistent with the data from the recovery trenches (Table A3-5 in Attachment 3), which provides further evidence that no widespread impacts are associated with these parameters.

Surface Water

Data regarding MPTP surface water sampling results are provided on the following tables in Attachment 3:

- Table A3-11: PCP (2001-2014 range and 2015 individual sampling event results)
- Table A3-12: Dioxin TEQ (annual)
- Table A3-13: PAHs and chlorophenols (2015)

From 2011 to 2015, surface water sampling locations were sampled semi-annually for PCP and annually for an extended parameter list that included PAHs, dioxins, and chlorophenols. Surface water locations sampled all five years (2011 to 2015) are illustrated in Figure 3, and include the following:

- SW-09: Silver Bow Creek, just east (upstream) of the MPTP site
- SS-06A: Silver Bow Creek, on the downstream side of the MPTP site but upstream from the effluent discharge from the WTP
- SW-05: Silver Bow Creek, just west (downstream) of the MPTP site

The locations above represent the current "compliance locations" identified in the current *Groundwater and Surface Water Monitoring Plan* (Tetra Tech, January 2013); DEQ plans to finalize the compliance points once system equilibrium is established after WWTP dewatering (which has occurred periodically from 2009 to 2016) is completed. In addition to the three sampling locations above, the following locations were also sampled in 2011:

- SW-03: Silver Bow Creek, located far west (downstream) of the MPTP site just below the outfall of the BTL and the confluence of the HCC
- SW-06: HCC, at the far western (downstream) end of the HCC

In 2011 the additional parameter list also included furans, six metals (arsenic, cadmium, chromium, copper, lead, and zinc) and six anions (bicarbonate, bromide, chloride, fluoride,

phosphate, and nitrate/nitrite). As stated in the *2012 Annual Sampling Report* (Tetra Tech, 2014), "The ROD does not require that surface water samples be analyzed for metals or anions. Based on a review of existing data, the characterization of baseline concentrations of metals in surface water was determined to be complete. Therefore, no further characterization of the concentrations of metals in surface water is required, and these analyses have been discontinued."

Observations from surface water results over the last five year period include the following:

- As indicated in Table A3-11 in Attachment 3, the surface water standard for PCP of 1 µg/L is consistently achieved at all current "compliance" sampling locations in Silver Bow Creek (SW-05, SW-06A, and SW-09). The concentrations of PCP at the upstream surface water station, SW-09, have been consistently below the ROD surface water cleanup level for PCP (1 µg/L), and below the detection limit value (0.2 µg/L). The concentration of PCP at SW-05 was at, or slightly above the detection limit value (0.2 µg/L) in 2011 and 2012 and below the detection limit value from 2013 to 2015. The concentration of PCP at SW-06A was slightly above the detection limit value (0.2 µg/L) in 2013 and below the detection limit value in 2011, 2012, 2014, and 2015.
- As indicated in Table A3-12 in Attachment 3, the ROD surface water standard for dioxin TEQ of 10 pg/L is consistently achieved at the compliance sampling locations in Silver Bow Creek (SW-05, SW-06A, and SW-09). The highest dioxin TEQ level was at upstream location SW-09 in 2013, when the concentration was 1.86 pg/L. That location is upstream from the Site and suggests the higher concentration at that location is not related to the dioxins associated with MPTP. All other dioxin TEQ values at these surface water sampling locations in the last five years were less than 0.5 pg/L, and typically less 0.1 pg/L.
- As indicated in Table A3-13 in Attachment 3, all ROD surface water standards were met for PAHs and chlorophenols in 2015, with the exception of dibenzo(a,h)anthracene at upstream location SW-09 (0.307 µg/L versus the ROD standard of 0.2 µg/L). That location is upstream from the Site and suggests the higher concentration at that location is not related to the PAHs associated with MPTP. Review of previous annual reports indicates that all concentrations for these constituents were below ROD surface water cleanup levels at each location in 2011, 2012, 2013, and 2014.

In summary, no significant concerns regarding surface water concentrations have been noted in the annual reports over the last five years. However, an updated evaluation of the cleanup standards for dioxins, including an evaluation of how "non-detect" congener values are used in the TEQ equation, should be incorporated into an appropriate decision document and included in subsequent annual reports.

V. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

No. In general, the remedy continues to operate and function as designed and outlined in the ROD, but the answer to this question is "no" for the overall remedy because the dioxin TCDD-TEQ cleanup level for soils outlined in the ROD is not being achieved, and the administrative record has not been updated accordingly via a decision document. The answer is generally "yes" for groundwater, surface water, and operation of the treatment plant. Institutional controls are not yet finalized.

The discussion below regarding Question A is organized into sections as follows:

- Soil Remediation (Dioxin)
- Soil Remediation (PCP)
- Water Treatment Plant
- Groundwater Remediation
- Surface Water and Storm Water
- Institutional Controls

Soil Remediation (Dioxin)

The ROD cleanup level for dioxin TEQ in soil (Table 1 of this FYR, or ROD Table 23) has not been achieved with biological treatment at the LTU, and is not anticipated to be met in the near future. The ROD states (page 30) "Biological land treatment is not expected to achieve the degree of treatment provided by incineration; however, it is anticipated that allowable final contaminant levels will be achieved. Design studies would be utilized to determine achievable treatment efficiencies and identify any additional remedial actions which may be necessary in conjunction with biological land treatment." The ROD did not identify actions to be taken should cleanup levels not be achieved.

CDM's Technical Memorandum Vadose Zone Soils Dioxin/Furan Mobility Evaluation, September 27, 2001, presented the results of modeling conducted to evaluate the potential for dioxins and furans that remain in treated soil backfilled within the vadose zone on-Site to leach into the groundwater via porous media flow. This evaluation concluded that dioxins and furans are not likely to be treated, biodegraded, or leached from soils during bioremediation. The risk exposure pathways for soils are ingestion or direct contact. Backfilling the treated soils that still contain dioxins/furans above the historic high groundwater level (based on over 20 years of monitoring), and covering these soils with at least one foot of clean soil (as indicated in the September 2001 "Vadose Zone Soils Dioxin/Furan Mobility Evaluation" by CDM), will be the control to render these exposure pathways incomplete.

Leaving soils with dioxins above ROD soil cleanup standards may be appropriate when implemented with appropriate engineering controls (e.g., soil cover designed in compliance with ARARs, as well as appropriate storm water management) and institutional controls. However, this was not a remedy identified in the ROD. A decision document is needed to sufficiently address placement of soils on-Site with dioxin concentrations above the ROD standard; the decision document should occur prior to the final design and implementation of the offload and cover. This is identified as in issue in this FYR.

Soil Remediation (PCP)

Excavation of soils and subsequent treatment at the LTU effectively reduced PCP (and PAH) concentrations in soil to ROD cleanup levels (Table 1 of this FYR, or ROD Table 23). However, the following items regarding PCP in soil were considered during this FYR as potentially pertinent to an anticipated future decision document:

- The ROD "Performance Standards for Soil" (ROD Page 43) indicates that after determination by the lead agency (in consultation with the support agency) that in-place

bioremediation of soils below the depth of excavation is no longer effective or practicable and contaminant levels have plateaued, or it is determined by the agencies that these areas would be effectively addressed by the in-situ bioremediation implemented under the groundwater actions, these areas will be backfilled. As illustrated on Figure 4, the backfilling of excavated areas with treated soils offloaded from the LTU began as early as 1999.

- The ROD "Performance Standards for Soil" (ROD Page 43) indicates that remediation of inaccessible contaminated soils (consisting primarily of soils under the Interstate and treatment plant) will be remediated via LNAPL recovery and soil flushing. That section of the ROD further indicates that, after determination by the lead agency (in consultation with the support agency) that recovery of hazardous substances from these areas by these methods is no longer effective or practical and contaminant levels have plateaued, these areas will be addressed by in-situ bioremediation as outlined under "Performance Standards for Groundwater."
- An evaluation of risk to groundwater from leaching of PCP remaining in soil (via modeling and/or leachate testing) is underway as part of the LTU Final Offload and Closure design.

Water Treatment Plant

The MPTP WTP removes COCs in plant influent with concentrations above ROD discharge standards (Table 5 of this FYR, or ROD Table 27), which are primarily PCP and dioxins. With respect to PCP, the discharge standard of 1 µg/L is routinely met. There have been a few instances where the PCP discharge standard was not met, but those have been isolated and a likely cause has been established and addressed. With respect to dioxin TEQ, the effluent has been treated to below 1 pg/L in each of the last five years, well below the ROD discharge standard of 10 pg/L. As discussed in this FYR report, the DEQ-7 surface water criterion of 0.005 pg/L does not appear to be a realistic criterion, since lab method blanks typically yield detections of dioxin of more than 2 pg/L dioxin TEQ using DEQ methods. PAHs and metals concentrations in plant effluent consistently meet ROD cleanup levels and should meet any modified cleanup levels as well.

Groundwater Remediation

The groundwater remedial goals (Table 3 of this FYR, or ROD Table 25) are to provide maximum source reduction and protect Silver Bow Creek and uncontaminated groundwater by minimizing migration of contaminants within the groundwater and meeting cleanup levels outlined in the ROD at the points of compliance. Under typical operating conditions groundwater capture associated with the MPTP extraction system appears to be sufficient, based on previous groundwater modeling. Under non-routine conditions caused by construction dewatering at the WWTP, a strategy of increased extraction at the NCRT has been developed and successfully implemented to mitigate impacts to the remedy capture zone extent.

PCP concentrations at the extraction trenches declined substantially over the course of the remedy, but have stabilized since approximately 2005. This is consistent with relatively constant mass flux from potential remaining sources, such as suspected continuing sources below the Interstate. No free oil has been recovered at the WTP since 2009; there have been three observations of minor sheen in the last five years. There have been no observations of free oil at

any monitoring well in the most recent five years. Although some oils are still likely to be present at the Site, it appears that mobile free oil is no longer a significant concern.

The current groundwater P&T system has been operating since 1997. The ROD anticipated "…the groundwater action would occur for a period of 30 years. Although groundwater remediation to cleanup levels is expected…some inaccessible source areas (under the interstate highway) would remain and be treated in place. Therefore, actual costs and efforts associated with Site monitoring, enforcement of institutional controls and operation and maintenance of the groundwater treatment system for the inaccessible source areas (under the interstate highway) may be incurred beyond 30 years." As discussed earlier, a 2016 evaluation concluded it is likely to take 56 to 123 additional years to exhaust the source, and assumes capture of groundwater will need to continue for that period. This is consistent with the ROD text above that suggested P&T would likely continue beyond 30 years to address inaccessible source areas such as beneath the Interstate.

Surface Water and Storm Water

No significant concerns regarding surface water concentrations have been noted in the annual reports over the last five years. The current surface water monitoring locations (SW-09, SW-06A, and SW-05) represent the current "compliance locations" identified in the *Groundwater and Surface Water Monitoring Plan* (Tetra Tech, January 2013); DEQ plans to finalize the compliance points once system equilibrium is established after WWTP dewatering (which has occurred periodically from 2009 to 2016) is completed. With respect to dioxin TEQ, the ROD cleanup standard is 10 pg/L (Table 4 of this FYR, or ROD Table 26). As with groundwater, analysis of previous dioxin analytical results for laboratory control samples calls into question the ability to assess dioxin TEQ results versus the current DEQ-7 standard for surface water. Average dioxin TEQ for laboratory method blanks (laboratory-grade distilled water using clean, laboratory-grade glassware) from 2009 to 2015 using the DEQ-7 methodology (2.04 pg/L) is greater than the Montana DEQ-7 dioxin standard for surface water (0.005 pg/L). DEQ is examining how to best evaluate dioxin TEQ results versus the DEQ-7 standard given this issue. An updated evaluation of the cleanup standards for dioxins, including an evaluation of how "non-detect" congener values are used in the TEQ equation, should be incorporated into an appropriate decision document and included in subsequent annual reports.

The highest dioxin TEQ level in the previous five years was at upstream location SW-09 in 2013, when the concentration was 1.86 pg/L. That location is upstream from the Site and suggests the higher concentration at that location is not Site-related. All other dioxin TEQ values at these surface water sampling locations were less than 0.5 pg/L, and typically less than 0.1 pg/L, versus a ROD standard of 10 pg/L. PAHs have not exceeded ROD standards. Metals sampling (not required by the ROD in surface water) did not indicate elevated levels and has been discontinued.

Per the ROD, all storm water must be controlled and treated to the ROD Table 27 cleanup levels, along with control and treatment, if necessary, of any contaminated runoff prior to discharge to Silver Bow Creek to meet the same cleanup levels. The treatment plant operator indicates that no storm water leaves the Site, even during large storms such as those that occurred in 2011. Updated Site-wide storm water run-on and run-off controls are being incorporated into the final offload and protective cap design.

Supplemental Engineering and Institutional Controls

For supplemental engineering and institutional controls, the objectives included the following: 1) prevent unauthorized access to contaminated media or to remedial action areas; 2) include adequate zoning restrictions, conservation easements, and other controls to prevent any future residential use of the Site; and 3) prevent any water well drilling in the contaminated groundwater plume and adjacent areas to prevent additional receptors of contaminated groundwater or an expansion of the plume. With respect to these items:

- The Site fence (which is an engineering control) is well-maintained and prevents trespassing.
- As described earlier, the current zoning prohibits almost all residential zoning, except for certain residential uses associated with industrial uses. Efforts to develop and implement permanent ICs to restrict residential use, as a component of the MPTP remedy, are implemented at the ARCO property on Site, and are being developed for the appropriate areas at the remainder of the Site, but are not yet complete.
- Other ICs to restrict land use in locations where waste (potentially including dioxin) is left in place above levels that allow for unlimited use/unrestricted exposure are not yet fully complete, although deed restrictions on Atlantic Richfield Company property do prevent remedy disturbance.
- A Controlled Ground Water Area was established after the Second FYR, which prevents new wells from being drilled. However, the CGA does not prevent significant increases in groundwater withdrawals from existing infrastructure, such as WWTP construction dewatering in vicinity of MPTP, which can adversely impact plume movement. In 2016 DEQ amended the Construction Dewatering General Permit, and associated coordination, to address the potential for any new withdrawals of groundwater that could spread contamination from any nearby DEQ sites, such as Superfund sites.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?

No. In general the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection are still valid, but the answer to Question B is "no" for the overall remedy, primarily due to the dioxins that remain after the soil remediation at concentrations above the ROD cleanup standard of 0.2 µg/kg, and as discussed in more detail below, also above current EPA Regional Screening Levels (RSLs) for soils. This differs from the remediation contemplated in the ROD, which anticipated that soils would meet remediation standards before being placed back on-Site. The answer to Question B is "yes" for groundwater and surface water; although some changes to specific criteria have occurred for those media (detailed below), those changes do not appear to impact the implementation of the remedy.

Soil

The selected soil remedy of bioremediating excavated soil at the LTU successfully achieved ROD standards for PCP (34 mg/kg) and PAHs (B2 PAHs TEF of 4.2 mg/kg) but not for dioxin. The average LTU dioxin TEQ values sampled between 1998 and 2013 ranged from 0.7 to 2.8 µg/kg. While these results did not achieve the 1993 ROD cleanup standard of 0.2 µg/kg, the dioxin TEQ values were within or below the EPA's commercial/industrial exposure scenario range of 5 to 20

μg/kg that was used as a starting point for setting cleanup levels at CERCLA removal sites (Office of Solid Waste and Emergency Response [OSWER] Directive 9200.4-26, April 13, 1998).

Approximately 136,000 cubic yards of LTU-treated soil were off-loaded (replaced) in excavated areas at the Site from 1999 through 2007 (Figure 4). In 1999, 24,000 cubic yards of soil were off-loaded north of the highway and covered with one-foot of clean fill. The remaining 112,000 cubic yards of off-loaded soils were placed south of the highway; these soils have not yet been covered. All areas of off-loaded soils have been revegetated and are inside the fenced, restricted-access Site.

On February 17, 2012, EPA released the final human health non-cancer dioxin reassessment, publishing an oral non-cancer toxicity value, or reference dose (RfD), of $7x10^{-10}$ mg/kg-day for dioxin TCDD in EPA's Integrated Risk Information System (IRIS). The dioxin RfD was approved for immediate use at Superfund sites to ensure protection of human health. A revised dioxin non-cancer RSL (composite worker soil) of 0.72 μg/kg was calculated using the 2012 RfD, 2005 World Health Organization (WHO) TEFs and incorporating the new commercial/industrial default exposure assumptions released by the EPA in February 2014 (*Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors, OSWER Directive 9200.1-120, February 6, 2014*. The current EPA RSLs (generic tables May 2016) for "composite worker soil" include the non-cancer RSL of 0.72 μg/kg and cancer RSL of 0.022 μg/kg (based on cancer risk of $1 X 10^{-6)}$. The ROD cleanup standard of 0.2 μg/kg corresponds to a cancer risk of less than $1 X 10^{-5}$.

The dioxin TEQ values for off-loaded soils (generally between 1 μg/kg and 5 μg/kg) exceed the ROD cleanup standard of 0.2 μg/kg, and also exceed the cancer and the non-cancer RSLs discussed above. It is expected, however, that the remedy will be protective with engineering controls and ICs in place. As stated in the response to Question A, management of this soil is expected to include soil cover that will be designed in compliance with ARARs. Combined with a Site Soil Management Plan, this should be effective, but needs to be appropriately documented in a decision document prior to the final design and implementation of the offload and cover.

Groundwater

This FYR includes an evaluation of the most current (2012) Montana DEQ-7 numeric water quality criteria for Site COCs versus ROD cleanup levels. The Montana Water Quality Act requires that human health standards for carcinogens be the more restrictive of either of the following: (1) the risk-based level of one in one hundred thousand [$1x10^{-5}$] for all carcinogens (except arsenic) or, (2) the MCL. Table 9 compares the ROD cleanup levels for groundwater to the 2012 Montana DEQ-7 criteria. For COCs where MCLs were the basis of the ROD cleanup level, the MCLs remain unchanged since the time of the ROD.

Analysis of previous dioxin analytical results for laboratory control samples calls into question the ability to assess dioxin TEQ results versus the DEQ-7 standard. Average dioxin TEQ for laboratory method blanks (laboratory-grade distilled water using clean, laboratory-grade glassware) from 2009 to 2015 using the DEQ-7 methodology (2.04 pg/L) is greater than the Montana DEQ-7 dioxin standard for groundwater (2.0 pg/L). DEQ is examining how best evaluate dioxin TEQ results versus the DEQ-7 standard given this issue.

Table 9
Comparison of Groundwater Cleanup Criteria in ROD and 2012 Montana DEQ-7 Criteria

Media	ROD Cleanup Contaminant	Cleanup Level (µg/L)	ROD Cleanup Basis	DEQ-7 Criteria (µg/L)
Groundwater	Pentachlorophenol	1.0	MCL	1.0
	Benzo(a)pyrene	0.2	MCL	0.05
	Benzo(a)anthracene	1.0	risk	0.5
	Benzo(b)fluoranthene	0.2	risk	0.5
	Benzo(k)fluoranthene	1.0	risk	5
	Chrysene	1.0	risk	50
	Dibenzo(a,h)anthracene	0.2	risk	0.05
	lndeno(1,2,3-CD)pyrene	1.0	risk	0.5
	Benzo(g,h,i)perylene	1.0	risk	-
	Total D PAHs[a]	360	hazard quotient	4,930
	Dioxin TCDD (TEF)[b]	3.0×10^{-5}	MCL	2.0×10^{-6}
	2,4,6-trichlorophenol	6.5	risk	30
	2-chlorophenol	45	hazard quotient	81
	2,4-dichlorophenol	27	hazard quotient	77
	2,3,5,6-tetrachlorophenol	267	hazard quotient	-

a The ROD criteria pertains to the sum of individual D PAH (acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, pyrene) concentrations. Some of these parameters have specific DEQ-7 criteria, and as noted on the table, the ROD criterion is much lower than the sum of the DEQ-7 criteria. Two of these constituents have criteria that are lower than the ROD criteria (which is based on the sum). However, as noted in the discussion below, there have been no detections for these constituents in Site groundwater that approach the DEQ-7 standard.

b Sum of individual chlorinated dibenzo-p-dioxins and -dibenzofurans concentrations multiplied by their corresponding toxicity equivalence factor (TEF) as shown on Table 29 of the ROD.

With respect to other parameters other than dioxin:

- For PCP, the principal Site contaminant, the DEQ-7 standard of 1 µg/L is identical to the ROD cleanup criterion.
- For benzo(a)pyrene the DEQ-7 standard is 0.05 µg/L, versus the ROD cleanup criterion of 0.2 µg/L. Note that the DEQ-7 standard is lower than the reporting limit stated in the DEQ-7 standards (0.06 µg/L), and lower than is typically reported for MPTP samples (generally 0.1 µg/L). Using influent to the WTP as indicators of groundwater impacts, all samples for benzo(a)pyrene for the last five years have been "non-detect," so it appears that there are not significant groundwater impacts for this constituent.
- For benzo(a)anthracene and indeno(1,2,3-c,d)pyrene the DEQ-7 standard for these compounds is 0.5 µg/L, versus the ROD cleanup criterion of 1 µg/L. The DEQ-7 standards are lower than the reporting limit typically reported for MPTP samples (generally 1 µg/L). Note that DEQ-7 suggests reporting levels below the DEQ-7 standards should be achievable for benzo(a)anthracene and indeno(1,2,3-c,d)pyrene. Using influent to the WTP as indicators of groundwater impacts, all samples for benzo(a)anthracene and indeno(1,2,3-c,d)pyrene for the last five years have been "non-detect," so it appears that there are not significant groundwater impacts for these constituents.
- For dibenzo(a,h)anthracene the DEQ-7 standard is 0.05 µg/L, versus the ROD cleanup criterion of 0.2 µg/L. The DEQ-7 standard (0.1 µg/L) is lower than the reporting limit

typically reported for MPTP samples (generally 0.2 µg/L). Using influent to the WTP as indicators of groundwater impacts, all samples for dibenzo(a,h)anthracene for the last five years have been "non-detect," so it appears that there are not significant groundwater impacts for this constituent.

- For D PAHs, the ROD criteria pertains to the sum of individual D PAH (acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, pyrene) concentrations. Some of these parameters have specific DEQ-7 criteria, and as noted on Table 9, the ROD criteria (360 µg/L) is much lower than the sum of the DEQ-7 criteria for those compounds (4,930 µg/L). Two of these constituents (fluoranthene and phenanthrene) have criteria that are lower than the ROD criteria (which is based on the sum). The DEQ-7 groundwater criterion for fluoranthene is 130 µg/L, and the DEQ-7 groundwater criterion for phenanthrene is 100 µg/L. A review of groundwater data from 2015 indicates that fluoranthene was not detected at any groundwater well that was sampled, and phenanthrene was detected at one well (MW-11-04) at a concentration of 7.64 µg/L, well below the DEQ-7 criteria of 100 µg/L. It appears that the parameter-specific criteria for fluoranthene and phenanthrene are not an issue because of these low groundwater concentrations (it appears that there are not significant groundwater impacts for these constituents).

DEQ is currently reassessing all groundwater cleanup levels to identify all contaminants of concern that will require an update to those cleanup levels. Any changes will be noted in the appropriate decision document.

Surface Water and Treatment Plant Effluent

For surface water and discharge to surface water, the ROD identified the basis for certain of the surface water and discharge to surface water standards as the DEQ-7 "Aquatic Life Standards." The current DEQ-7 "Aquatic Life Standards" were compared to the ROD cleanup criteria for the following contaminants:

- For PCP, the DEQ-7 aquatic life standards are higher than the ROD cleanup criterion (5.3 µg/L for acute and 4.0 µg/L for chronic, versus the ROD criterion of 1 µg/L). The DEQ-7 human health surface water criterion is the same as the ROD criterion (1 µg/L).
- For all the B2 PAH compounds and Dioxin TEQ, there are no values for "Aquatic Life Standards" provided in the DEQ-7 standards. For most of these compounds the DEQ-7 surface water criterion is 0.038 µg/L, which is below the ROD criteria (generally 0.2 µg/L or 1.0 µg/L depending on the constituent). Generally the DEQ-7 reporting limit is higher than the DEQ-7 surface water criterion.
- For metals that are monitored in treatment plant effluent (other than arsenic and hexavalent chromium), the 2012 DEQ-7 Aquatic Life Standards depend on hardness. The receiving water hardness is the determinant for calculating the DEQ-7 Aquatic Life Standard. The hardness range for Silver Bow Creek is 125 to 150 mg/L; a value of 125 mg/L (most conservative within the range of hardness numbers) has been used to determine the appropriate DEQ-7 value.
    - For arsenic (criteria not a function of hardness), the DEQ-7 standards are higher than the ROD cleanup criterion (340 µg/L for acute and 150 µg/L for chronic, versus the ROD criterion of 48 µg/L). However, the DEQ-7 surface water criterion

of 10 µg/L is lower than the ROD standard of 48 µg/L. The arsenic concentration has below 10 µg/L in plant effluent samples each of the last five years.

- For hexavalent chromium (criteria not a function of hardness), the DEQ-7 standards are mixed versus the ROD cleanup criterion (16 µg/L for acute is higher than the ROD criterion of 11 µg/L, but 11 µg/L for chronic is the same as the ROD criterion of 11 µg/L). To date, there have been no exceedances of the ROD cleanup criterion in the WTP effluent.
- For cadmium, the DEQ-7 standards are mixed versus the ROD cleanup criterion (2.68 µg/L for acute is higher than the ROD criterion of 1.1 µg/L, and 0.32 µg/L for chronic is slightly lower than the ROD criterion of 1.1 µg/L). Results for influent and effluent from the WTP collected during the last five years were all non-detect. The detection limit the last four years was 0.25 µg/L; in 2011 the detection limit was 1.25 µg/L. There does not appear to be any issue with cadmium regarding the lowest of these criteria (DEQ-7 chronic).
- For copper, the DEQ-7 acute standard (17.27 µg/L) is higher than the ROD cleanup criterion (12 µg/L), while the DEQ-7 chronic standard (11.29 µg/L) is slightly lower than the ROD criterion. Copper detections for the effluent from the WTP collected during the last five years consistently remained below both the ROD standard and the DEQ-7 chronic standard.
- For lead, the DEQ-7 standards are higher than the ROD cleanup criterion (108 µg/L for acute and 4.23 µg/L for chronic, versus the ROD criterion of 3.2 µg/L).
- For zinc, the DEQ-7 standards are higher than the ROD cleanup criterion (145 µg/L for acute and chronic, versus the ROD criterion of 110 µg/L).

Sampling for metals in surface water is not required by the ROD. Metals sampling was conducted up until 2011, and indicated non-detect or low metals concentrations in surface water, so metals sampling in surface water was discontinued after 2011.

- Analysis of previous dioxin analytical results for laboratory control samples calls into question the ability to assess dioxin TEQ results versus the DEQ-7 standard for surface water. Average dioxin TEQ for laboratory method blanks (laboratory-grade distilled water using clean, laboratory-grade glassware) from 2009 to 2015 using the DEQ-7 methodology (2.04 pg/L) is greater than the Montana DEQ-7 dioxin standard for surface water (0.005 pg/L). DEQ is examining how best evaluate dioxin TEQ results versus the DEQ-7 standard given this issue.
- For D- PAHs, the ROD criteria for surface water and for discharge to surface water pertains to the sum of individual D PAH (acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, pyrene) concentrations. Some of these parameters have specific DEQ-7 criteria, and the ROD criteria (360 µg/L for surface water and discharge to surface water) is much lower than the sum of the DEQ-7 criteria for those compounds (4,930 µg/L for groundwater and 11,300 for surface water). Two of these constituents (fluoranthene and phenanthrene) have criteria that are lower than the ROD criteria (which is based on the sum). The DEQ-7 groundwater and surface water criterion for fluoranthene is 130 µg/L, and the DEQ-7 groundwater and surface water criterion for phenanthrene is 100 µg/L. A review of plant effluent data and surface water data from

2015 indicates that fluoranthene and phenanthrene were not detected in plant influent or plane effluent, or in any surface water sample. Therefore, it appears that the parameter specific criteria for fluoranthene and phenanthrene are not an issue because of these low concentrations (there are not significant groundwater impacts for these constituents).

With respect to plant discharge criteria there does not appear to be any issues regarding remedy protectiveness resulting from changed criteria for any other constituents, but it is recommended that the new DEQ-7 chronic value for cadmium (already being utilized in annual reports for the MPTP site) be adopted as a cleanup standard through the appropriate decision document in conjunction with other standards updates (e.g., dioxin in groundwater). At that time, consideration should also be given for a lower plant discharge criterion and surface water criterion for dioxin TEQ. DEQ is currently reassessing all surface water cleanup levels to identify all contaminants of concern that will require an update to those cleanup levels. Any changes will be noted in the appropriate decision document.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No. However, during the five-year-review it was noted that the ROD did not have a cleanup standard for protectiveness to groundwater. In late 2016 an assessment was initiated to determine if the site-specific cleanup standard for PCP in soil (34 mg/kg) is adequately protective of groundwater based on leaching to groundwater. The assessment will be concluded in 2017 and the results will help determine any future modifications necessary to ensure protectiveness.

VI. Issues/Recommendations

Two issues are identified in this FYR. These two issues incorporate items identified as issues in the previous FYR that were not completely addressed since the time of that review.

<table>
<tr><td rowspan="3">OU(s): OU1</td><td colspan="5">Issue Category: Remedy Performance</td></tr>
<tr><td colspan="5">Issue: The appropriate decision document needs to be prepared to document and/or incorporate the following changes:
Placing treated soil on-Site that contains dioxins above cleanup levels.
Updates to certain ROD cleanup or discharge standards should be evaluated, revised, and incorporated as appropriate.
Points of compliance for surface water and groundwater should be finalized.
Clarify other remedy items as needed or appropriate (e.g., potentially remaining sources of PCP beneath the Interstate or elsewhere on the Site).</td></tr>
<tr><td colspan="5">Recommendation: Prepare a decision document to address the items above, prior to final design and implementation of the remaining LTU offload and placement of cover (see text below for additional details).</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Party Responsible</td><td>Oversight Party</td><td>Milestone Date</td></tr>
<tr><td>No</td><td>Yes</td><td>State</td><td>EPA</td><td>9/30/2017</td></tr>
</table>

OU(s): OU1	**Issue Category:** Institutional Controls			
	Issue: Permanent ICs are not in place in all locations on-Site to prevent residential use, and/or restrict land use where waste (potentially including dioxin) is left in place above levels that allow for unlimited use/unrestricted exposure.			
	Recommendation: Develop and implement permanent ICs including deed restrictions and/or environmental covenants at all appropriate locations on-Site. This is currently underway.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	State	EPA	9/30/2018

The planned decision document (in the first recommendation above) should address the following:

- Leaving treated soil with dioxin levels above ROD cleanup levels on-Site, for the previous LTU offloads and the forthcoming final offload.
- Updating ROD standards based on changes since the ROD as needed and appropriate (e.g., soil cleanup standard for PCP in soil to be protective of groundwater, cleanup standard for dioxins in groundwater and surface water, cadmium standard in plant effluent).
- Identifying objectives and performance standards for cover and ICs in all areas with treated soils containing dioxins above ROD cleanup standards (previous and planned) and/or containing PCP at concentrations above levels that are protective of groundwater.
- Finalizing points of compliance for groundwater and surface water, and the elimination of residential well sampling.
- Any other remedy items as needed or appropriate (e.g., potentially remaining sources of PCP beneath the Interstate or elsewhere on the Site).

Other Findings

In addition, the following are findings and/or recommendations that were identified during the FYR but do not affect current and/or future protectiveness:

- There appears to be a need for increased communication between DEQ and other stakeholders including BSB and nearby residents.
- There are a series of Site documents that are “draft” and have not been finalized, and it is recommended that these documents be finalized (based on DEQ and/or EPA review of the draft documents) and placed in the public information repositories.
- During the FYR Site inspection, the plant operators suggested potential reductions in monitoring that could be considered for cost reduction. Some of these suggestions are summarized below, and may be considered during the next revision of the monitoring plan.

- Currently plant samples are collected and analyzed monthly for PCP from the NHRT and NCRT, but weekly for combined influent, midpoint of GAC, and effluent. One possible cost reduction would be to continue weekly sampling for the effluent, but scale back the other weekly locations to bi-weekly or monthly, assuming it is sufficiently demonstrated that reduced sampling would not lead to unexpected breakthrough of the treatment media. Special sampling at higher frequency could be performed if a high concentration is observed in the effluent or other non-routine activities are occurring that could impact plant performance.
- Groundwater sampling at deep monitoring location BMW-1B may be redundant given nearby wells BMW-1A (deep) and 10-12 (shallow). However, location BMW-1B monitors a deeper interval than BMW-1A and provides some assurance that the PCP plume is not migrating off-Site in a deeper interval. A reduction in sampling frequency at BMW-1B may be appropriate if it is sufficiently demonstrated that such action would not lead to unacceptable off-site migration of Site contaminants.
- Some other wells on the plume fringe or with low concentrations could be considered for reduced sampling, perhaps every 5 years, if it is sufficiently demonstrated that such action would not lead to unacceptable off-site migration of site contaminants. Examples could include 10-18, GS-34D, 10-19, and 10-20. The same could be considered for wells considered to be up-gradient of the impacts. For plume map construction, the latest value could be used for wells not sampled in the current event, so that all well locations can be used to draw contours on the plume maps (i.e., not just the wells sampled in the current event).
- Consideration could also be given to reducing sampling frequency for PAHs to once every five years, if it is sufficiently demonstrated that such action would not lead to unacceptable off-site migration of Site contaminants.

VII. Protectiveness Statement

There is only one operable unit at this Site, so the operable unit-specific statement and the Site-wide protectiveness statement are the same. Therefore, only a Site-wide protectiveness statement is provided.

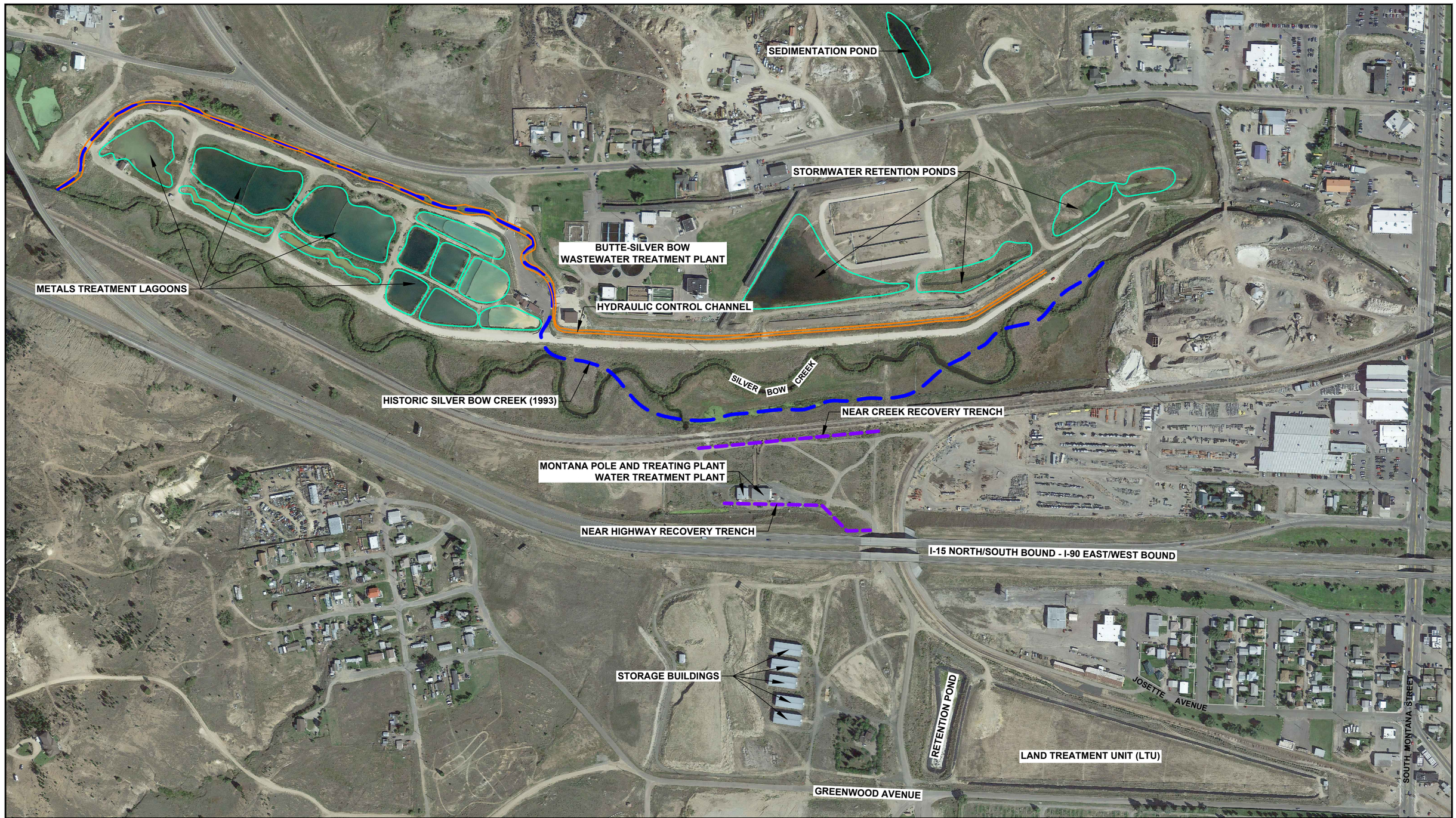
{this space intentionally left blank}

Site-wide Protectiveness Statement(s)
Protectiveness Determination: Short-term Protective
Protectiveness Statement: The remedy for OU-1 (the only OU for this Site) currently protects human health and the environment because exposure pathways that could result in unacceptable risk are being controlled by soil containment, hydraulic capture of impacted groundwater, access controls, and a Controlled Ground Water Area (an institutional control). In order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness: • Prepare a decision document, prior to final design and implementation of the remaining LTU offload and placement of cover, to document and/or incorporate the following: 1) Placing treated soil on-Site that contains dioxins above cleanup levels; 2) Updating ROD cleanup or discharge standards; 3) Identifying objectives and performance standards for cover and ICs; 4) Finalizing points of compliance for surface water and groundwater; and 5) Clarifying other remedy items as needed or appropriate (e.g., potentially remaining sources of PCP beneath the Interstate or elsewhere on the Site). • Develop and implement permanent ICs including deed restrictions and/or environmental covenants for all appropriate areas to prevent future on-Site residential use, and restrict land use where waste is left in place above levels that allow for unlimited use/unrestricted exposure. The ICs should also address protection of remedy components such as the CAMU facility that is planned. These efforts are currently in progress.

VIII. Next Review

The next five-year review report for the MPTP site is required five years from the completion date of this review.

Figures



AERIAL IMAGERY SOURCE: GOOGLE EARTH PRO (2013) DJA SURVEY JUNE 2015

N

200 0 200 400

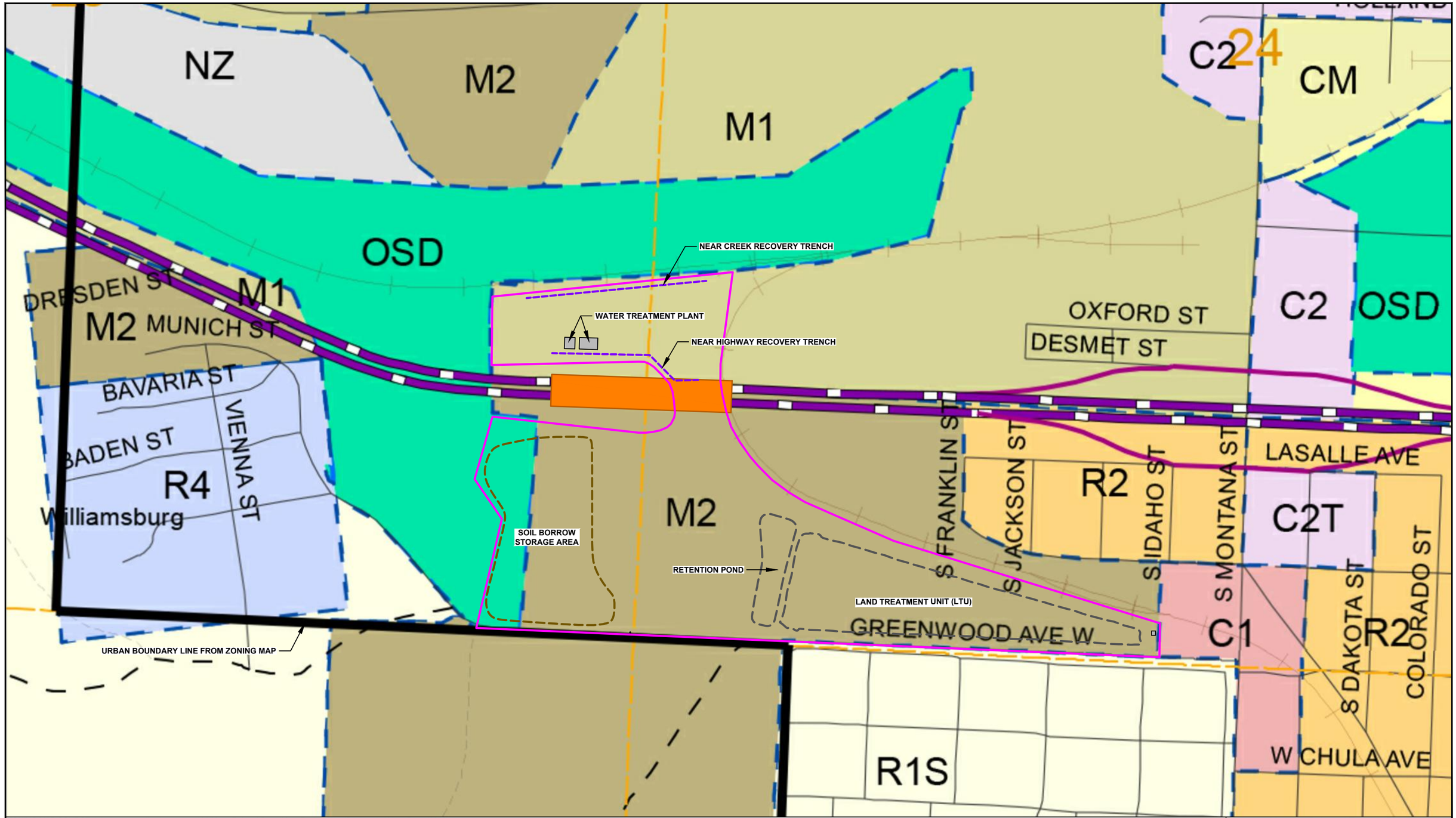
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 1
SITE FEATURES IN VICINITY OF
MONTANA POLE AND TREATING PLANT SITE

TETRA TECH

Figure 1_Site Features-Vicinity.dwg - DWH - 05/11/2016



ZONING MAP SOURCE: http://www.co.silverbow.mt.us/191/Maps-Related-Data (Map: Zoning Classifications in Urban Butte (2013)

FEATURE LEGEND

- MONTANA POLE AND TREATING PLANT FENCE LINE
- BUILDING
- POTENTIAL REMAINING SOURCE OF PCP BENEATH I-90

ZONING CLASSIFICATIONS

C1	LOCAL COMMERCIAL	NZ	NOT ZONED OR EXEMPT
C2	COMMUNITY COMMERCIAL	OSD	OPEN SPACE - DEVELOPABLE
C2T	TRANSITIONAL COMMUNITY COMMERCIAL	R1S	ONE FAMILY SUBURBAN RESIDENTIAL
CM	COMMERCIAL AND LIGHT INDUSTRIAL	R2	TWO FAMILY RESIDENTIAL
M1	LIGHT INDUSTRIAL	R4	MOBILE HOME
M2	HEAVY INDUSTRIAL		

N

200 0 200 400

SCALE IN FEET

Montana Pole and Treating Plant
Butte/Silver Bow Montana

FIGURE 2
CURRENT ZONING

TETRA TECH

Figure 2_ Zoning.dwg - DWH - 05/12/2016

LEGEND

- GROUNDWATER MONITORING WELL
- SURFACE WATER STATION
- WATER TREATMENT PLANT SAMPLE STATION

AERIAL IMAGERY SOURCE:
GOOGLE EARTH PRO (2013) DJA SURVEY JUNE 2015

N

150 0 150 300

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 3
LOCATIONS OF
SELECTED MONITORING STATIONS

TETRA TECH

Figure 3_Selected Monitoring Stations.dwg - DWH - 05/10/2016

ACTIVE BNSF RAILROAD LINE
NEAR CREEK RECOVERY TRENCH
ENTRY GATE
1999
WATER TREATMENT PLANT
GATE
NEAR HIGHWAY RECOVERY TRENCH
I-15 SOUTH BOUND / I-90 WEST BOUND
I-15 NORTH BOUND / I-90 EAST BOUND
GATE
ACTIVE BNSF RAILROAD LINE
VAULT
2005
2007
2005
2007
2000
2001
2000
2001
GATE
BLOWER BUILDING
STORAGE BUILDING 5
STORAGE BUILDING 4
STORAGE BUILDING 3
STORAGE BUILDING 2
STORAGE BUILDING 1
VAULT
2000
2001
2007
SOIL BORROW STORAGE AREA
DECONTAMINATION PAD/HYDRANT
ABANDONED OAAS RESIDENCE
RETENTION POND
LAND TREATMENT UNIT (LTU)
GREENWOOD AVENUE
GATE
LTU NUTRIENT FEED BUILDING

OFFLOAD AREA AND YEAR (APPROXIMATE LOCATION)
APPROXIMATE CONCEPTUAL FUTURE OFFLOAD AREA

N

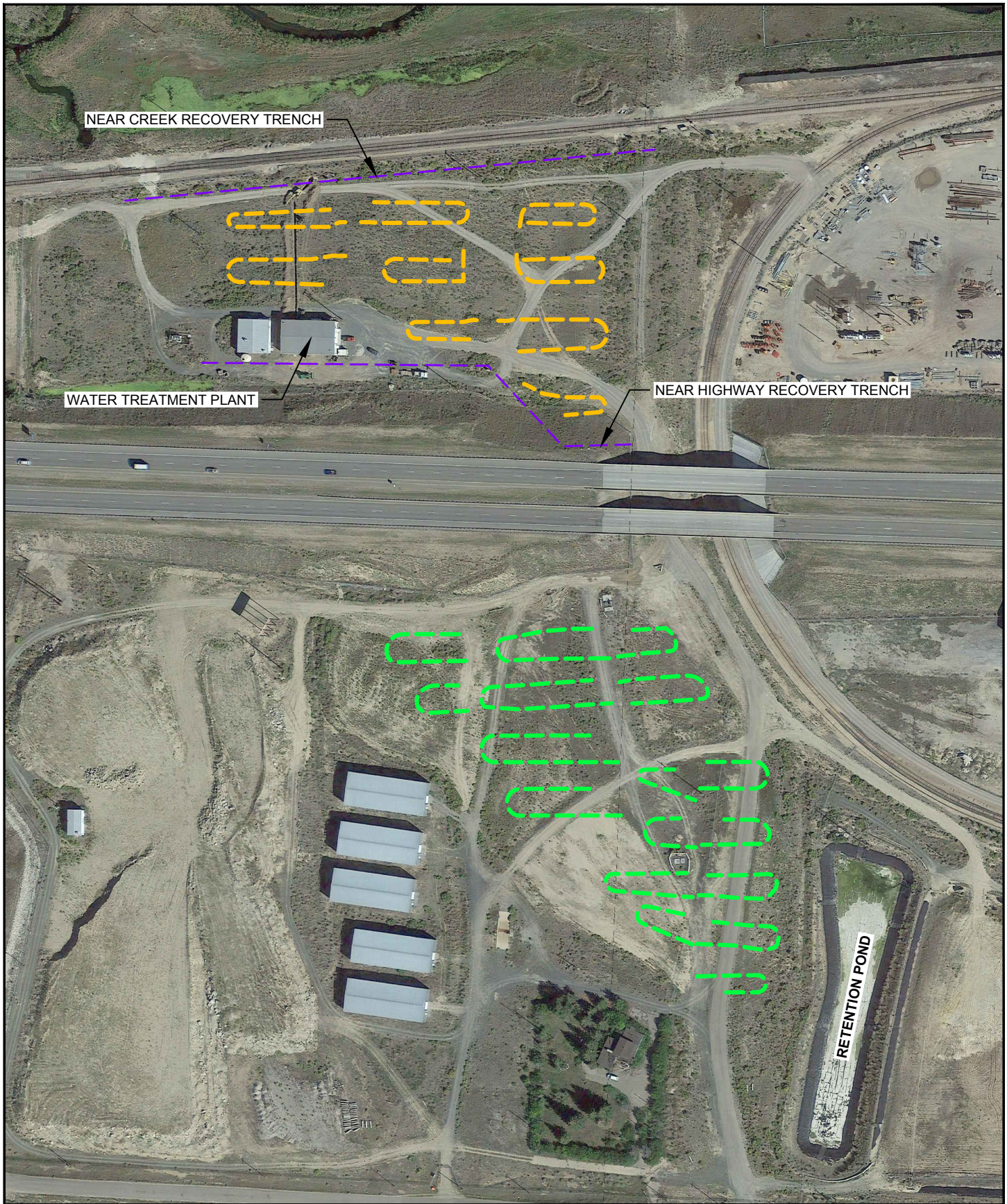
100 0 100 200
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4
LTU OFFLOAD AREAS
FORMER AND FUTURE

TETRA TECH

Figure 4_LTU Offload Areas.dwg - DWH - 05/10/2016



AERIAL IMAGERY SOURCE: GOOGLE EARTH PRO (2013) DJA SURVEY JUNE 2015

LEGEND

NORTH-SIDE INFILTRATION SYSTEM - INACTIVE (APPROXIMATE LOCATION)

SOUTH-SIDE INFILTRATION SYSTEM - ACTIVE (APPROXIMATE LOCATION)

N

100 0 100 200

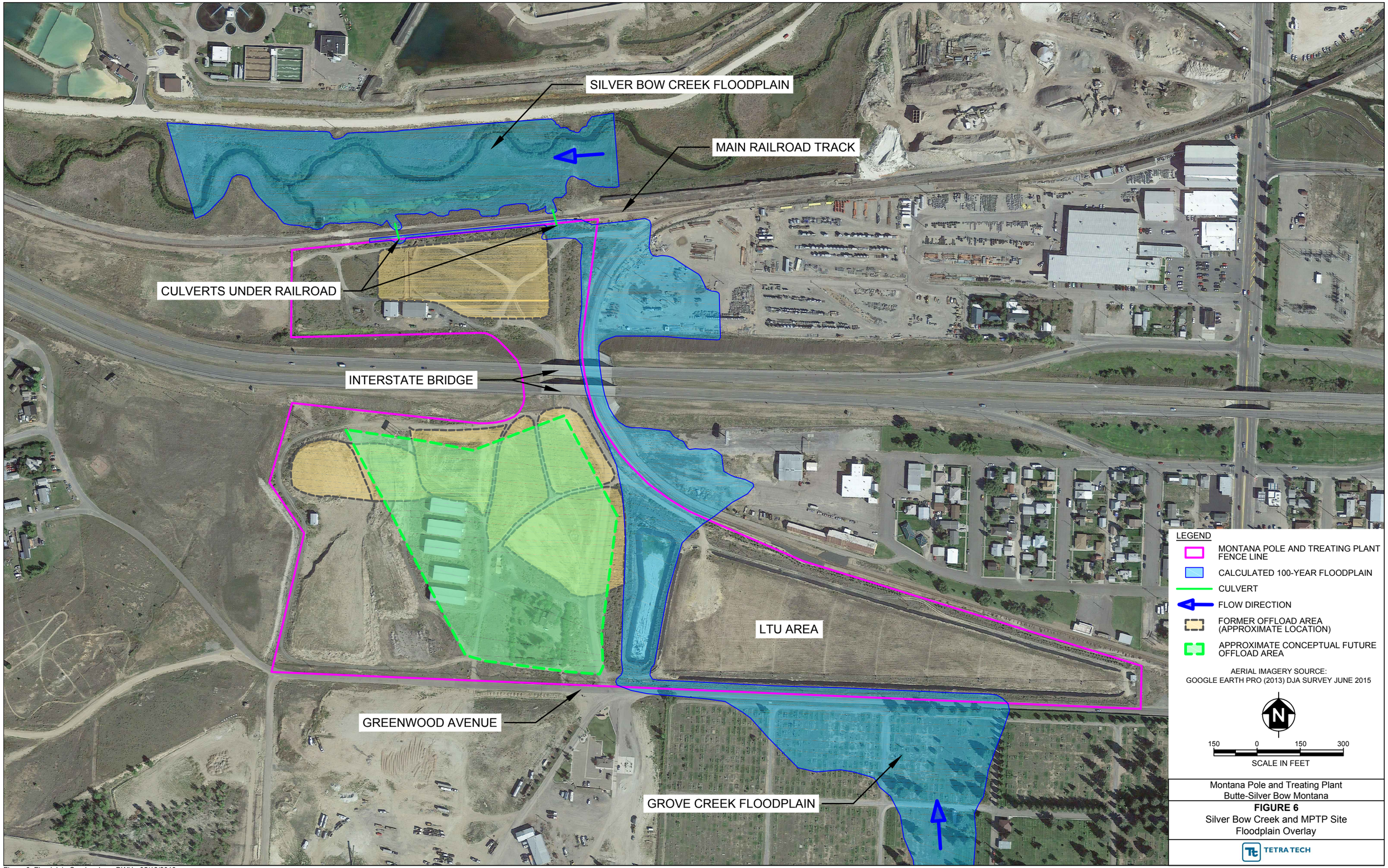
SCALE IN FEET

Montana Pole and Treating Plant
Butte/Silver Bow Montana

FIGURE 5
INFILTRATION SYSTEMS

TETRA TECH

Figure 5_Infiltration Systems.dwg - DWH - 05/10/2016

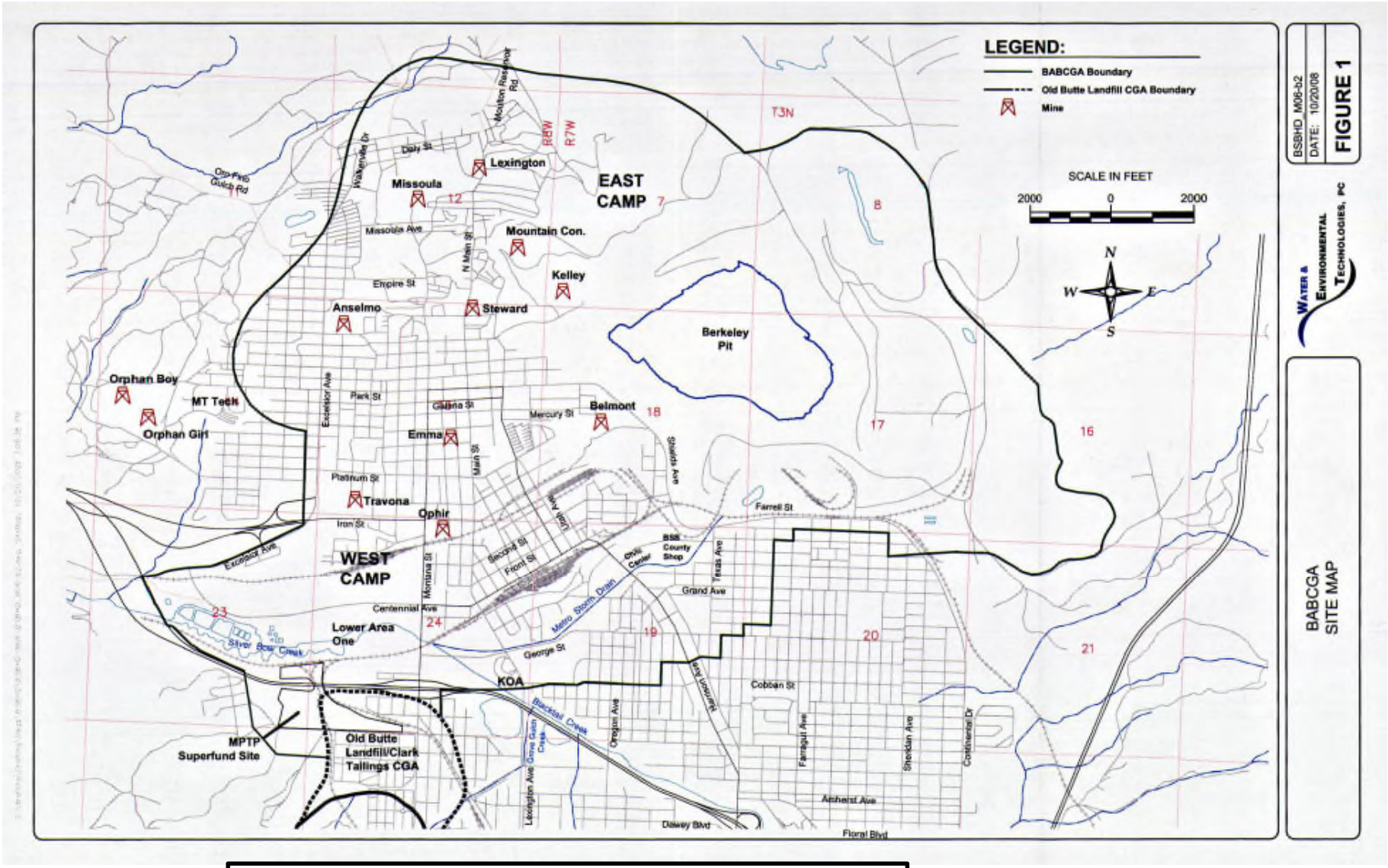


Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 6
Silver Bow Creek and MPTP Site
Floodplain Overlay

TETRA TECH

Figure 6_Floodplain Overlay.dwg - DWH - 05/12/2016



From Figure 1 of the CGA Final Order, October 30, 2009

Figure 7. Location of Controlled Ground Water Area (CGA)

TETRA TECH

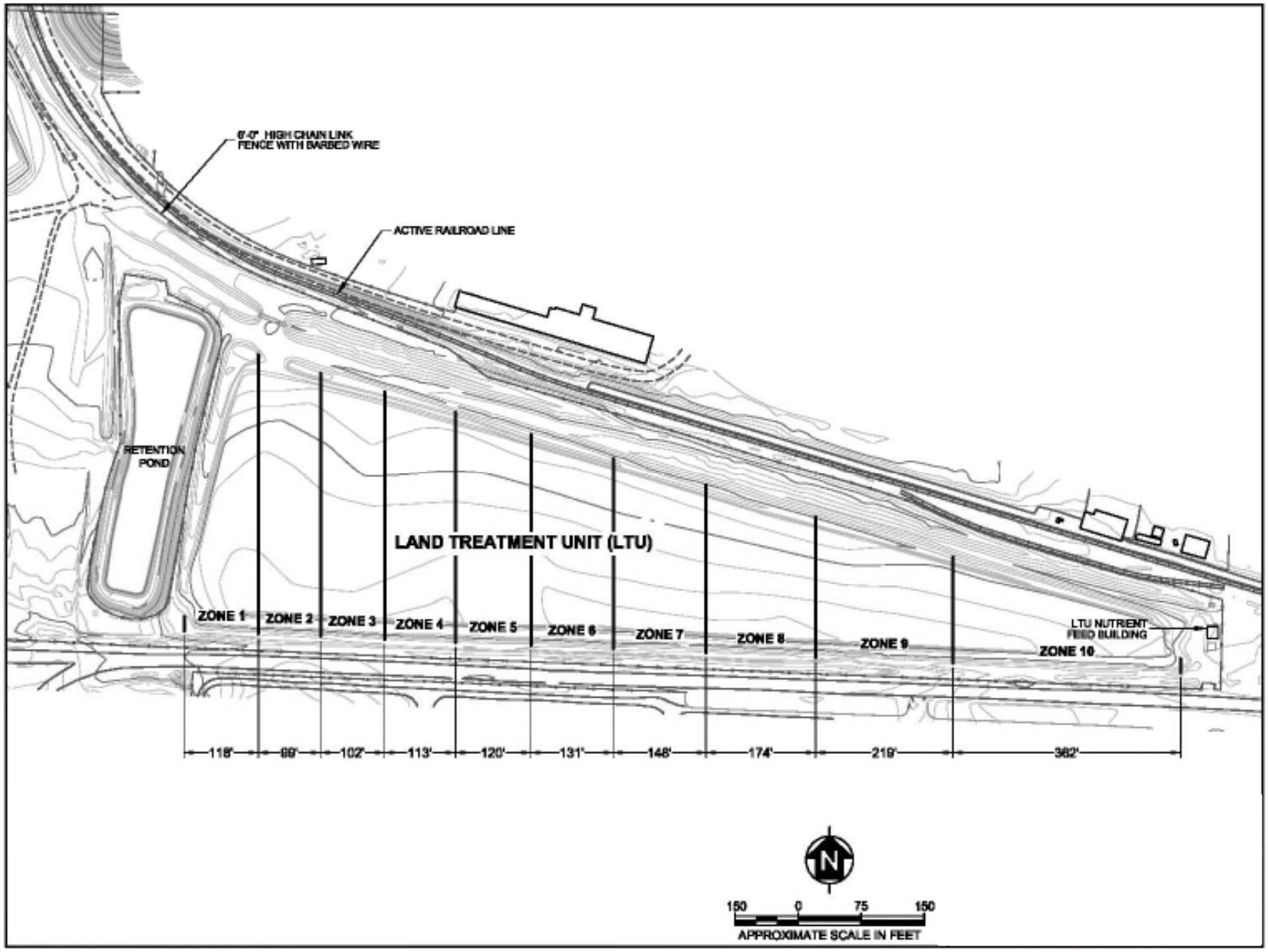


Figure 8. Locations of LTU Sampling Zones

TETRA TECH

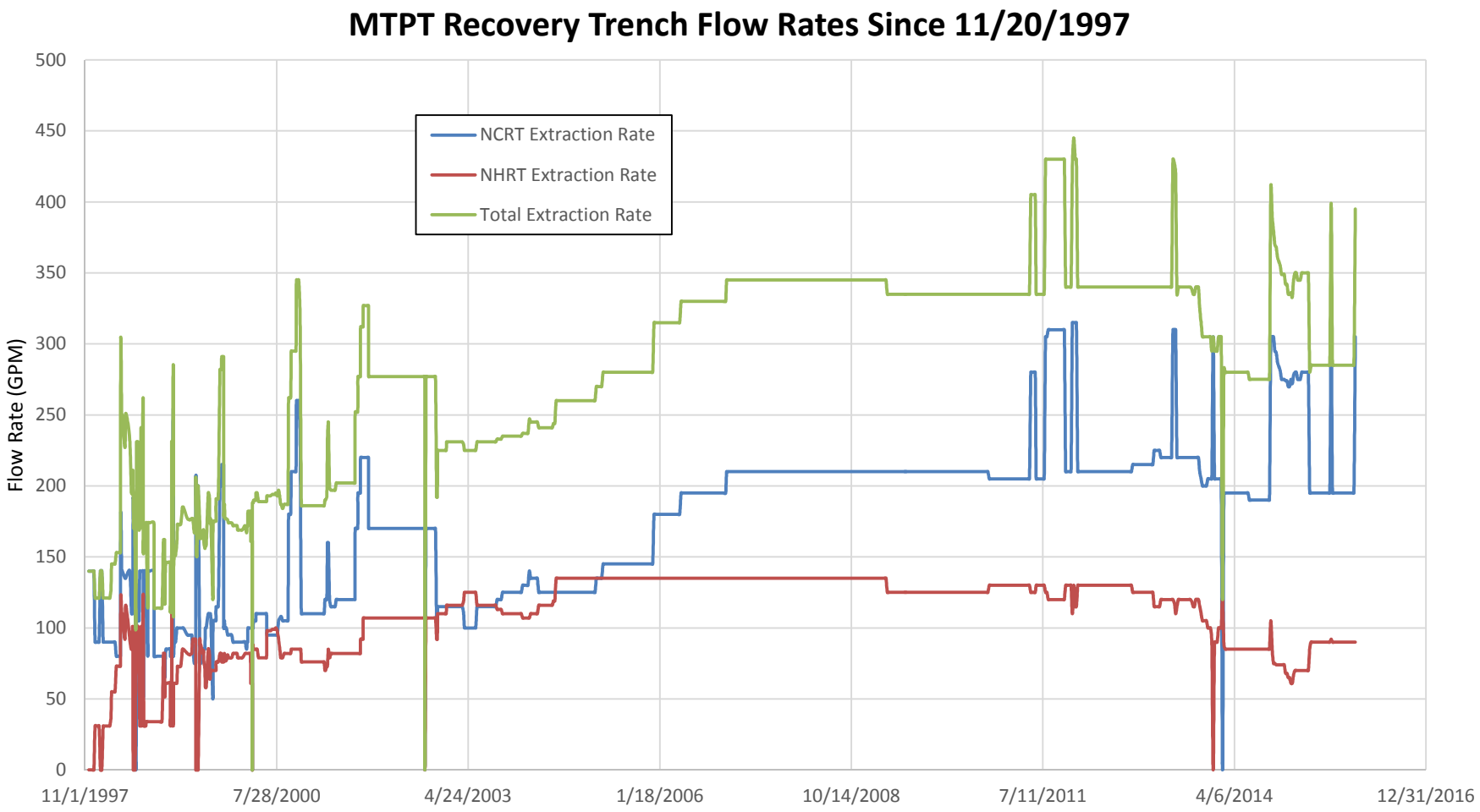


Figure 9. Flow Rates at MPTP Recovery Trenches since 11/20/97

TETRA TECH

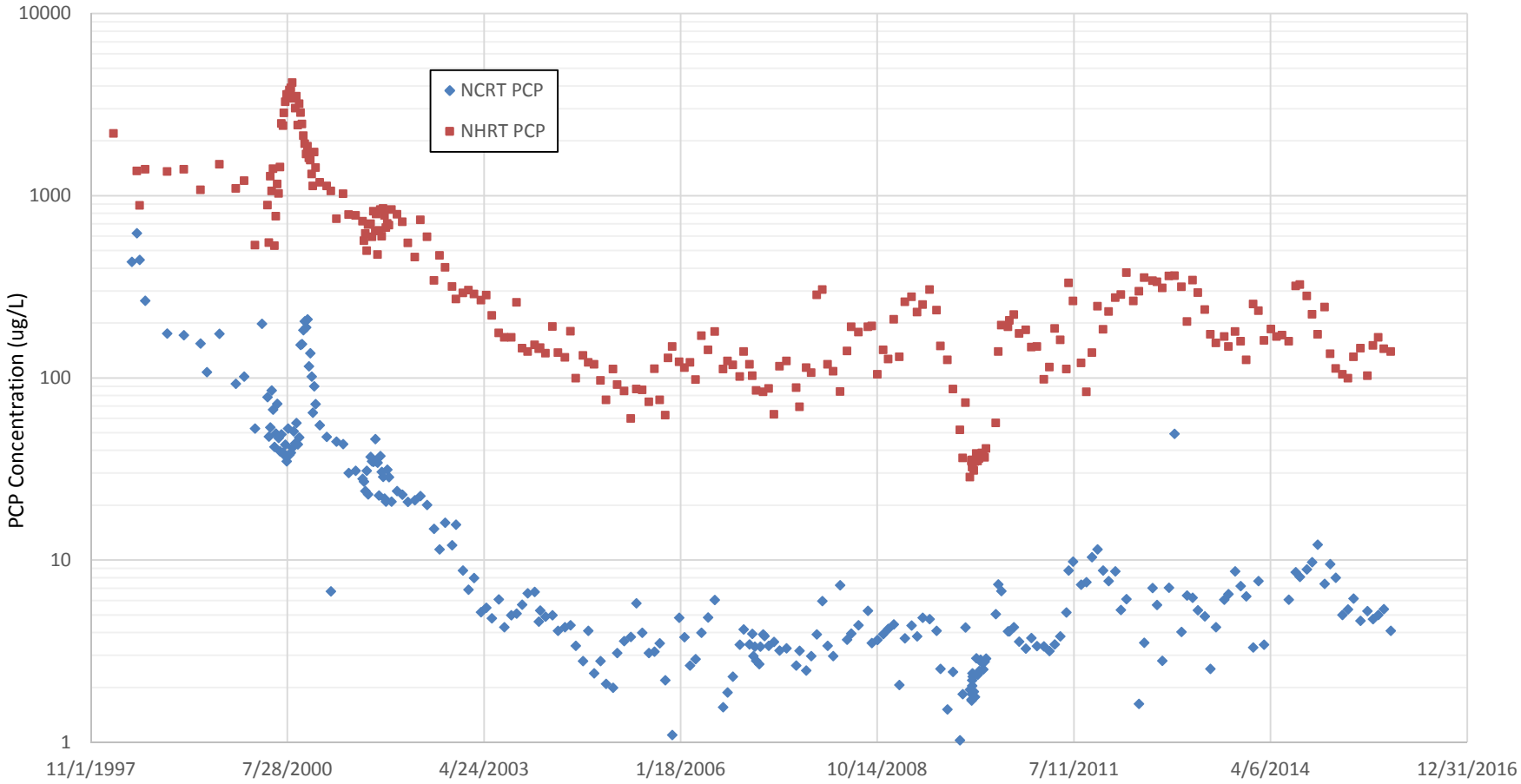


Figure 10. PCP Concentrations at MPTP Recovery Trenches since 11/20/97

TETRA TECH

Appendix A

References

References

Site-Specific Documents[8]:

The following Site-specific documents were reviewed for preparing this Five-Year Review (in date order, from most recent):

- *Grove Creek and Silver Bow Creek Floodplain Mapping near the Montana Pole Treatment Plant, Butte, Montana* (Tetra Tech, January 2016)
- *Draft Memorandum: Montana Pole and Treating Plant (MPTP) Cleanup Time Estimate* (Tetra Tech, January 28, 2016)
- MPTP *Quarterly Reports* for 2015 and MPTP *Annual Reports* for 2014, 2013, 2012, 2011 (Tetra Tech)
- *Construction Report for the Montana Pole and Treating Plant Water Treatment Plant Piping Modifications and Repairs, Summer/Fall 2014* (Tetra Tech, June 2015)
- *Draft Memorandum: "Feasibility Level Analysis" for In Situ Treatment Beneath Interstate 15/90* (Tetra Tech, October, 2013)
- DEQ/EPA Presentation for Citizens Technical Environmental Committee (CTEC) (October 29, 2013)
- *Draft Points of Compliance Analysis for the Montana Pole and Treating Plant, Butte-Silver Bow, Montana, Revision 1* (Tetra Tech, March 13, 2013)
- *Groundwater and Surface Water Monitoring Plan* (Tetra Tech, January 2013) *Construction Report: Power Pole and Soil Removal and Transport to the Butte Mine Waste Repository, Butte, Montana* (Tetra Tech, June 2012)
- *Third Five-Year Review Report for the Montana Pole and Treating Plant Site* (EPA and DEQ, June 2011)
- *Information Summary, Conceptual Model, and Groundwater Modeling Report: Butte Metro Sewer Treatment Plant Dewatering* (Tetra Tech, November 2010)
- *Final Treatability Study Workplan, Montana Pole And Treating Plant Site – Phase 5* (Tetra Tech, March 2009)
- *Phase 3 Construction Report* (CDM, 2001)
- *Montana Pole and Treating Plant Site Vadose Zone Soils Dioxin/Furan Mobility* Evaluation (CDM, September 2001)
- *Phase 1 Construction Report (CDM,* August 2001)

[8] There are some cases where documents are referenced in the text of this FYR based on summaries provided in other site documents, but only the documents specifically reviewed during this FYR are listed here. Also, for documents indicated as "Draft", the document has not been finalized, and is subject to change. The draft document is referenced here because information contained in the draft document is considered within this FYR

- *MPTP Remedial Investigation (RI) Report* (James M. Montgomery, 1993)
- MPTP *Record of Decision (ROD)* (EPA and DEQ, 1993)

DEQ's contractor and treatment plant operator (Tetra Tech) also provided updated Site data in the form of spreadsheets. Additional, various letters and emails from community members were reviewed.

Other Documents:

Butte Alluvial and Bedrock Controlled Ground Water Area - http://dnrc.mt.gov/divisions/water/water-rights/docs/cgwa/butte_alluvial_final_order.pdf

EPA, January 2016. *Transmittal of the Five-Year Review Recommended Template* (OSWER OLEM-9200.0-89).

EPA, February 2014. *Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors* (OSWER 9200.1-120).

EPA, September 2012. *Clarifying the Use of Protectiveness Determinations for Comprehensive Environmental Response, Compensation, and Liability Act Five-Year Reviews* (OSWER OLEM-9200.2-111).

EPA, April 1998. *Approach for Addressing Dioxin in Soil at CERCLA and RCRA Sites* (OSWER Directive 9200.4-26)

Montana Department of Environmental Quality, October 2012. *Circular DEQ-7, Montana Numeric Water Quality Standards.*

Montana Department of Environmental Quality, February 2008. *Circular DEQ-7, Montana Numeric Water Quality Standards.*

Montana Department of Environmental Quality, January 2004. *Circular WQB-7, Montana Numeric Water Quality Standards.*

Zoning in the vicinity of the MPTP site: http://co.silverbow.mt.us/DocumentCenter/View/150

ATTACHMENTS

Attachment 1

Completed Site Inspection Checklist

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Montana Pole and Treating Plant	**Date of inspection:** March 1, 2016
Location and Region: Butte, Montana (Region 8)	**EPA ID:** MTD 986073583
Agency, office, or company leading the five-year review: Montana DEQ, cooperatively with USEPA Region 8	**Weather/temperature:** Partly Cloudy, ~ 40°F

Remedy Includes: (Check all that apply)

- ☑ Landfill cover/containment
- ☑ Access controls
- ☑ Institutional controls
- ☑ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other Completed active soil remedy included a Land Treatment Unit
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☑ Vertical barrier walls *(wall on NHRT)*

Attachments: ☑ Inspection team roster attached (see main report) ☑ Site map attached (see main report)

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Tom Bowler (Name) — Site Operations Manager (Title) — Mar 1, 2016 (Date)
   Interviewed ☑ at site ☐ at office ☐ by phone Phone no. 406-723-7247
   Problems, suggestions; ☐ Report attached

2. **O&M staff** Travis Dunkle (Name) — Plant Operator (Title) — Mar 1, 2016 (Date)
   Interviewed ☑ at site ☐ at office ☐ by phone Phone no. 406-723-7247
   Problems, suggestions; ☐ Report attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☑ O&M manual	☑ Readily available	☑ Up to date	☐ N/A
☑ As-built drawings	☑ Readily available	☑ Up to date	☐ N/A
☑ Maintenance logs	☑ Readily available	☑ Up to date	☐ N/A

Remarks: *O&M Manual currently being revised, maintenance logs in spreadsheet form based on daily inspections.*

2. **Site-Specific Health and Safety Plan** ☑ Readily available ☑ Up to date ☐ N/A
   ☐ Contingency plan/emergency response plan ☑ Readily available ☑ Up to date ☐ N/A

   Remarks:

3. **O&M and OSHA Training Records** ☑ Readily available ☑ Up to date ☐ N/A

   Remarks:

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☑ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☑ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☑ N/A
☐ Other permits_____	☐ Readily available	☐ Up to date	☑ N/A

   Remarks:

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☑ N/A

   Remarks:

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☑ N/A

   Remarks:

7. **Groundwater Monitoring Records** ☑ Readily available ☑ Up to date ☐ N/A
   Available electronically at the Site and also available on the state of Montana's Groundwater Information Center Database.

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☑ N/A

   Remarks:

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☑ N/A
☐ Water (effluent)	☑ Readily available	☐ Up to date	☐ N/A

   Remarks: *Available electronically*

10. **Daily Access/Security Logs** ☑ Readily available ☑ Up to date ☐ N/A

    Remarks:

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☑ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other

Costs estimated by DEQ Site Manager. Approximately $28M to $29M remains in cash-out fund, which was originally $36M. Approximately $25M spent to date. Remaining value reflects stewardship of the fund including investments. Routine annual O&M costs for the MPTP site are approximately $850K/year.

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: *Trench pumps have required increased maintenance in the last five years due to the dewatering at the BSB WWTP. The lower water levels introduce more air into the pumps. The lower water levels resulting from the dewatering have also made it harder to sample some monitoring wells due to the smaller water column.*

V. ACCESS AND INSTITUTIONAL CONTROLS ☑ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☑ Gates secured ☐ N/A

Remarks:

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks – *Signs are placed on fence in 50 yard intervals around the Site.*

C. Institutional Controls (ICs)

1. **Implementation and enforcement** *not a simple "yes" or "no"- see text below}*

Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) GW Use Restriction Ordinance enforced by City
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☐ N/A
Other problems or suggestions: ☐ Report attached

With respect to soil, access to the site is limited by fencing, but permanent long-term ICs still need to be implemented, particularly on the south side of the site where less restricted use is foreseen in the near future. With respect to groundwater, a controlled groundwater area is in place, but it does not prevent significant increases in groundwater withdrawals from existing infrastructure, such as WWTP construction dewatering in vicinity of MPTP, which can adversely impact plume movement. DEQ is working to address this issue through permitting procedures. {This last item was subsequently completed}.

2. **Adequacy** ☐ ICs are adequate ☑ ICs are inadequate ☐ N/A

Remarks: *Land use restrictions will need to be implemented for the Site where less restricted access will occur. Controlled Groundwater Area needs to be revised to include notification of significant increases in groundwater withdrawals from existing infrastructure, such as WWTP construction dewatering in vicinity of MPTP. {This last item was subsequently completed}.*

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☑ No vandalism evident

Remarks: *One minor event in 2015 where somebody broke a gate and then tried (unsuccessfully) to get into the treatment building.*

2. **Land use changes on site** ☑ N/A

Remarks: *None*

3. **Land use changes off site** ☐ N/A

Remarks: *Hollow Contracting, located just south of the site across Greenwood Avenue, has built up the site of that property which promotes drainage of storm water from that site to the MPTP site.*

VI. GENERAL SITE CONDITIONS

A. Roads ☑ Applicable ☐ N/A

1.	**Roads damaged**	☐ Location shown on site map	☑ Roads adequate	☐ N/A
	Remarks:			
B. Other Site Conditions				
	Remarks: *A former house on the south side of the site was demolished in 2015.*			
VII. LANDFILL COVERS ☑ Applicable ☐ N/A				
A. Landfill Surface				
1.	**Settlement** (Low spots) Areal extent_____	☐ Location shown on site map Depth_____	☑ Settlement not evident	
	Remarks:			
2.	**Cracks** Lengths_____ Widths_____ Depths_____	☐ Location shown on site map	☑ Cracking not evident	
	Remarks:			
3.	**Erosion** Areal extent_____	☐ Location shown on site map Depth_____	☑ Erosion not evident	
	Remarks:			
4.	**Holes** Areal extent_____	☐ Location shown on site map Depth_____	☑ Holes not evident	
	Remarks:			
5.	**Vegetative Cover** ☐ Grass ☐ Trees/Shrubs (indicate size and locations on a diagram)	☐ Cover properly established	☑ No signs of stress	
	Remarks:			
6.	**Alternative Cover (armored rock, concrete, etc.)** ☑ N/A			
	Remarks:			
7.	**Bulges** Areal extent_____	☐ Location shown on site map Height_____	☑ Bulges not evident	
	Remarks:			

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident

☐ Wet areas	☐ Location shown on site map	Areal extent_____
☑ Ponding	☐ Location shown on site map	Areal extent_____
☐ Seeps	☐ Location shown on site map	Areal extent_____
☑ Soft subgrade	☐ Location shown on site map	Areal extent_____

Remarks: *Ponding refers to snowmelt, soft subgrade refers to discharge area for treatment plant. Plant operator indicates that no storm water has been observed to leave the site, even during flooding in 2011.*

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☑ No evidence of slope instability
Areal extent_____

Remarks:

B. Benches ☐ Applicable ☑ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay

Remarks:

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay

Remarks:

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay

Remarks:

C. Letdown Channels ☐ Applicable ☑ N/A

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____

Remarks:

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____

Remarks:

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____

Remarks:

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____

Remarks:

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____

Remarks:

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____

Remarks:

D. Cover Penetrations ☐ Applicable ☑ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A

Remarks:

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A

Remarks:

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A

Remarks:

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A

Remarks:

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A

Remarks:

E. Gas Collection and Treatment ☐ Applicable ☑ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs Maintenance

Remarks:

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs Maintenance

Remarks:

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs Maintenance ☐ N/A

Remarks:

F. Cover Drainage Layer ☐ Applicable ☑ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A

Remarks:

2. **Outlet Rock Inspected** ☐ Functioning ☑ N/A

Remarks:

G. Detention/Sedimentation Ponds ☐ Applicable ☑ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
☐ Siltation not evident

Remarks:

2. **Erosion** Areal extent_____ Depth_____
☐ Erosion not evident

Remarks:

3. **Outlet Works** ☐ Functioning ☐ N/A

Remarks:

4. **Dam** ☐ Functioning ☐ N/A

Remarks:

H. Retaining Walls ☐ Applicable ☑ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____

Remarks:

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident

Remarks:

I. Perimeter Ditches/Off-Site Discharge ☑ Applicable ☐ N/A

Storm water is routed around the areas where LTU soils were offloaded. Efforts are in progress to better document storm water management design and objectives, implement and document improvements if needed, and develop a plan for O&M of storm water infrastructure (including inspections), as part of the design for the final LTU offload and cover.

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____

   Remarks:

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____

   Remarks:

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____

   Remarks:

4. **Discharge Structure** ☐ Functioning ☐ N/A

   Remarks:

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☑ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____

   Remarks:

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored
   Frequency_____☐ Evidence of breaching
   Head differential_____

   Remarks:

IX. GROUNDWATER/SURFACE WATER REMEDIES ☑Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☑ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☑ Good condition ☑ All required wells located ☐ Needs O&M ☐ N/A

   Remarks: *Both recovery pumps jetted June 2015, replaced pumps in NHRT December 2013 and September 2015, and in NCRT in February 2014.*

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☑ Good condition ☐ Needs O&M

   Remarks: *Re-piping from NHRT and NCRT directly to treatment plant was completed in 2014, bypassing the previous oil/water separator.*

3. **Spare Parts and Equipment**
☑ Readily available ☑ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks:

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☑N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs O&M ☑N/A

Remarks:

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs O&M ☑N/A

Remarks:

C. Treatment System ☑Applicable ☐ N/A

. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☑ Carbon adsorbers
☐ Filters - Bag Filters
☐ Additive (*e.g.*, chelation agent, flocculent) Nutrients (fertilizer)
☐ Others_____
☑ Good condition ☐ Needs Maintenance
☑ Sampling ports properly marked and functional
☑ Sampling/maintenance log displayed and up to date
☑ Equipment properly identified
☑ Quantity of groundwater treated annually - *approximately 158 million gallons annually (300 gpm)*
☐ Quantity of surface water treated annually_____

Remarks: *Treatment flow rate is increased to mitigate WWTP dewatering when it occurs.*

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☑ Good condition ☐ Needs Maintenance

Remarks:

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☑ Good condition ☐ Proper secondary containment ☐ Needs Maintenance

Remarks: *Old product tank outside treatment building is now bypassed and should be removed.*

4. **Discharge Structure and Appurtenances**
☐ N/A ☑ Good condition ☐ Needs Maintenance

Remarks:

5. **Treatment Building(s)**
☐ N/A ☑ Good condition (esp. roof and doorways) ☐ Needs repair
☑ Chemicals and equipment properly stored

Remarks – *No chemicals used except acid for sampling that is only on-site just prior to sampling.*

6. **Monitoring Wells** (pump and treatment remedy)
☑ Properly secured/locked ☑ Functioning ☑ Routinely sampled ☑ Good condition
☑ All required wells located ☐ Needs Maintenance ☐ N/A

Remarks: *Wells inside fenced area are not locked. Wells outside fenced area that are not in the controlled area are locked. In controlled area (Silver Bow Creek floodplain), wells serve multiple purposes and are not locked to allow access by multiple parties. Wells installed in 2006 have used PVC as a protective well casing instead of state approved metal casing due to potential for frost heaving in this area. Wells installed in 2010 have no protective casing due to potential for settlement.*

D. Monitoring Data

1. Monitoring Data
☑ Is routinely submitted on time ☑ Is of acceptable quality

2. Monitoring data suggests:
☑ Groundwater plume is effectively contained ☑ Contaminant concentrations are declining

No longer free product. Extracted PCP concentrations have declined since remedy began but have stabilized in recent years. There is PCP north of Silver Bow Creek but it is unknown if those impacts were present before the remedy or if those impacts were pulled over by WWTP dewatering.

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☑ N/A
Remarks_____

X. OTHER REMEDIES

☑ N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Pump and treat was intended for hydraulic containment and appears effective. LTU was effective for remediating PCP and PAHs in soils, but dioxin remains in treated soils above ROD cleanup standards. The plan is to place these treated soils on site with appropriate engineering controls (cover and storm water management) and institutional controls.

B.	Adequacy of O&M
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. *Permanent ICs need to be established. An updated storm water management plan is needed and is being developed. A mitigation approach to address dewatering operations for construction at the WWTP appears to be effective.*

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. *Dewatering operations at the WWTP have upset site equilibrium.*

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. *Treatment plant operators suggested several potential monitoring reductions (frequency and parameters), as discussed in the FYR text. An energy efficiency evaluation was performed in 2014.*

Attachment 2

Copy of Newspaper Notice of Fourth Five-Year Review

Review of Cleanup at the Montana Pole and Treating Plant Superfund Site

The Montana Department of Environmental Quality (DEQ) and the U.S. Environmental Protection Agency (EPA) are conducting a Five-Year Review on the Montana Pole and Treating Plant (MPTP) Superfund Site. The Five-Year Review is a regular checkup on a Superfund site to ensure that cleanup decisions continue to protect people and the environment. This represents the fourth five-year review on the remedial actions implemented at the MPTP Site.

People living in the area of the site may have information that can help the review team decide if the site is still safe. Here are some examples of things to tell MDEQ about:

- Ways the cleanup at the site has helped or hurt the neighborhood;
- Broken fences, unusual odors, dead plants, materials leaving the site or other problems;
- Buildings or land around the site being used in new ways;
- Any unusual activity at the site such as dumping, vandalism or trespassing.

If you have not already participated in an interview for the five-year review and are interested in doing so, please contact Jeni Flatow at 406-444-6469 or David Bowers at 406-444-6335 by April 27.

The deadline to have the fourth five-year review completed is June 2016.

If you would like to learn more about the Montana Pole and Treating Plant Superfund Site, please visit the DEQ website at http://deq.mt.gov/Land/fedsuperfund/mtpole.

474300

n underage drinking weekend in Butte


Twomey

It was more than the legal limit, the sheriff said. He is charges of endanger- e welfare of a child sorderly conduct, his- nors. s also with r in sion hol. mey leased at rom unty e Sunday afternoon. separate incident ing underage drink- lice responded to a of a juvenile party on 0 block of Ketchum bout 11 p.m. Sunday. letich said police not access the resi- however, a 14-year- l was found hiding n the backseat of arked on Ketchum Lane. A portable breath test showed alcohol in her system. The teen was cited and released to a parent.

Shortly after midnight, police stopped a white 2002 Ford pickup truck with several males in the area of Mount Highland and Continental drives who they believe had attended the party.

Skuletich three 18-year-old males and one 17-year-old male, all of Butte, were cited after a breath test identified alcohol in their systems. The teens were released to a parent at the scene or driven home by a police officer. The driver, 17, was not cited.

The undersheriff said alcohol was not found in either car and that police were unable to estimate how many people were in the Ketchum Lane residence at the time of the party.

sted for ng knife,


Naresh

, who or her led fter struck ls with e and ed l. ay highly intoxicated me of the incident. was arrested about n. Sunday. n police arrived, — who was wanted ony parole viola- was sitting on the ith bleeding cuts to ers. The woman suf- ratches to a leg. sh is being held at nty jail on $20,000 preliminary hearing ed for March 31.

On the Books

HOME BURGLARY

A woman who returned home after a three-week absence reported stolen items valued at $2,000. Two flat-screen TVs, an entertainment center, nine New Era baseball caps and 10 pairs of Jordan shoes went missing from her apartment on the 1300 block of West Quartz Street.

DUI

- Paul Battermann, 69, of Butte was stopped in the area of Oregon and Second on Friday after police said they saw him speeding in a 2012 Ford pickup truck. Police sought a warrant for a blood test. He is facing misdemeanor DUI and felony possession of methadone, after police found 20 pills in a bag.
- Weston Comfort, 33, of Belgrade was arrested on a stop light violation and aggravated DUI, both misdemeanors, after police allege he failed to stop and was pulled over at Shields and Mercury early Saturday. A Breathalyzer test showed his blood alcohol content more than double the limit.
- Police say Chrystyna Gillespey, 21, of Butte was speeding on the 1300 block of Granite Street about 2:30 a.m. Saturday. A Breathalyzer showed her blood alcohol content was more than double the legal limit. She is facing misdemeanor charges of careless driving and aggravated DUI.
- Joseph Rivers, 19, of Butte was found asleep in a parked car that was running in the area of Zarelda and Henry shortly before 6 a.m. Saturday. He said he drank 15 or 16 Bud Light beers at a bonfire behind Montana Tech. He was booked on DUI and no liability insurance .

THEFT

Fiesta En Jalisco restaurant in Butte reported two 18-year-old females left without paying for their meals valued at about $37 on Saturday night. Police say management does not want to file charges. Instead, payment from the teens is requested.

MISDEMEANOR ASSAULT

James Keeney, 44, of Butte is facing partner assault and disorderly conduct, both misdemeanors, after a 31-year-old female reported he slapped and knocked her to the ground in a residence on the 200 block of West Silver Street on Sunday night. The woman called police after a neighbor intervened.

Keeney allegedly returned to the home about 2 a.m. Monday where the two argued before he attempted to flee and was arrested.

Attachment 3
Data Summary Tables

Table	Media	Contents
A3-1	LTU Soil	LTU soil results after 2007 offload for PCP and dioxins
A3-2	LTU Soil	LTU soil results after 2007 offload for PAHs
A3-3	Treatment Plant	PCP (monthly in 2015, annual summary for other years)
A3-4	Treatment Plant	Dioxin TEQ (annual)
A3-5	Treatment Plant	Metals, PAHs, chlorophenols and anions (2015)
A3-6	Groundwater	Historical concentrations of PCP for selected groundwater samples
A3-7	Groundwater	Historical concentrations of dioxin TEQ for groundwater samples
A3-8	Groundwater	Summary of dioxin TEQ in Laboratory Method Blanks, 2009-2015
A3-9	Groundwater	Comparison of unfiltered and filtered dioxin TEQ data and values for turbidity
A3-10	Groundwater	Concentrations of chlorophenols and PAH, 2015
A3-11	Surface Water	PCP (2001-2014 range and 2015 individual sampling event results)
A3-12	Surface Water	Dioxin TEQ (annual)
A3-13	Surface Water	PAHs and chlorophenols (2015)

TABLE A3-1
LTU SAMPLING RESULTS FOLLOWING 2007 LTU OFFLOAD

	2-Oct-07		2-Jul-08	2-Oct-08	8-Jul-09	14-Oct-10	19-Sep-11	26-Sep-12		1-Oct-13	
Sample	PCP	Dioxin TEQ	PCP	PCP	PCP	PCP	PCP	PCP	Dioxin TEQ	PCP	Dioxin TEQ
Cleanup levels	34 mg/kg	0.2 µg/kg	34 mg/kg	34 mg/kg	34 mg/kg	34 mg/kg	34 mg/kg	34 mg/kg	0.2 µg/kg	34 mg/kg	0.2 µg/kg
Units	mg/kg	µg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	mg/kg	µg/kg
Laboratory	MBMG	TAL	MBMG	MBMG	MBMG	MBMG	MBMG	MBMG	Pace	MBMG	Pace
Method	8270	8290	8270	8270	8270	8270	8270	8270	8290	8270	8290
LTUZ01 0-24"	20.7	--	**82.10**	**61.9**	**42**	22.2	18.6	13.9	--	--	--
LTUZ01 24-36"	17.5	--	**69.10**	**52.2**	**41.2**	20.8	10.3	1.3	--	--	--
LTUZ01 Comp	--	**1.9**		--	--	--	--	--	**3.6**	--	**2.5**
LTUZ02 0-24"	28.4	--	**109**	**75.7**	**81.1**	**67.3**	**34.9**	32.6	--	20.3	--
LTUZ02 24-36"	**87.6**	--	**124**	**160**	**162**	**64.4**	**47.6**	**36.2**	--	18.6	--
LTUZ02 Comp	--	**9.1**		--	--		--	--	**2.8**	--	**4.2**
LTUZ03 0-24"	**55.9**	--	**187**	**79.5**	21.5	14.5	**97.9**	**91.7**	--	**39.1**	--
LTUZ03 24-36"	**153**	--	**343**	--	**149**	16.6	**96.1**	**77.7**	--	**39.3**	--
LTUZ03 Comp	--	**2.6**		--	--	--	--	--	**1.8**	--	**2.3**
LTUZ04 0-24"	15.9	--	**156**	**36.2**	**46.9**	14.6	**49.9**	12.2	--	**45.7**	--
LTUZ04 24-36"	13.4	--	**246**	**256**	**37.2**	14.5	**50.9**	13.1	--	**40.9**	--
LTUZ04 Comp	--	**1.6**		--	--	--	--	--	**2.8**	--	**1.9**
LTUZ05 0-24"	18.3	--	**49.1**	**63.3**	**42.6**	**34.0**	**51.8**	**37.2**	--	13.9	--
LTUZ05 24-36"	15.5	--	**64.2**	**147**	**50.1**	**50.7**	**41.9**	**34.2**	--	12.2	--
LTUZ05 Comp	--	**1.2**		--	--	--	--	--	**3.7**	--	**1.0**
LTUZ06 0-24"	21.8	--	**40.6**	**50.5**	**63.9**	28.5	33.4	**41.3**	--	19.3	--
LTUZ06 24-36"	16.7	--	32.1	**93.3**	**79**	31.6	32.8	**46.2**	--	19.1	--
LTUZ06 Comp	--	**1.9**		--	--	--	--	--	**2.5**	--	**2.7**
LTUZ07 0-24"	18.9	--	3.6	--	--	--	20.2	20.1	--	--	--
LTUZ07 24-36"	13.0	--	32.6	--	--	--	20.3	22.4	--	--	--
LTUZ07 Comp	--	**1.1**	--	--	--	--	--	--	**6.0**	--	**3.7**
LTUZ08 0-24"	13.1	--	1.9	--	--	--	27.6	18.6	--	--	--
LTUZ08 24-36"	33.7	--	4.7	--	--	--	28.2	15.7	--	--	--
LTUZ08 Comp	--	**1.3**	--	--	--	--	--	--	**1.9**	--	**3.2**
LTUZ09 0-24"	9.26	--	2.74	--	--	--	16.3	6.2	--	--	--
LTUZ09 24-36"	32.0	--	2.3	--	--	--	22.8	5.8	--	--	--
LTUZ09 Comp	--	**1.1**	--	--	--	--	--	--	**1.0**	--	**2.0**
LTUZ10 0-24"	15.4	--	4.1	--	--	--	32.0	1.4	--	--	--
LTUZ10 24-36"	15.0	--	4.1	--	--	--	**35.8**	6.5	--	--	--
LTUZ10 Comp	--	**0.9**	--	--	--	--	--	--	**1.6**	--	**2.2**
Average	30.7	**2.3**	77.9	97.8	68.0	31.6	38.5	26.7	**2.8**	26.8	**2.6**

Notes:
October 2007 sampling was conducted after 2007 LTU offload and after addition of SSP soils for final treatment.
Dioxin toxicity equivalency quotients (TEQ) were calculated using dioxin toxicity equivalency factors (TEF) provided in the ROD.
Soil samples were not collected from the LTU in 2014 or 2015.

--	Not analyzed	Pace	Pace Analytical
µg/kg	Micrograms per kilogram	PCP	Pentachlorophenol
Bold	Concentration greater than cleanup level	ROD	Record of Decision
Comp	Composite	SSP	Soil salvage piles
LTU	Land treatment unit	TAL	Test America Laboratories / Severn Trent Laboratories, Inc.
MBMG	Montana Bureau of Mines and Geology Laboratory	TEF	Toxicity equivalency factor
mg/kg	Milligrams per kilogram	TEQ	Toxicity equivalency quotient

Table A3-2

LTU SAMPLING RESULTS FOLLOWING 2007 LTU OFFLOAD

POLYCYCLIC AROMATIC HYDROCARBONS

Date Sampled	2-Oct-07	19-Sep-11
Sample	B2PAH TEQ	B2PAH TEQ
Cleanup levels	4.2	4.2
Units	mg/kg	mg/kg
Laboratory	MBMG	MBMG
Method	8270	8270
LTUZ01 0-18"	<1.25	--
LTUZ01 18-30"	<1.25	--
LTUZ01 Comp	--	<DL
LTUZ02 0-18"	<1.25	--
LTUZ02 18-30"	<1.25	--
LTUZ02 Comp	--	<DL
LTUZ03 0-18"	<1.25	--
LTUZ03 18-30"	<1.25	--
LTUZ03 Comp	--	<DL
LTUZ04 0-18"	<1.25	--
LTUZ04 18-30"	<1.25	--
LTUZ04 Comp	--	<DL
LTUZ05 0-18"	<1.25	--
LTUZ05 18-30"	<1.25	--
LTUZ05 Comp	--	<DL
LTUZ06 0-18"	<1.25	--
LTUZ06 18-30"	<1.25	--
LTUZ06 Comp	--	<DL
LTUZ07 0-18"	<1.25	--
LTUZ07 18-30"	<1.25	--
LTUZ07 Comp	--	<DL
LTUZ08 0-18"	<1.25	--
LTUZ08 18-30"	<1.25	--
LTUZ08 Comp	--	<DL
LTUZ09 0-18"	<1.25	--
LTUZ09 18-30"	<1.25	--
LTUZ09 Comp	--	<DL
LTUZ10 0-18"	<1.25	--
LTUZ10 18-30"	<1.25	--
LTUZ10 18-30" (field dup)	<1.25	--
LTUZ10 Comp	--	<DL

Notes:

--	Not analyzed
< DL	Not detected at laboratory specified detection lir
Bold	Concentration greater than cleanup level
Comp	Composite
LTU	Land treatment unit
MBMG	Montana Bureau of Mines and Geology Laborat
mg/kg	Milligrams per kilogram
PAH	Polycyclic aromatic hydrocarbons
TEQ	Toxicity Equivalency Quotient

NOTE: October 2007 sampling conducted after 2007 LTU offload and after addition of SSP soils for final treatment.

TABLE A3-3
HISTORICAL CONCENTRATIONS OF PCP FOR WTP SAMPLES

Date	Laboratory	EPA Method	NHRT Effluent (NHRTEFF)	NCRT Effluent (NCRTEFF)	WTP Influent (IN)	WTP Beteen Tanks (BABB)	WTP Effluent (EFF)	ROD Cleanup Level[a] (µg/L)
2001 Range	MBMG	528	476 - 1185	6.76 - 55.2	130 - 631	--	0.1U - **1.12**	1.0
2002 Range	MBMG	528	272 - 842	11.5 - 24	143 - 463	--	0.1U - **7.08**	1.0
2003 Range	MBMG	528	140 - 304	4.3 - 8.8	47 - 262	17.0	0.04U - **1.7**	1.0
2004 Range	MBMG	528	97 - 192	2.4 - 6.7	33 - 82	0.11 - 4.1	0.056 - 0.39	1.0
2005 Range	MBMG	528	60 - 149	1.1 - 5.8	25.7 - 73.7	0.04 - 1.2	0.1U - 0.4	1.0
2006 Range	MBMG	528	98 - 180	1.56 - 6.06	4.21 - 98.8	0.062 - 9.83	0.1U - **3.35**	1.0
2007 Range	MBMG	528	63.2 - 286	2.69 - 3.92	19.3 - 310	0.126 - 1.05	0.06 - 0.483	1.0
2008 Range	MBMG	528	84.5 - 306	2.98 - 7.81	16.9 - 296	0.11 - 17.2	0.089 - **2.58**	1.0
2009 Range	MBMG	528	36.4 - 306	1.03 - 4.84	17.8 - 153	0.2U - 18.7	0.082 - **7.13**	1.0
2010 Range	MBMG	528	31.1 - 233	1.70 - 7.38	10.8 - 84.6	0.2U - 4.3	0.207 - **1.46**	1.0
2011 Range	MBMG	528	84.2 - 333	3.18 - 11.5	9.14 - 137	0.267 - 39.4	0.208 - **15.7**	1.0
2012 Range	MBMG	528	232 -379	0.785 - 49.4	35.5 - 161	0.456 - 14.6	0.23 - **1.03**	1.0
2013 Range	MBMG	528	126 - 345	2.54 - 8.71	0.852 -176	0.2U - 31.1	0.2U - **11.1**	1.0
2014 Range	MBMG	528	159 - 326	0.2U - 12.2	17.5 - 250	0.2U - 38.9	0.2U - **10.4**	1.0
2015 Range	MBMG	528	100 - 245	4.1 - 9.5	22.7 - 52.3	0.2U - 0.64	0.2U - 0.271	1.0
1/5/2015	MBMG	528	245	7.4	25.1	0.26	0.2U	1.0
1/12/2015	MBMG	528			23.0	0.56	0.2U	1.0
1/19/2015	MBMG	528			26.8	0.28	0.2U	1.0
1/26/2015	MBMG	528			28.7	0.21	0.2U	1.0
2/2/2015	MBMG	528	136	9.5	23.4	0.21	0.2U	1.0
2/9/2015	MBMG	528			22.7	0.24	0.2U	1.0
2/16/2015	MBMG	528			23.1	0.25	0.2U	1.0
2/23/2015	MBMG	528			31.0	0.46	0.2U	1.0
3/2/2015	MBMG	528	113	8.0	36.8	0.2U	0.2U	1.0
3/9/2015	MBMG	528			32.1	0.25	0.2U	1.0
3/16/2015	MBMG	528			26.9	0.2U	0.2U	1.0
3/23/2015	MBMG	528			29.8	0.31	0.2U	1.0
3/30/2015	MBMG	528			36.9	0.2U	0.2U	1.0
4/6/2015	MBMG	528	105	5.0	30.7	0.2U	0.2U	1.0
4/13/2015	MBMG	528			32.5	0.2U	0.2U	1.0
4/20/2015	MBMG	528			27.6	0.21	0.2U	1.0
4/27/2015	MBMG	528			28.9	0.2U	0.2U	1.0
5/4/2015	MBMG	528	99.9	5.4	28.3	0.2U	0.2U	1.0
5/11/2015	MBMG	528			40.2	0.27	0.2U	1.0
5/18/2015	MBMG	528			44.4	0.56	0.2U	1.0
5/26/2015	MBMG	528			38.8	0.27	0.2U	1.0
6/1/2015	MBMG	528	131	6.2	45.1	0.53	0.2U	1.0
6/8/2015	MBMG	528			48.9	0.37	0.2U	1.0
6/15/2015	MBMG	528			39.6	0.24	0.2U	1.0
6/22/2015	MBMG	528			39.5	0.64	0.2U	1.0
6/29/2015	MBMG	528			42.0	0.41	0.2U	1.0
7/6/2015	MBMG	528	146	4.7	50.6	0.23	0.2U	1.0
7/13/2015	MBMG	528			38.9	0.29	0.2U	1.0
7/20/2015	MBMG	528			46.3	0.31	0.2U	1.0
7/27/2015	MBMG	528			34.3	0.28	0.2U	1.0
8/3/2015	MBMG	528			42.2	0.23	0.2U	1.0
8/10/2015	MBMG	528	103	5.3	35.1	0.30	0.2U	1.0
8/17/2015	MBMG	528			31.6	0.31	0.222	1.0
8/24/2015	MBMG	528			34.0	0.2U	0.2U	1.0
8/31/2015	MBMG	528			29.0	0.28	0.2U	1.0
9/8/2015	MBMG	528	151	4.8	42.9	0.2U	0.2U	1.0
9/14/2015	MBMG	528			46.6	0.24	0.2U	1.0
9/21/2015	MBMG	528			49.4	0.34	0.2U	1.0
9/28/2015	MBMG	528			46.0	0.23	0.2U	1.0
10/5/2015	MBMG	528	167	5.0	46.9	0.23	0.2U	1.0
10/12/2015	MBMG	528			42.7	0.55	0.242	1.0
10/19/2015	MBMG	528			47.4	0.29	0.271	1.0
10/26/2015	MBMG	528			41.2	0.2U	0.2U	1.0
11/2/2015	MBMG	528	145	5.4	52.3	0.23	0.2U	1.0
11/9/2015	MBMG	528			40.6	0.29	0.2U	1.0
11/16/2015	MBMG	528			46.4	0.2U	0.2U	1.0
11/23/2015	MBMG	528			38.5	0.24	0.2U	1.0
11/30/2015	MBMG	528			45.1	0.2U	0.2U	1.0
12/7/2015	MBMG	528	140	4.1	40.9	0.2U	0.2U	1.0
12/14/2015	MBMG	528			44.2	0.2U	0.2U	1.0
12/21/2015	MBMG	528			41.9	0.25	0.2U	1.0
12/28/2015	MBMG	528			44.4	0.2U	0.2U	1.0

Notes:

All units are in µg/L unless otherwise noted.

--	Not sampled
µg/L	Micrograms per liter
a	Cleanup level applies to the WTP effluent sample, only.
BABB	WTP sample collected from between primary and secondary carbon vessels
Bold	Concentration exceeds ROD discharge to surface water cleanup level (1.0 µg/L)
EPA	U.S. Environmental Protection Agency
MBMG	Montana Bureau of Mines and Geology
MPTP	Montana Pole and Treating Plant
NCRT	Near creek recovery trench
NHRT	Near highway recovery trench
PCP	Pentachlorophenol
ROD	Record of Decision
U	Analyzed for but not detected above the method detection limit

TABLE A3-4
HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR WTP SAMPLES

(µg/L)

Sample Date	NHRT Effluent (NHRTEFF) (µg/L)	NCRT Effluent (NCRTEFF) (µg/L)	WTP Influent (IN) (µg/L)	WTP Effluent (EFF) (µg/L)	ROD Cleanup Level[a] (µg/L)
8/13/2001	4.60E-07	9.20E-07	2.03E-06	2.40E-07	1.00E-05
2/4/2002	4.60E-07	1.60E-07	3.21E-06	1.30E-07	1.00E-05
8/12/2002	5.50E-07	1.19E-06	1.53E-06	2.10E-07	1.00E-05
2/3/2003	2.70E-07	4.17E-06	2.16E-06	6.90E-07	1.00E-05
8/4/2003	2.30E-07	2.16E-06	1.57E-06	3.00E-07	1.00E-05
2/2/2004	1.50E-07	8.30E-07	8.50E-07	1.40E-07	1.00E-05
8/2/2004	2.20E-07	3.09E-06	1.40E-06	5.60E-07	1.00E-05
8/8/2005	7.60E-07	1.29E-06	1.95E-05	1.28E-06	1.00E-05
2/6/2006	2.10E-07	8.50E-07	2.78E-06	1.00E-06	1.00E-05
8/21/2006	2.10E-07	2.70E-07	7.70E-07	2.86E-06	1.00E-05
8/27/2007	8.70E-08	8.10E-07	0.00E+00	3.10E-07	1.00E-05
8/26/2008	1.70E-07	1.58E-06	5.60E-07	1.70E-07	1.00E-05
8/10/2009	6.20E-07	3.92E-06	1.80E-06	1.80E-07	1.00E-05
8/16/2010	1.12E-05	5.84E-06	4.40E-06	5.80E-07	1.00E-05
8/15/2011[b]	1.91E-07	1.90E-07	3.91E-07	7.60E-08	1.00E-05
8/13/2012	2.27E-05	1.21E-05	7.26E-06	4.40E-07	1.00E-05
8/12/2013	1.27E-04	7.72E-06	3.58E-05	3.69E-07	1.00E-05
8/11/2014	1.06E-05	3.07E-06	6.75E-06	7.99E-07	1.00E-05
8/10/2015	5.68E-06	7.72E-06	4.48E-06	4.00E-07	1.00E-05

HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR WTP SAMPLES

(pg/L)

Sample Date	NHRT Effluent (NHRTEFF) (pg/L)	NCRT Effluent (NCRTEFF) (pg/L)	WTP Influent (IN) (pg/L)	WTP Effluent (EFF) (pg/L)	ROD Cleanup Levela (pg/L)
8/13/2001	0.46	0.92	2.03	0.24	10.00
2/4/2002	0.46	0.16	3.21	0.13	10.00
8/12/2002	0.55	1.19	1.53	0.21	10.00
2/3/2003	0.27	4.17	2.16	0.69	10.00
8/4/2003	0.23	2.16	1.57	0.30	10.00
2/2/2004	0.15	0.83	0.85	0.14	10.00
8/2/2004	0.22	3.09	1.40	0.56	10.00
8/8/2005	0.76	1.29	19.50	1.28	10.00
2/6/2006	0.21	0.85	2.78	1.00	10.00
8/21/2006	0.21	0.27	0.77	2.86	10.00
8/27/2007	0.09	0.81	0.00	0.31	10.00
8/26/2008	0.17	1.58	0.56	0.17	10.00
8/10/2009	0.62	3.92	1.80	0.18	10.00
8/16/2010	11.20	5.84	4.40	0.58	10.00
8/15/2011[b]	0.19	0.19	0.39	0.08	10.00
8/13/2012	22.70	12.10	7.26	0.44	10.00
8/12/2013	127.00	7.72	35.80	0.37	10.00
8/11/2014	10.60	3.07	6.75	0.80	10.00
8/10/2015	5.68	7.72	4.48	0.40	10.00

Notes:

TEQs were calculated using ROD TEFs with zero for non-detects

µg/L	Micrograms per liter
pg/L	Picograms per liter
a	Cleanup level applies to the WTP effluent sample, only.
b	Data for this date appear to be anomalously low.
MPTP	Montana Pole and Treating Plant
NCRT	Near creek recovery trench
NHRT	Near highway recovery trench
ROD	Record of Decision
TEF	Toxicity equivalence factor
TEQ	Toxicity equivalent
WTP	MPTP water treatment plant

TABLE A3-5
CONCENTRATIONS OF METALS, PAH, CHLOROPHENOLS, AND ANIONS FOR WTP SAMPLES

	NHRT Effluent (NHRTEFF)	NCRT Effluent (NCRTEFF)	WTP Influent (IN)	WTP Effluent (EFF)	ROD[b]
ANALYTES					
METALS, TOTAL[a] (EPA Method 200.8)					
ARSENIC	8.81	2.73	4.73	2.69	48
CADMIUM	0.25U	0.25U	0.25U	0.25U	1.1 (0.8) [c]
CHROMIUM	0.61	0.93	1.56	0.68	11
COPPER	2.29	4.29	1.89	1.28	12
IRON (mg/L)	0.707	0.11	0.296	0.038U	-
LEAD	0.15U	0.15U	0.15U	0.15U	3.2
MANGANESE (mg/L)	0.867	0.050	0.316	0.017	-
ZINC	5.18	18.16	12.54	5.69	110
PAH (EPA Method SW8270C)					
ACENAPHTHENE	1.0U	1.0U	1.0U	1.0U	-
ACENAPHTHYLENE	1.0U	1.0U	1.0U	1.0U	-
ANTHRACENE	1.0U	1.0U	1.0U	1.0U	-
BENZO(A)ANTHRACENE	1.0U	1.0U	1.0U	1.0U	1
BENZO(A)PYRENE	0.1U	0.1U	0.1U	0.1U	0.2 (0.05) [c]
BENZO(B)FLUORANTHENE	0.2U	0.2U	0.2U	0.2U	0.2
BENZO(G,H,I)PERYLENE	1.0U	1.0U	1.0U	1.0U	1
BENZO(K)FLUORANTHENE	1.0U	1.0U	1.0U	1.0U	1
CHRYSENE	1.0U	1.0U	1.0U	1.0U	1
DIBENZO(A,H)ANTHRACENE	0.66	0.2U	0.2U	0.2U	0.2
FLUORANTHENE	1.0U	1.0U	1.0U	1.0U	-
FLUORENE	1.0U	1.0U	1.0U	1.0U	-
INDENO(1,2,3-CD)PYRENE	1.0U	1.0U	1.0U	1.0U	1
NAPHTHALENE	1.0U	1.0U	1.5	1.0U	-
PHENANTHRENE	1.0U	1.0U	1.0U	1.0U	-
PYRENE	1.0U	1.0U	1.0U	1.0U	-
TOTAL D PAHs	1.0U	1.0U	1.5	1.0U	360
CHLOROPHENOLS (EPA Method SW8270C)					
2,3,4,6-TETRACHLOROPHENOL	1.0U	1.0U	1.0U	1.0U	-
2,3,5,6-TETRACHLOROPHENOL	5	1.0U	1.5	1.0U	267
2,4,5-TRICHLOROPHENOL	1.0U	1.0U	1.0U	1.0U	-
2,4,6-TRICHLOROPHENOL	1.0U	1.0U	9.6	1.0U	-
2,4-DICHLOROPHENOL	1.0U	1.0U	1.0U	1.0U	45
2-CHLOROPHENOL	1.0U	1.0U	1.0U	1.0U	27
4-CHLORO-3-METHYLPHENOL	1.0U	1.0U	1.0U	1.0U	6.5
PENTACHLOROPHENOL	103	5.27	35.1	0.2U	1
ANIONS[a] (EPA Method 300)					
BROMIDE	268	227	230	226	-
CHLORIDE (mg/L)	53.55	62.6	59.97	58.85	-
FLUORIDE (mg/L)	0.36	0.45	0.42	0.41	-
NITRATE (mg/L)	2.25	8.74	6.99	6.64	-
NITRITE (mg/L)	0.01U	0.01U	0.01U	0.01U	-
PHOSPHATE (mg/L)	0.14	0.08	0.12	0.04	-

Notes:
All units are in ug/L unless otherwise noted.
All samples were collected on August 10, 2015.
- No cleanup level specified in the ROD.
a Concentration units for anion constituents (other than bromide), as well as the two metals - iron and manganese, are mg/L.
b Cleanup level applies to the WTP effluent sample, only.
c The water quality standards for cadmium and benzo(a)pyrene outlined in Circular DEQ-7 are lower than the cleanup levels specified in the ROD tables; therefore, the lower DEQ-7 standards (in parentheses) currently take precedence over the ROD cleanup levels for these analytes.
The hardness-adjusted DEQ-7 Aquatic Life Standard for the chronic standard for cadmium is 0.8 µg/L.
The DEQ-7 standard for benzo(a)pyrene is 0.05 µg/L.

Bold Concentration exceeds the ROD discharge to surface water cleanup level
D PAH Sum of the acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene concentrations
DEQ Montana Department of Environmental Quality
EPA U.S. Environmental Protection Agency
mg/L Milligrams per liter
MPTP Montana Pole and Treating Plant
NCRT Near creek recovery trench
NHRT Near highway recovery trench
PAH Polycyclic aromatic hydrocarbons
ROD Record of Decision
µg/L Micrograms per liter
U Analyzed for but not detected above the method detection limit
WTP MPTP water treatment plant

TABLE A3-6
HISTORICAL CONCENTRATIONS OF PCP FOR SELECTED GROUNDWATER SAMPLES

Monitoring Well:	10-12	BMW-01A	BMW-01B	GW-14R-98	HCA-21	INF-04	MW-11-04	ROD Cleanup Level (µg/L)
Units:	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	
Laboratory:	MBMG	MBMG	MBMG	MBMG	MBMG	MBMG	MBMG	
EPA Method:	8270/528[a]	8270/528[a]	8270/528[a]	8270/528[a]	8270/528[a]	8270/528[a]	8270/528[a]	
2000 Range	NI	--	--	**9.02 - 34.5**	**265**	**787 - 1,500**	NI	1.0
2001 Range	NI	--	--	**2.1 - 38.9**	**253**	**14 - 663**	NI	1.0
2002 Range	NI	--	--	**1.6 - 37.5**	**165 - 201**	**5.4 - 72.3**	NI	1.0
2003 Range	NI	--	--	**1.8 - 28**	**171**	**12 - 151**	NI	1.0
2004 Range	NI	--	--	**1.3 - 4.6**	**84**	**13 - 17**	NI	1.0
2005 Range	NI	--	--	**1.1 - 37.5**	**57**	**28 - 35**	NI	1.0
2006 Range	NI	--	--	**17.5 - 72.7**	**1.11 - 39.2**	**18 - 205**	NI	1.0
2007 Range	NI	--	--	**2.25 - 15.2**	**20.2 - 20.6**	**119 - 199**	NI	1.0
2008 Range	NI	--	--	**1.1 - 4.41**	**13.7 - 26.3**	**102 - 124**	NI	1.0
2009 Range	NI	0.2U	0.2U	0.2U - **2.6**	**3.69 - 28.9**	**44.2 - 79.3**	NI	1.0
2010 Range	0.605 - **1.03**	0.186	0.164	0.806 - **3.45**	0.873 - **7.67**	**80.0 - 81.3**	NI	1.0
2011 Range	0.618 - **1.51**	NS	NS	0.60 - **1.45**	**6.18 - 16.9**	**31.7 - 56.3**	**3,490**	1.0
2012 Range	0.2U - 0.351	0.2U	0.2U	**1.05**	**1.16 - 9.35**	**1.61 - 67.7**	**1,440 - 1,450**	1.0
2013 Range	0.213 - 0.305	0.2U - 0.251	0.2U	0.297	0.49	**21.5 - 43.2**	**1,536 - 7,400**[b]	1.0
2014 Range	0.2U - 0.626	0.2U	0.2U	0.2U	0.34	**10.3 - 105**	**668 - 1197**	1.0
2015 Range	0.2U	0.2U	0.2U	0.2U - 1.32	0.2U - 0.37	**47.7 - 53.4**	**340 - 1,022**	1.0
February 2, 2015 (semi-annual sampling event)	0.2U	0.2U	0.2U	0.2U	0.2U	**47.7**	**340**	1.0
August 10, 2015 (annual sampling event)	0.2U	0.2U	0.2U	1.32	0.37	**53.4**	**1,022**	1.0

Notes:

--	Not sampled
µg/L	Micrograms per liter
a	EPA Method 8270 was used prior to 2011; EPA Method 528 was used in 2011 and thereafter
b	Insufficient water to fully bail well before sample was collected; concentration biased high
Bold	Concentration exceeds ROD groundwater cleanup level
EPA	U.S. Environmental Protection Agency
Frozen	Monitoring well frozen - unable to sample
MBMG	Montana Bureau of Mines and Geology
NI	Monitoring well was net yet installed
NS	Not sampled
PCP	Pentachlorophenol
ROD	Record of Decision
U	Analyzed for but not detected above the method detection limit

TABLE A3-7
HISTORICAL CONCENTRATIONS OF DIOXIN TEQ FOR GROUNDWATER SAMPLES
(µg/L)

Sample Date	10-12 (µg/L)	BMW-01A (µg/L)	BMW-01B (µg/L)	GW-12 (µg/L)	GW-14R-98 (µg/L)	HCA-21 (µg/L)	INF-04 (µg/L)	INF-05 (µg/L)	INF-06 (µg/L)	MW-11-04 (µg/L)	MW-B-98 (µg/L)	MW-D-96 (µg/L)	MW-E-01 (µg/L)	MW-L-96 (µg/L)	MW-U-01 (µg/L)	MW-V-01 (µg/L)	NWW (µg/L)	ROD Cleanup Level (µg/L)
8/13/2001	--	--	--	--	--	--	--	--	3.83E-06	--	--	--	7.70E-08	2.10E-08	--	--	--	3.00E-05
8/12/2002	--	--	--	--	--	--	--	--	2.00E-07	--	--	--	2.10E-07	1.70E-07	--	--	--	3.00E-05
8/4/2003	--	--	--	--	--	--	--	--	4.90E-08	--	--	--	1.10E-07	0	--	--	--	3.00E-05
8/2/2004	--	--	--	--	--	--	--	--	7.00E-07	--	--	--	**4.35E-05**	0	--	--	--	3.00E-05
8/1/2005	--	--	--	--	--	--	--	--	9.20E-08	--	--	--	2.70E-06	5.30E-07	--	--	--	3.00E-05
8/21/2006	--	--	--	7.90E-08	--	--	1.29E-05	0	7.20E-08	--	7.80E-08	9.20E-08	**5.96E-05**	0	--	--	--	3.00E-05
8/27/2007	--	--	--	2.80E-07	--	--	6.90E-07	7.00E-08	0.00E+00	--	0	0	1.00E-07	0	--	--	--	3.00E-05
8/25/2008	--	--	--	0	--	--	1.26E-05	8.00E-08	0.00E+00	--	0	6.50E-07	1.30E-07	0	--	--	--	3.00E-05
8/10/2009	--	--	--	--	0	--	1.40E-07	--	--	--	0	--	--	--	0	--	--	3.00E-05
8/16/2010	--	--	--	--	0	--	**4.50E-05**	--	--	--	0	--	--	--	0	--	--	3.00E-05
8/15/2011	--	--	--	--	1.05E-06	--	4.09E-06	--	--	--	9.30E-09	--	--	--	--	2.82E-08	1.70E-08	3.00E-05
8/13/2012	--	--	--	--	1.18E-07	--	2.75E-05	--	--	--	1.04E-07	--	--	--	--	3.30E-08	7.40E-08	3.00E-05
8/13/2013	4.50E-08	8.81E-08	1.12E-07	--	6.70E-07	8.04E-08	5.59E-06	--	--	9.91E-06	--	--	--	--	--	--	--	3.00E-05
8/11/2014	2.70E-08	2.08E-08	1.83E-08	--	1.42E-07	7.77E-07	1.38E-04	--	--	7.15E-06	--	--	--	--	--	--	--	3.00E-05
8/10/2015	1.04E-07	7.50E-09	2.70E-08	--	9.03E-06	4.23E-07	6.31E-07	--	--	6.46E-06	--	--	--	--	--	--	--	3.00E-05

HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR GROUNDWATER SAMPLES
(pg/L)

Sample Date	10-12 (pg/L)	BMW-01A (pg/L)	BMW-01B (pg/L)	GW-12 (pg/L)	GW-14R-98 (pg/L)	HCA-21 (pg/L)	INF-04 (pg/L)	INF-05 (pg/L)	INF-06 (pg/L)	MW-11-04 (pg/L)	MW-B-98 (pg/L)	MW-D-96 (pg/L)	MW-E-01 (pg/L)	MW-L-96 (pg/L)	MW-U-01 (pg/L)	MW-V-01 (pg/L)	NWW (pg/L)	ROD Cleanup Level (pg/L)
8/13/2001	--	--	--	--	--	--	--	--	3.83	--	--	--	0.077	0.021	--	--	--	30.00
8/12/2002	--	--	--	--	--	--	--	--	0.20	--	--	--	0.21	0.17	--	--	--	30.00
8/4/2003	--	--	--	--	--	--	--	--	0.049	--	--	--	0.11	0.00	--	--	--	30.00
8/2/2004	--	--	--	--	--	--	--	--	0.70	--	--	--	**43.45**	0.00	--	--	--	30.00
8/1/2005	--	--	--	--	--	--	--	--	0.092	--	--	--	2.695	0.53	--	--	--	30.00
8/21/2006	--	--	--	0.079	--	--	12.92	0	0.072	--	0.078	0.092	**59.63**	0.00	--	--	--	30.00
8/26/2007	--	--	--	0.28	--	--	0.69	0.07	0	--	0	0	0.10	0	--	--	--	30.00
8/25/2008	--	--	--	0	--	--	12.64	0.08	0	--	0	0.650	0.13	0	--	--	--	30.00
8/10/2009	--	--	--	--	0	--	0.14	--	--	--	0	--	--	--	0	--	--	30.00
8/16/2010	--	--	--	--	0	--	**45.0**	--	--	--	0	--	--	--	0	--	--	30.00
8/15/2011	--	--	--	--	1.05	--	4.09	--	--	--	0.009	--	--	--	--	0.028	0.017	30.00
8/13/2012	--	--	--	--	0.12	--	27.50	--	--	--	0.104	--	--	--	--	0.033	0.074	30.00
8/12/2013	0.05	0.09	0.11	--	0.67	0.08	5.59	--	--	9.91	--	--	--	--	--	--	--	30.00
8/11/2014	0.03	0.02	0.02	--	0.14	0.78	**138.00**	--	--	7.15	--	--	--	--	--	--	--	30.00
8/10/2015	0.10	0.01	0.03	--	9.03	0.42	0.63	--	--	6.46	--	--	--	--	--	--	--	30.00

Notes:

0	Dioxin cogeners were below the reporting limit and set to 0 for the calculation of TEQ, resulting in a TEQ equal to 0.
--	Monitoring well did not exist or was not sampled on this date
pg/L	Picograms per liter
µg/L	Micrograms per liter
Bold	Concentration exceeds the ROD groundwater cleanup level
MPTP	Montana Pole and Treating Plant
MPTP ROD Methodology	MPTP ROD methodology using 0 where ND
ROD	Record of Decision
TEQ	Toxicity equivalent quotient (calculated using MPTP ROD methodology)

TABLE A3-8
SUMMARY OF DIOXIN TEQ IN LABORATORY METHOD BLANKS
FOR THE MPTP SITE 2009 TO 2015

Analysis Date	Laboratory	Lab Sample ID	Analytical Method	Data Qualifiers[a]	TEQ (pg/L) DEQ-7 Methodology	TEQ (pg/L) MPTP ROD Methodology
10/31/2015	Pace	BLANK-47558	8290	I, J	2.41	0.00
10/15/2015	Pace	BLANK-47241	EPA Method 8290	I, J	0.81	0.00
10/14/2015	Pace	BLANK-47253	EPA Method 8290	J	3.15	0.04
9/6/2015	Pace	BLANK-46736	EPA Method 8290	I, J	1.16	0.42
9/3/2015	Pace	BLANK-46716	EPA Method 8290	I, J	3.75	0.22
8/21/2015	Pace	BLANK-46522	EPA Method 8290	I, J	2.81	0.00
9/9/2014	Pace	BLANK-41817	EPA Method 8290	none	3.28	0.00
8/30/2014	Pace	BLANK-41717	EPA Method 8290	I, J	1.43	0.01
8/21/2013	Pace	BLANK-37461	EPA Method 8290	I, J	0.65	0.17
8/24/2013	Pace	BLANK-37491	EPA Method 8290	J	0.75	0.03
8/27/2013	Pace	BLANK-37513	EPA Method 8290	I, J	1.15	0.05
8/31/2012	Pace	BLANK-33712	EPA Method 8290	J	1.37	0.08
8/31/2011	Pace	BLANK-30051	EPA Method 8290	I, J	1.31	0.03
9/6/2011	Pace	BLANK-30117	EPA Method 8290	none	4.53	0.00
8/25/2010	TestAmerica	G0H210000-062	EPA Method 8290	none	1.34	0.00
9/8/2010	TestAmerica	G0H310000-290	EPA Method 8290	none	2.96	0.00
8/28/2009	TestAmerica	G9H200000-504B	EPA Method 8290	none	1.87	0.00
			2009 to 2015 Count		17	17
			2009 to 2015 Minimum		0.65	0.00
			2009 to 2015 Maximum		4.53	0.42
			2009 to 2015 Average		2.04	0.06

Notes:

a	At least one of the dioxin congeners in the data set are flagged with the data qualifier shown
DEQ	Montana Department of Environmental Quality
DEQ-7 Methodology	2005 WHO Using PRL/2 where ND
EPA	U.S. Environmental Protection Agency
I	Interference present
J	Estimated value
MPTP ROD Methodology	DEQ ROD Using 0 where ND
ND	Not detected
none	Data set did not include any data qualifiers
Pace	Pace Analytical Services, Inc.
PRL	Project reporting limit
ROD	Record of Decision
TEQ	Toxicity equivalence quotient
WHO	World Health Organization

TABLE A3-9
COMPARISON OF UNFILTERED AND FILTERED DIOXIN TEQ DATA
AND VALUES FOR TURBIDITY

Sample Date	Monitoring Well	**UNFILTERED** DEQ-7 Methodology Dioxin TEQ (pg/L)	**UNFILTERED** MPTP ROD Methodology Dioxin TEQ (pg/L)	**FILTERED** DEQ-7 Methodology Dioxin TEQ (pg/L)	**FILTERED** MPTP ROD Methodology Dioxin TEQ (pg/L)	PCP (ug/L)	Turbidity (NTU)
10/5/2015	10-01	1.2	0.05	-	-	11.2	0.36
10/5/2015	10-02	1.0	0.02	-	-	16.2	2.79
10/5/2015	GW-09	1.5	0.61	-	-	0.2U	0.66
10/5/2015	GW-14R-98	3.0	2.04	1.4	0.011	1.06	7.2
10/5/2015	INF-13	1.9	0.61	1.9	0.531	21.8	0.4
10/5/2015	INF-14	1.7	0.43	1.6	0.027	0.2U	0.32
10/5/2015	INF-15	1.2	0.36	1.4	0.000	0.2U	0.61
10/5/2015	INF-16	103.6	139.66	4.3	3.371	24.1	4.09
10/5/2015	INF-17	3.3	2.72	1.1	0.036	1.06	0.39
10/5/2015	INF-18	2.2	1.41	0.97	0.000	0.2U	0.34
10/5/2015	MW-11-04	125.7	169.31	1.1	0.175	35,700	22.2
10/5/2015	MW-W-01	1.0	0.01	-	-	0.2U	0.48
10/5/2015	NCRTEFF	3.7	3.74	-	-	5.02	1.73
10/5/2015	NHRTEFF	5.8	5.95	-	-	167	0.06

Note:

-	Filtered sample was not submitted to laboratory
Yellow	Indicates samples exhibiting relatively higher turbidiy coupled with relatively higher dioxin TEQ in the unfiltered sample
DEQ-7 Methodology	2005 WHO methodology and using PRL/2 where ND
DEQ	Montana Department of Environmental Quality
MPTP ROD Methodology	DEQ ROD methodology using 0 where ND
ND	Not detected
none	Data set did not include any data qualifiers
NTU	Nephelometric turbidity units
Pace	Pace Analytical Services, Inc.
PRL	Project reporting limit
ROD	Record of Decision
TEQ	Toxicity equivalence quotient
WHO	World Health Organization

Table A3-10

AUGUST 2015 ANNUAL SAMPLING EVENT
GROUNDWATER - CONCENTRATIONS OF CHLOROPHENOLS AND PAH

DATE	STATION ID	GROUP	ANALYTE	CONCENTRATION	QUALIFIER	ROD CLEAN UP LEVEL	UNITS
8/10/2015	10-12	SVOA-CHLOR	2,3,4,6-TETRACHLOROPHENOL	1	U	-	ug/L
8/10/2015	10-12	SVOA-CHLOR	2,3,5,6-TETRACHLOROPHENOL	1	U	267	ug/L
8/10/2015	10-12	SVOA-CHLOR	2,4,5-TRICHLOROPHENOL	1	U	-	ug/L
8/10/2015	10-12	SVOA-CHLOR	2,4,6-TRICHLOROPHENOL	1	U	6.5	ug/L
8/10/2015	10-12	SVOA-CHLOR	2,4-DICHLOROPHENOL	1	U	27	ug/L
8/10/2015	10-12	SVOA-CHLOR	2-CHLOROPHENOL	1	U	45	ug/L
8/10/2015	10-12	SVOA-CHLOR	4-CHLORO-3-METHYLPHENOL	1	U	-	ug/L
8/10/2015	10-12	SVOA-CHLOR	PENTACHLOROPHENOL	0.2	U	1.00	ug/L
8/10/2015	10-12	SVOA-PAH	ACENAPHTHENE	1	U	-	ug/L
8/10/2015	10-12	SVOA-PAH	ACENAPHTHYLENE	1	U	-	ug/L
8/10/2015	10-12	SVOA-PAH	ANTHRACENE	1	U	-	ug/L
8/10/2015	10-12	SVOA-PAH	BENZO(A)ANTHRACENE	1	U	1	ug/L
8/10/2015	10-12	SVOA-PAH	BENZO(A)PYRENE	0.1	U	0.2/(0.05)[a]	ug/L
8/10/2015	10-12	SVOA-PAH	BENZO(B)FLUORANTHENE	0.2	U	0.2	ug/L
8/10/2015	10-12	SVOA-PAH	BENZO(G,H,I)PERYLENE	1	U	1	ug/L
8/10/2015	10-12	SVOA-PAH	BENZO(K)FLUORANTHENE	1	U	1	ug/L
8/10/2015	10-12	SVOA-PAH	CHRYSENE	1	U	1	ug/L
8/10/2015	10-12	SVOA-PAH	DIBENZO(A,H)ANTHRACENE	0.2	U	0.2	ug/L
8/10/2015	10-12	SVOA-PAH	FLUORANTHENE	1	U	-	ug/L
8/10/2015	10-12	SVOA-PAH	FLUORENE	1	U	-	ug/L
8/10/2015	10-12	SVOA-PAH	INDENO(1,2,3-CD)PYRENE	1	U	1	ug/L
8/10/2015	10-12	SVOA-PAH	NAPHTHALENE	1	U	-	ug/L
8/10/2015	10-12	SVOA-PAH	PHENANTHRENE	1	U	-	ug/L
8/10/2015	10-12	SVOA-PAH	PYRENE	1	U	-	ug/L
8/10/2015	BMW-01A	SVOA-CHLOR	2,3,4,6-TETRACHLOROPHENOL	1	U	-	ug/L
8/10/2015	BMW-01A	SVOA-CHLOR	2,3,5,6-TETRACHLOROPHENOL	1	U	267	ug/L
8/10/2015	BMW-01A	SVOA-CHLOR	2,4,5-TRICHLOROPHENOL	1	U	-	ug/L
8/10/2015	BMW-01A	SVOA-CHLOR	2,4,6-TRICHLOROPHENOL	1	U	6.5	ug/L
8/10/2015	BMW-01A	SVOA-CHLOR	2,4-DICHLOROPHENOL	1	U	27	ug/L
8/10/2015	BMW-01A	SVOA-CHLOR	2-CHLOROPHENOL	1	U	45	ug/L
8/10/2015	BMW-01A	SVOA-CHLOR	4-CHLORO-3-METHYLPHENOL	1	U	-	ug/L
8/10/2015	BMW-01A	SVOA-CHLOR	PENTACHLOROPHENOL	0.2	U	1.00	ug/L
8/10/2015	BMW-01A	SVOA-PAH	ACENAPHTHENE	1	U	-	ug/L
8/10/2015	BMW-01A	SVOA-PAH	ACENAPHTHYLENE	1	U	-	ug/L
8/10/2015	BMW-01A	SVOA-PAH	ANTHRACENE	1	U	-	ug/L
8/10/2015	BMW-01A	SVOA-PAH	BENZO(A)ANTHRACENE	1	U	1	ug/L
8/10/2015	BMW-01A	SVOA-PAH	BENZO(A)PYRENE	0.1	U	0.2/(0.05)[a]	ug/L
8/10/2015	BMW-01A	SVOA-PAH	BENZO(B)FLUORANTHENE	0.2	U	0.2	ug/L
8/10/2015	BMW-01A	SVOA-PAH	BENZO(G,H,I)PERYLENE	1	U	1	ug/L
8/10/2015	BMW-01A	SVOA-PAH	BENZO(K)FLUORANTHENE	1	U	1	ug/L
8/10/2015	BMW-01A	SVOA-PAH	CHRYSENE	1	U	1	ug/L
8/10/2015	BMW-01A	SVOA-PAH	DIBENZO(A,H)ANTHRACENE	0.2	U	0.2	ug/L
8/10/2015	BMW-01A	SVOA-PAH	FLUORANTHENE	1	U	-	ug/L
8/10/2015	BMW-01A	SVOA-PAH	FLUORENE	1	U	-	ug/L
8/10/2015	BMW-01A	SVOA-PAH	INDENO(1,2,3-CD)PYRENE	1	U	1	ug/L
8/10/2015	BMW-01A	SVOA-PAH	NAPHTHALENE	1	U	-	ug/L
8/10/2015	BMW-01A	SVOA-PAH	PHENANTHRENE	1	U	-	ug/L
8/10/2015	BMW-01A	SVOA-PAH	PYRENE	1	U	-	ug/L
8/10/2015	BMW-01B	SVOA-CHLOR	2,3,4,6-TETRACHLOROPHENOL	1	U	-	ug/L
8/10/2015	BMW-01B	SVOA-CHLOR	2,3,5,6-TETRACHLOROPHENOL	1	U	267	ug/L
8/10/2015	BMW-01B	SVOA-CHLOR	2,4,5-TRICHLOROPHENOL	1	U	-	ug/L
8/10/2015	BMW-01B	SVOA-CHLOR	2,4,6-TRICHLOROPHENOL	1	U	6.5	ug/L
8/10/2015	BMW-01B	SVOA-CHLOR	2,4-DICHLOROPHENOL	1	U	27	ug/L
8/10/2015	BMW-01B	SVOA-CHLOR	2-CHLOROPHENOL	1	U	45	ug/L
8/10/2015	BMW-01B	SVOA-CHLOR	4-CHLORO-3-METHYLPHENOL	1	U	-	ug/L
8/10/2015	BMW-01B	SVOA-CHLOR	PENTACHLOROPHENOL	0.2	U	1.00	ug/L
8/10/2015	BMW-01B	SVOA-PAH	ACENAPHTHENE	1	U	-	ug/L
8/10/2015	BMW-01B	SVOA-PAH	ACENAPHTHYLENE	1	U	-	ug/L
8/10/2015	BMW-01B	SVOA-PAH	ANTHRACENE	1	U	-	ug/L
8/10/2015	BMW-01B	SVOA-PAH	BENZO(A)ANTHRACENE	1	U	1	ug/L
8/10/2015	BMW-01B	SVOA-PAH	BENZO(A)PYRENE	0.1	U	0.2/(0.05)[a]	ug/L
8/10/2015	BMW-01B	SVOA-PAH	BENZO(B)FLUORANTHENE	0.2	U	0.2	ug/L
8/10/2015	BMW-01B	SVOA-PAH	BENZO(G,H,I)PERYLENE	1	U	1	ug/L
8/10/2015	BMW-01B	SVOA-PAH	BENZO(K)FLUORANTHENE	1	U	1	ug/L
8/10/2015	BMW-01B	SVOA-PAH	CHRYSENE	1	U	1	ug/L
8/10/2015	BMW-01B	SVOA-PAH	DIBENZO(A,H)ANTHRACENE	0.2	U	0.2	ug/L
8/10/2015	BMW-01B	SVOA-PAH	FLUORANTHENE	1	U	-	ug/L
8/10/2015	BMW-01B	SVOA-PAH	FLUORENE	1	U	-	ug/L
8/10/2015	BMW-01B	SVOA-PAH	INDENO(1,2,3-CD)PYRENE	1	U	1	ug/L
8/10/2015	BMW-01B	SVOA-PAH	NAPHTHALENE	1	U	-	ug/L
8/10/2015	BMW-01B	SVOA-PAH	PHENANTHRENE	1	U	-	ug/L
8/10/2015	BMW-01B	SVOA-PAH	PYRENE	1	U	-	ug/L

Table A3-10

AUGUST 2015 ANNUAL SAMPLING EVENT
GROUNDWATER - CONCENTRATIONS OF CHLOROPHENOLS AND PAH

DATE	STATION ID	GROUP	ANALYTE	CONCENTRATION	QUALIFIER	ROD CLEAN UP LEVEL	UNITS
8/10/2015	GW-14R-98	SVOA-CHLOR	2,3,4,6-TETRACHLOROPHENOL	1	U	-	ug/L
8/10/2015	GW-14R-98	SVOA-CHLOR	2,3,5,6-TETRACHLOROPHENOL	1	U	267	ug/L
8/10/2015	GW-14R-98	SVOA-CHLOR	2,4,5-TRICHLOROPHENOL	1	U	-	ug/L
8/10/2015	GW-14R-98	SVOA-CHLOR	2,4,6-TRICHLOROPHENOL	1.47		6.5	ug/L
8/10/2015	GW-14R-98	SVOA-CHLOR	2,4-DICHLOROPHENOL	1	U	27	ug/L
8/10/2015	GW-14R-98	SVOA-CHLOR	2-CHLOROPHENOL	1	U	45	ug/L
8/10/2015	GW-14R-98	SVOA-CHLOR	4-CHLORO-3-METHYLPHENOL	1	U	-	ug/L
8/10/2015	GW-14R-98	SVOA-CHLOR	PENTACHLOROPHENOL	**1.32**		1.00	ug/L
8/10/2015	GW-14R-98	SVOA-PAH	ACENAPHTHENE	1	U	-	ug/L
8/10/2015	GW-14R-98	SVOA-PAH	ACENAPHTHYLENE	1	U	-	ug/L
8/10/2015	GW-14R-98	SVOA-PAH	ANTHRACENE	1.23		-	ug/L
8/10/2015	GW-14R-98	SVOA-PAH	BENZO(A)ANTHRACENE	1	U	1	ug/L
8/10/2015	GW-14R-98	SVOA-PAH	BENZO(A)PYRENE	0.1	U	0.2/(0.05)[a]	ug/L
8/10/2015	GW-14R-98	SVOA-PAH	BENZO(B)FLUORANTHENE	0.2	U	0.2	ug/L
8/10/2015	GW-14R-98	SVOA-PAH	BENZO(G,H,I)PERYLENE	1	U	1	ug/L
8/10/2015	GW-14R-98	SVOA-PAH	BENZO(K)FLUORANTHENE	1	U	1	ug/L
8/10/2015	GW-14R-98	SVOA-PAH	CHRYSENE	1	U	1	ug/L
8/10/2015	GW-14R-98	SVOA-PAH	DIBENZO(A,H)ANTHRACENE	0.2	U	0.2	ug/L
8/10/2015	GW-14R-98	SVOA-PAH	FLUORANTHENE	1	U	-	ug/L
8/10/2015	GW-14R-98	SVOA-PAH	FLUORENE	1	U	-	ug/L
8/10/2015	GW-14R-98	SVOA-PAH	INDENO(1,2,3-CD)PYRENE	1	U	1	ug/L
8/10/2015	GW-14R-98	SVOA-PAH	NAPHTHALENE	1	U	-	ug/L
8/10/2015	GW-14R-98	SVOA-PAH	PHENANTHRENE	1	U	-	ug/L
8/10/2015	GW-14R-98	SVOA-PAH	PYRENE	1	U	-	ug/L
8/10/2015	HCA-21	SVOA-CHLOR	2,3,4,6-TETRACHLOROPHENOL	1	U	-	ug/L
8/10/2015	HCA-21	SVOA-CHLOR	2,3,5,6-TETRACHLOROPHENOL	1	U	267	ug/L
8/10/2015	HCA-21	SVOA-CHLOR	2,4,5-TRICHLOROPHENOL	1	U	-	ug/L
8/10/2015	HCA-21	SVOA-CHLOR	2,4,6-TRICHLOROPHENOL	1	U	6.5	ug/L
8/10/2015	HCA-21	SVOA-CHLOR	2,4-DICHLOROPHENOL	1	U	27	ug/L
8/10/2015	HCA-21	SVOA-CHLOR	2-CHLOROPHENOL	1	U	45	ug/L
8/10/2015	HCA-21	SVOA-CHLOR	4-CHLORO-3-METHYLPHENOL	1	U	-	ug/L
8/10/2015	HCA-21	SVOA-CHLOR	PENTACHLOROPHENOL	0.37		1.00	ug/L
8/10/2015	HCA-21	SVOA-PAH	ACENAPHTHENE	1	U	-	ug/L
8/10/2015	HCA-21	SVOA-PAH	ACENAPHTHYLENE	1	U	-	ug/L
8/10/2015	HCA-21	SVOA-PAH	ANTHRACENE	1	U	-	ug/L
8/10/2015	HCA-21	SVOA-PAH	BENZO(A)ANTHRACENE	1	U	1	ug/L
8/10/2015	HCA-21	SVOA-PAH	BENZO(A)PYRENE	0.1	U	0.2/(0.05)[a]	ug/L
8/10/2015	HCA-21	SVOA-PAH	BENZO(B)FLUORANTHENE	0.2	U	0.2	ug/L
8/10/2015	HCA-21	SVOA-PAH	BENZO(G,H,I)PERYLENE	1	U	1	ug/L
8/10/2015	HCA-21	SVOA-PAH	BENZO(K)FLUORANTHENE	1	U	1	ug/L
8/10/2015	HCA-21	SVOA-PAH	CHRYSENE	1	U	1	ug/L
8/10/2015	HCA-21	SVOA-PAH	DIBENZO(A,H)ANTHRACENE	0.2	U	0.2	ug/L
8/10/2015	HCA-21	SVOA-PAH	FLUORANTHENE	1	U	-	ug/L
8/10/2015	HCA-21	SVOA-PAH	FLUORENE	1	U	-	ug/L
8/10/2015	HCA-21	SVOA-PAH	INDENO(1,2,3-CD)PYRENE	1	U	1	ug/L
8/10/2015	HCA-21	SVOA-PAH	NAPHTHALENE	1	U	-	ug/L
8/10/2015	HCA-21	SVOA-PAH	PHENANTHRENE	1	U	-	ug/L
8/10/2015	HCA-21	SVOA-PAH	PYRENE	1	U	-	ug/L
8/10/2015	INF-04	SVOA-CHLOR	2,3,4,6-TETRACHLOROPHENOL	1	U	-	ug/L
8/10/2015	INF-04	SVOA-CHLOR	2,3,5,6-TETRACHLOROPHENOL	3.6		267	ug/L
8/10/2015	INF-04	SVOA-CHLOR	2,4,5-TRICHLOROPHENOL	1	U	-	ug/L
8/10/2015	INF-04	SVOA-CHLOR	2,4,6-TRICHLOROPHENOL	1.23		6.5	ug/L
8/10/2015	INF-04	SVOA-CHLOR	2,4-DICHLOROPHENOL	1	U	27	ug/L
8/10/2015	INF-04	SVOA-CHLOR	2-CHLOROPHENOL	1	U	45	ug/L
8/10/2015	INF-04	SVOA-CHLOR	4-CHLORO-3-METHYLPHENOL	1	U	-	ug/L
8/10/2015	INF-04	SVOA-CHLOR	PENTACHLOROPHENOL	**53.4**	D	1.00	ug/L
8/10/2015	INF-04	SVOA-PAH	ACENAPHTHENE	1	U	-	ug/L
8/10/2015	INF-04	SVOA-PAH	ACENAPHTHYLENE	1	U	-	ug/L
8/10/2015	INF-04	SVOA-PAH	ANTHRACENE	1	U	-	ug/L
8/10/2015	INF-04	SVOA-PAH	BENZO(A)ANTHRACENE	1	U	1	ug/L
8/10/2015	INF-04	SVOA-PAH	BENZO(A)PYRENE	0.1	U	0.2/(0.05)[a]	ug/L
8/10/2015	INF-04	SVOA-PAH	BENZO(B)FLUORANTHENE	0.2	U	0.2	ug/L
8/10/2015	INF-04	SVOA-PAH	BENZO(G,H,I)PERYLENE	1	U	1	ug/L
8/10/2015	INF-04	SVOA-PAH	BENZO(K)FLUORANTHENE	1	U	1	ug/L
8/10/2015	INF-04	SVOA-PAH	CHRYSENE	1	U	1	ug/L
8/10/2015	INF-04	SVOA-PAH	DIBENZO(A,H)ANTHRACENE	0.2	U	0.2	ug/L
8/10/2015	INF-04	SVOA-PAH	FLUORANTHENE	1	U	-	ug/L
8/10/2015	INF-04	SVOA-PAH	FLUORENE	1.35		-	ug/L
8/10/2015	INF-04	SVOA-PAH	INDENO(1,2,3-CD)PYRENE	1	U	1	ug/L
8/10/2015	INF-04	SVOA-PAH	NAPHTHALENE	1	U	-	ug/L
8/10/2015	INF-04	SVOA-PAH	PHENANTHRENE	1	U	-	ug/L
8/10/2015	INF-04	SVOA-PAH	PYRENE	1	U	-	ug/L

Table A3-10

AUGUST 2015 ANNUAL SAMPLING EVENT
GROUNDWATER - CONCENTRATIONS OF CHLOROPHENOLS AND PAH

DATE	STATION ID	GROUP	ANALYTE	CONCENTRATION	QUALIFIER	ROD CLEAN UP LEVEL	UNITS
8/10/2015	MW-11-04	SVOA-CHLOR	2,3,4,6-TETRACHLOROPHENOL	1	U	-	ug/L
8/10/2015	MW-11-04	SVOA-CHLOR	2,3,5,6-TETRACHLOROPHENOL	1	U	267	ug/L
8/10/2015	MW-11-04	SVOA-CHLOR	2,4,5-TRICHLOROPHENOL	1	U	-	ug/L
8/10/2015	MW-11-04	SVOA-CHLOR	2,4,6-TRICHLOROPHENOL	1	U	6.5	ug/L
8/10/2015	MW-11-04	SVOA-CHLOR	2,4-DICHLOROPHENOL	1	U	27	ug/L
8/10/2015	MW-11-04	SVOA-CHLOR	2-CHLOROPHENOL	1	U	45	ug/L
8/10/2015	MW-11-04	SVOA-CHLOR	4-CHLORO-3-METHYLPHENOL	1	U	-	ug/L
8/10/2015	MW-11-04	SVOA-CHLOR	PENTACHLOROPHENOL	**1022**	D	1.00	ug/L
8/10/2015	MW-11-04	SVOA-PAH	ACENAPHTHENE	7.16	D	-	ug/L
8/10/2015	MW-11-04	SVOA-PAH	ACENAPHTHYLENE	2.64	D	-	ug/L
8/10/2015	MW-11-04	SVOA-PAH	ANTHRACENE	10.5	D	-	ug/L
8/10/2015	MW-11-04	SVOA-PAH	BENZO(A)ANTHRACENE	1	U	1	ug/L
8/10/2015	MW-11-04	SVOA-PAH	BENZO(A)PYRENE	0.1	U	0.2/(0.05)[a]	ug/L
8/10/2015	MW-11-04	SVOA-PAH	BENZO(B)FLUORANTHENE	0.2	U	0.2	ug/L
8/10/2015	MW-11-04	SVOA-PAH	BENZO(G,H,I)PERYLENE	1	U	1	ug/L
8/10/2015	MW-11-04	SVOA-PAH	BENZO(K)FLUORANTHENE	1	U	1	ug/L
8/10/2015	MW-11-04	SVOA-PAH	CHRYSENE	1	U	1	ug/L
8/10/2015	MW-11-04	SVOA-PAH	DIBENZO(A,H)ANTHRACENE	0.2	U	0.2	ug/L
8/10/2015	MW-11-04	SVOA-PAH	FLUORANTHENE	1	U	-	ug/L
8/10/2015	MW-11-04	SVOA-PAH	FLUORENE	6.97	D	-	ug/L
8/10/2015	MW-11-04	SVOA-PAH	INDENO(1,2,3-CD)PYRENE	1	U	1	ug/L
8/10/2015	MW-11-04	SVOA-PAH	NAPHTHALENE	10	D	-	ug/L
8/10/2015	MW-11-04	SVOA-PAH	PHENANTHRENE	7.64	D	-	ug/L
8/10/2015	MW-11-04	SVOA-PAH	PYRENE	1	U	-	ug/L

Notes
All concentrations reported in µg/L

a The water quality standard for benzo(a)pyrene outlined in Circular DEQ-7 is lower than the cleanup levels specified in the ROD tables; therefore, the lower DEQ-7 standard (in parentheses) currently takes precedence over the ROD cleanup level for this analyte. The DEQ-7 standard for benzo(a)pyrene is 0.05 ug/L.

Bold Concentration exceeds ROD cleanup level
µg/L Micrograms per liter
CHLOR Chlorophenol
D Dilution
ID Identification
MDL Method detection limit
PAH Polycyclic aromatic hydrocarbon
ROD Record of Decision
SVOA Semi-volatile organic analyte
U Analyzed for but not detected above the MDL

TABLE A3-11
HISTORICAL CONCENTRATIONS OF PCP FOR SURFACE WATER SAMPLES

Surface Water Station:	**SW-05**	**SS-06A**	**SW-09**	
Analyte:	PCP	PCP	PCP	
Units:	(µg/L)	(µg/L)	(µg/L)	
Laboratory:	MBMG	MBMG	MBMG	ROD
EPA Method:	8270/528[a]	8270/528[a]	8270/528[a]	Cleanup Level (µg/L)
2001 Range	0.071 - **1.8**	--	--	1.0
2002 Range	0.423 - **2.36**	--	--	1.0
2003 Range	0.058 - 0.15	--	--	1.0
2004 Range	--	--	--	1.0
2005 Range	0.45 - 0.071	--	--	1.0
2006 Range	0.038 - **1.03**	--	0.6	1.0
2007 Range	0.1U - 0.349	--	0.1U - 0.246	1.0
2008 Range	0.1U - 0.349	--	0.1U - 0.246	1.0
2009 Range	0.061 - 0.188	--	0.064 - 0.454	1.0
2010 Range	0.2U - 0.186	0.2U	0.2U	1.0
2011 Range	0.2U - 0.281	0.2U	0.2U	1.0
2012 Range	0.2U - 0.670	0.2U	0.2U	1.0
2013 Range	0.2U	0.2U - 0.214	0.2U	1.0
2014 Range	0.2U	0.2U	0.2U	1.0
2015Range	0.2U	0.2U	0.2U	1.0
February 2, 2015 (semi-annual sampling event)	0.2U	0.2U	0.2U	1.0
August 10, 2015 (annual sampling event)	0.2U	0.2U	0.2U	1.0

Notes:

--	Not sampled
µg/L	Micrograms per liter
a	U.S. EPA Method 8270 was used prior to 2011; U.S. EPA Method 528 was used beginning in 2011.
Bold	Concentration exceeds ROD surface water cleanup level (1.0 µg/L)
EPA	U.S. Environmental Protection Agency
MBMG	Montana Bureau of Mines and Geology laboratory
PCP	Pentachlorophenol
ROD	Record of Decision
U	Analyzed for but not detected above the method detection limit

Data prior to October 2010 have not been back-checked against original laboratory data sheets.

TABLE A3-12

HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR SURFACE WATER SAMPLES

(µg/L)

Sample Date	SS-06A (µg/L)	SW-05 (µg/L)	SW-09 (µg/L)	ROD Cleanup Level (µg/L)
8/21/2006	--	0	0	1.00E-05
8/26/2007	--	7.70E-07	--	1.00E-05
8/25/2008	--	0	5.10E-08	1.00E-05
8/10/2009	--	0	0	1.00E-05
8/16/2010	--	0	0	1.00E-05
8/15/2011	1.09E-07	8.10E-08	1.70E-08	1.00E-05
8/13/2012	4.10E-08	3.47E-07	3.40E-08	1.00E-05
8/13/2013[a]	2.50E-08	2.27E-07	1.86E-06	1.00E-05
8/11/2014	4.13E-08	5.84E-08	1.90E-08	1.00E-05
8/10/2015	3.94E-08	2.30E-08	5.14E-08	1.00E-05

HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR SURFACE WATER SAMPLES

(pg/L)

Sample Date	SS-06A (pg/L)	SW-05 (pg/L)	SW-09 (pg/L)	ROD Cleanup Level (pg/L)
8/21/2006	--	0	0	10.00
8/26/2007	--	0.77	--	10.00
8/25/2008	--	0	0.05	10.00
8/10/2009	--	0	0	10.00
8/16/2010	--	0	0	10.00
8/15/2011	0.11	0.08	0.02	10.00
8/13/2012	0.04	0.35	0.03	10.00
8/12/2013[a]	0.03	0.23	1.86	10.00
8/11/2014	0.04	0.06	0.02	10.00
8/10/2015	0.04	0.02	0.05	10.00

Notes:

0	All dioxin cogeners were below the reporting limit and set to 0 for the calculation of TEQ, resulting in a TEQ value equal to 0.
--	Not sampled
µg/L	Micrograms per liter
pg/L	Picograms per liter
a	Significant rain event on August 1, 2013 (0.6 inch)
ROD	Record of Decision
TEQ	Toxicity equivalent quotient

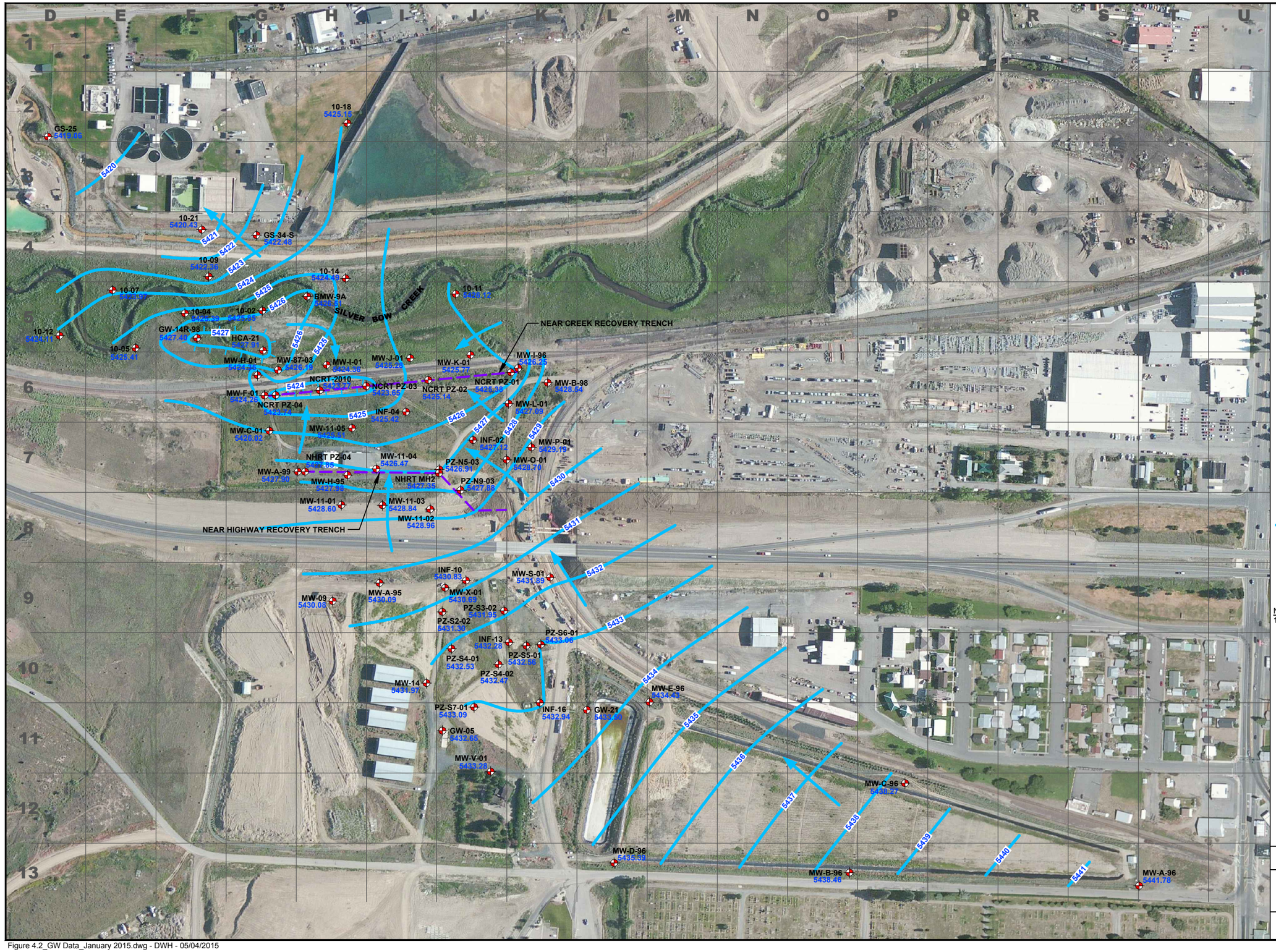
TABLE A3-13
CONCENTRATIONS OF PAH AND CHLOROPHENOLS FOR SURFACE WATER SAMPLES

Surface Water Station:	SS-06A	SW-05	SW-09	ROD
Sample Date:	8/10/2015	8/10/2015	8/10/2015	Cleanup Level
Laboratory:	MBMG	MBMG	MBMG	(µg/L)
Units:	(µg/L)	(µg/L)	(µg/L)	
ANALYTES				
PAH (EPA Method 8270)				
ACENAPHTHENE	1.0U	1.0U	1.0U	-
ACENAPHTHYLENE	1.0U	1.0U	1.0U	-
ANTHRACENE	1.0U	1.09	1.21	-
BENZO(A)ANTHRACENE	1.0U	1.0U	1.0U	1
BENZO(A)PYRENE	0.1U	0.1U	0.1U	0.2/0.05[a]
BENZO(B)FLUORANTHENE	0.2U	0.2U	0.2U	0.2
BENZO(G,H,I)PERYLENE	1.0U	1.0U	1.0U	1
BENZO(K)FLUORANTHENE	1.0U	1.0U	1.0U	1
CHRYSENE	1.0U	1.0U	1.0U	1
DIBENZO(A,H)ANTHRACENE	0.2U	0.2U	0.307	0.2
FLUORANTHENE	1.0U	1.0U	1.0U	-
FLUORENE	1.0U	1.0U	1.0U	-
INDENO(1,2,3-CD)PYRENE	1.0U	1.0U	1.0U	1
NAPHTHALENE	1.0U	1.4	1.0U	-
PHENANTHRENE	1.0U	1.0U	1.0U	-
PYRENE	1.0U	1.0U	1.0U	-
Total D PAH	1.0U	2.49	1.21	360
CHLOROPHENOLS (EPA Method 8270)				
2,3,4,6-TETRACHLOROPHENOL	1.0U	1.0U	1.0U	-
2,3,5,6-TETRACHLOROPHENOL	1.0U	1.0U	1.0U	267
2,4,5-TRICHLOROPHENOL	1.0U	1.0U	1.0U	-
2,4,6-TRICHLOROPHENOL	1.0U	1.0U	1.0U	6.5
2,4-DICHLOROPHENOL	1.0U	1.0U	1.0U	27
2-CHLOROPHENOL	1.0U	1.0U	1.0U	45
4-CHLORO-3-METHYLPHENOL	1.0U	1.0U	1.0U	-
PENTACHLOROPHENOL	0.2U	0.2U	0.2U	1.0

Notes:
- No cleanup level specified in ROD
µg/L Micrograms per liter
a The water quality standard for benzo(a)pyrene outlined in Circular DEQ-7 is lower than the cleanup levels specified in the ROD tables; therefore, the lower DEQ-7 standard (in parentheses) currently takes precedence over the ROD cleanup level for this analyte. The DEQ-7 standard for benzo(a)pyrene is 0.05 µg/L.
D PAH Sum of the acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene concentrations
DEQ Montana Department of Environmental Quality
EPA U.S. Environmental Protection Agency
MBMG Montana Bureau of Mines and Geology
PAH Polycyclic aromatic hydrocarbons
ROD Record of Decision
U Analyzed for but not detected above the method detection limit

Attachment 4

Water Level Maps and PCP Plume Maps from 2015



LEGEND

- MONITORING WELL
- GROUNDWATER CONTOUR - 1' INTERVAL
- GROUNDWATER MOUND
- GROUNDWATER SINK
- INTERPRETED DIRECTION OF GROUNDWATER FLOW

NOTE:

1) THIS FIGURE PROVIDES ONE INTERPRETATION OF GROUNDWATER FLOW; OTHER INTERPRETATIONS ARE POSSIBLE.

AERIAL PHOTO SOURCE: ESRI/BING MAPS (2010)

N

150 0 150 300

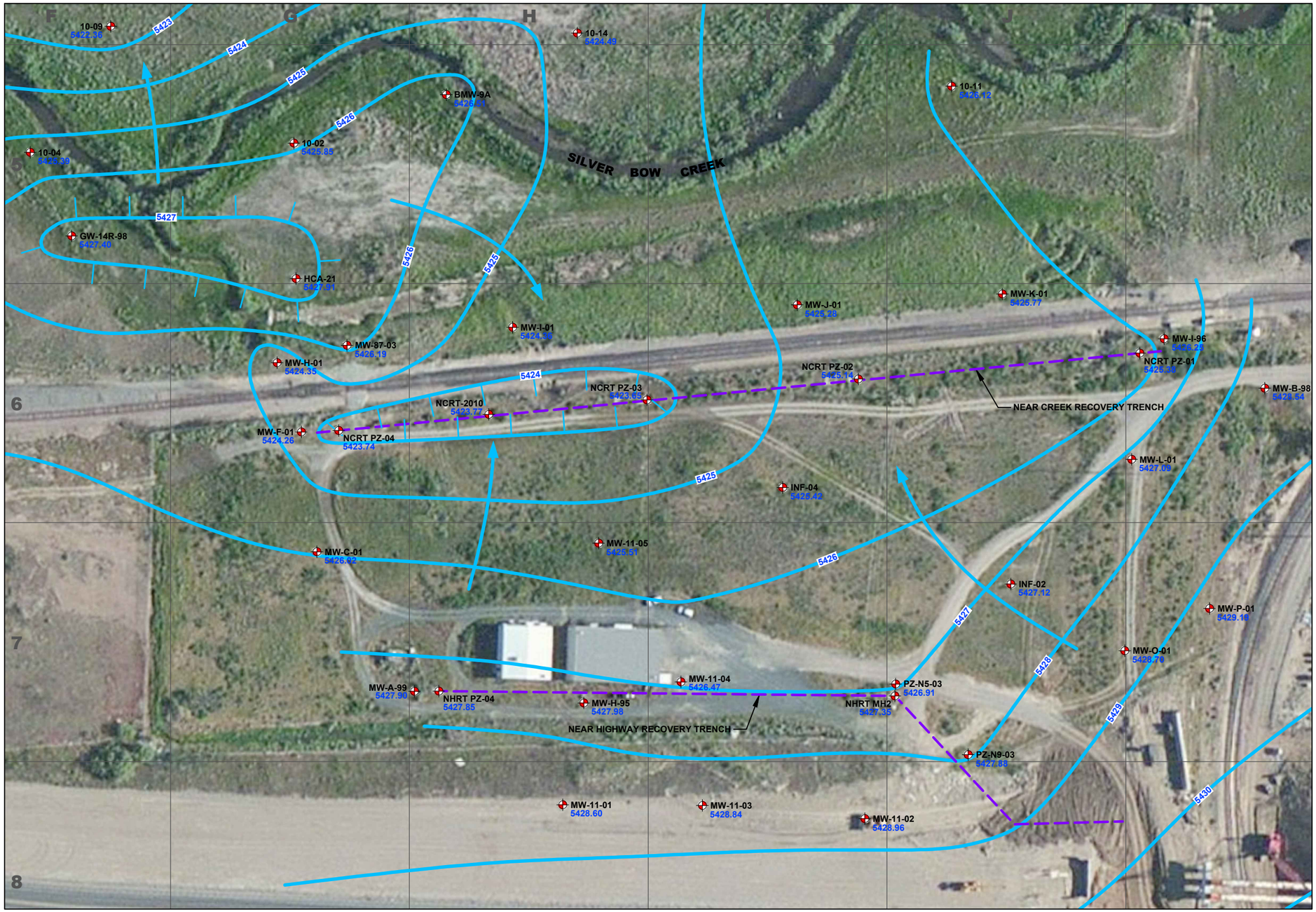
SCALE IN FEET

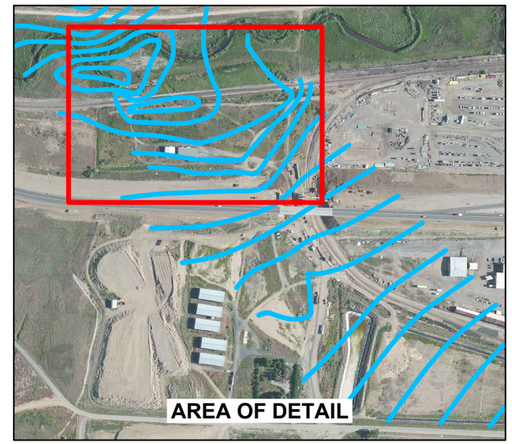
Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.2
GROUNDWATER LEVEL DATA - JANUARY 29, 2015

TETRA TECH

Figure 4.2_GW Data_January 2015.dwg - DWH - 05/04/2015





LEGEND

- MONITORING WELL
- GROUNDWATER CONTOUR - 1' INTERVAL
- GROUNDWATER MOUND
- GROUNDWATER SINK
- INTERPRETED DIRECTION OF GROUNDWATER FLOW

NOTE:
1) THIS FIGURE PROVIDES ONE INTERPRETATION OF GROUNDWATER FLOW; OTHER INTERPRETATIONS ARE POSSIBLE.

AERIAL PHOTO SOURCE: ESRI/BING MAPS (2010)

50 0 50 100

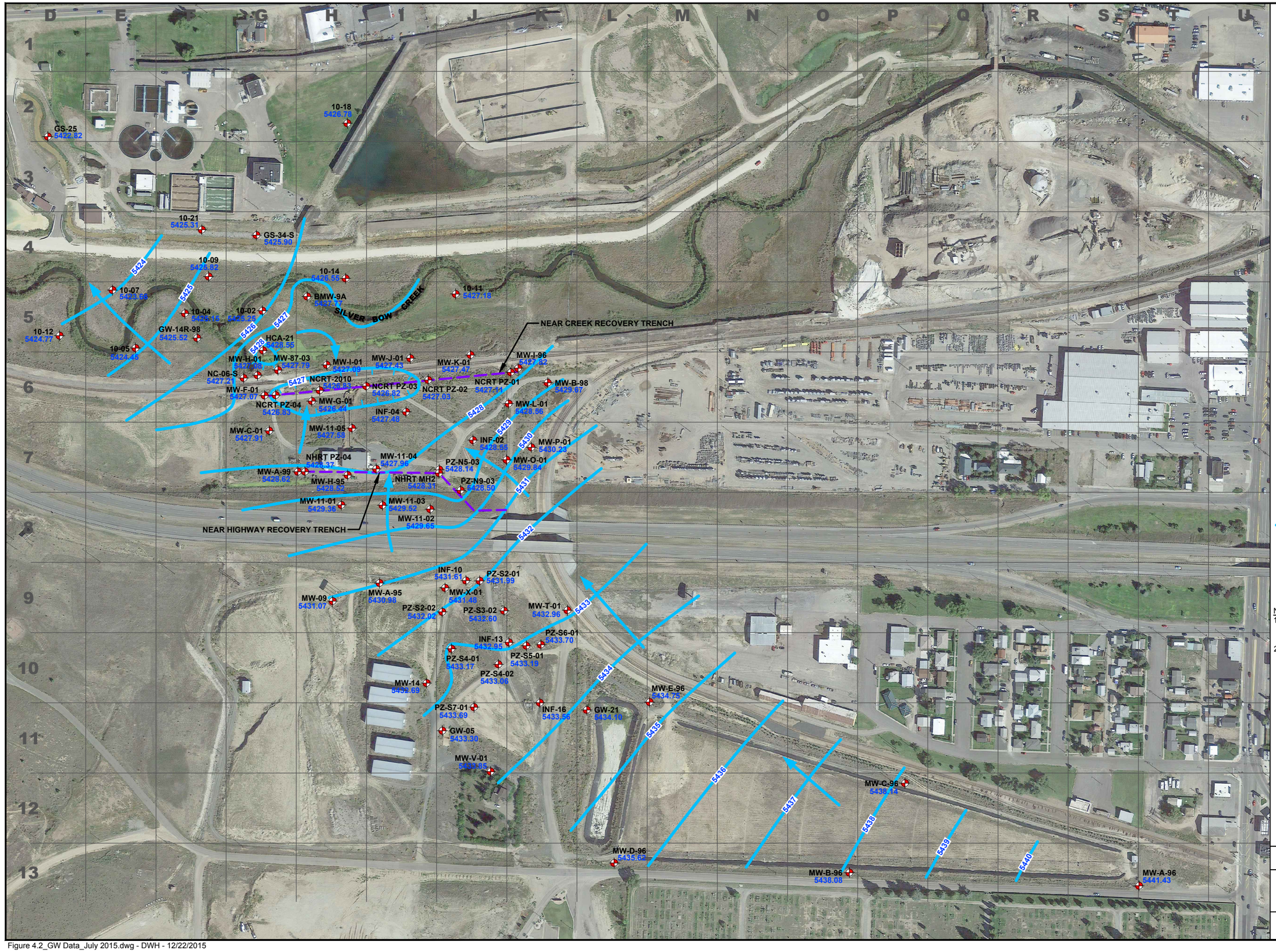
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.3
ON-SITE GROUNDWATER LEVEL DATA - JANUARY 29, 2015

TETRA TECH

Figure 4.3_On-Site GW Data_January 2015.dwg - DWH - 06/24/2015



LEGEND

- MONITORING WELL
- GROUNDWATER CONTOUR - 1' INTERVAL
- GROUNDWATER MOUND
- GROUNDWATER SINK
- INTERPRETED DIRECTION OF GROUNDWATER FLOW

NOTES:

1) THIS FIGURE PROVIDES ONE INTERPRETATION OF GROUNDWATER FLOW; OTHER INTERPRETATIONS ARE POSSIBLE.
2) ALL ELEVATIONS PRESENTED IN THIS REPORT ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) VERTICAL CONTROL DATUM.

AERIAL IMAGERY SOURCE:
GOOGLE EARTH PRO (2013) DJA SURVEY JUNE 2015

N

150 0 150 300

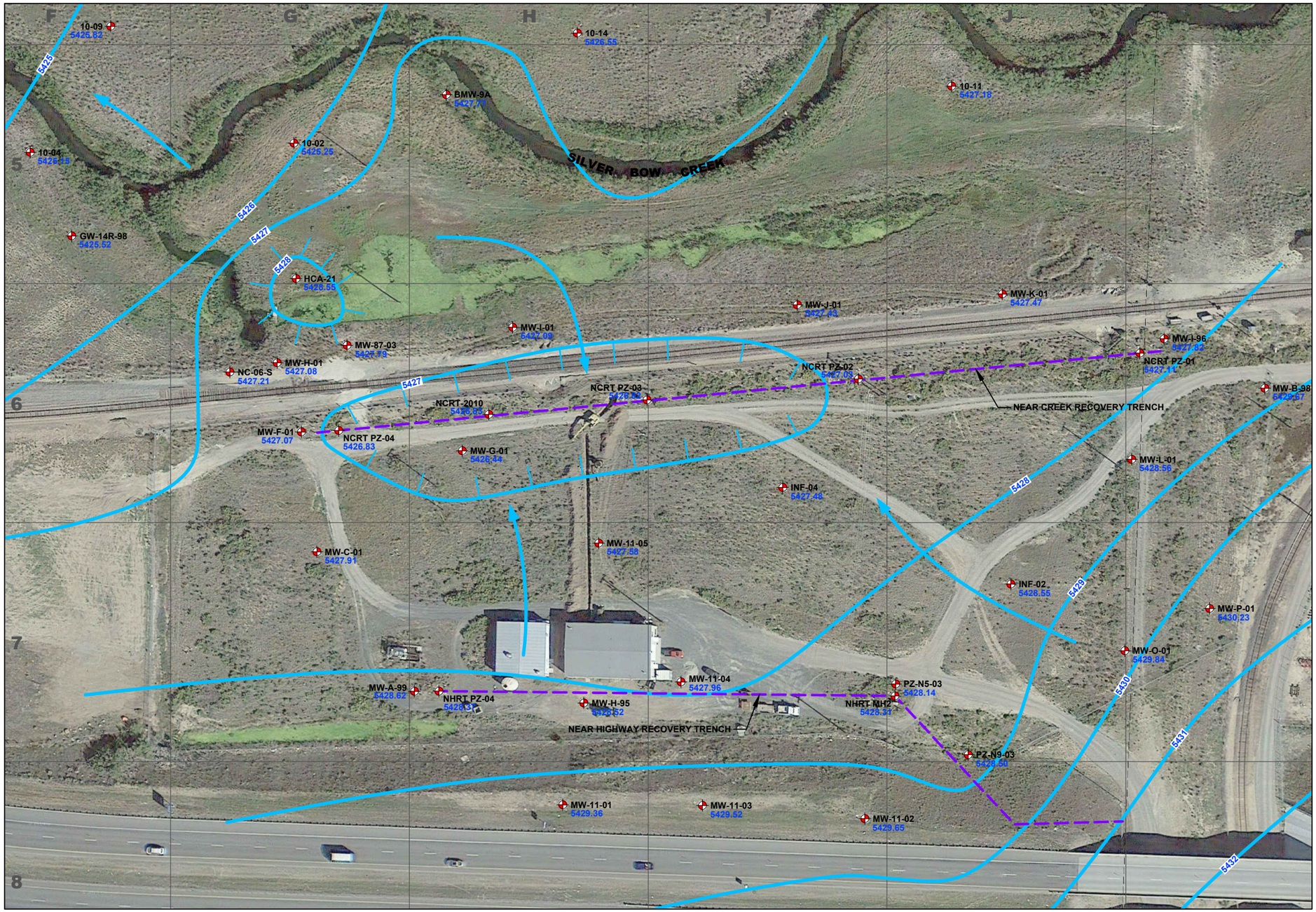
SCALE IN FEET

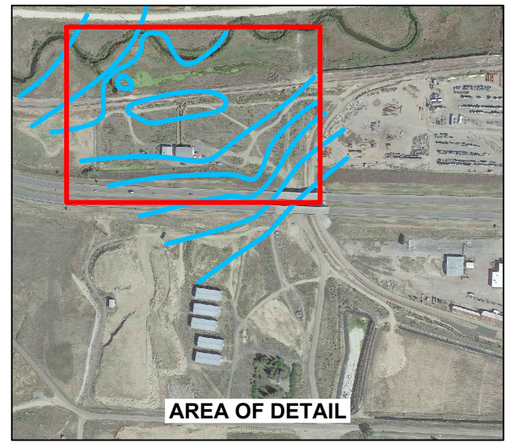
Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.2
GROUNDWATER LEVEL DATA - JULY 31, 2015

TETRA TECH

Figure 4.2_GW Data_July 2015.dwg - DWH - 12/22/2015





LEGEND

- MONITORING WELL
- GROUNDWATER CONTOUR - 1' INTERVAL
- GROUNDWATER MOUND
- GROUNDWATER SINK
- INTERPRETED DIRECTION OF GROUNDWATER FLOW

NOTES:

1) THIS FIGURE PROVIDES ONE INTERPRETATION OF GROUNDWATER FLOW; OTHER INTERPRETATIONS ARE POSSIBLE.
2) ALL ELEVATIONS PRESENTED IN THIS REPORT ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) VERTICAL CONTROL DATUM.

AERIAL IMAGERY SOURCE:
GOOGLE EARTH PRO (2013) DJA SURVEY JUNE 2015

N

50 0 50 100

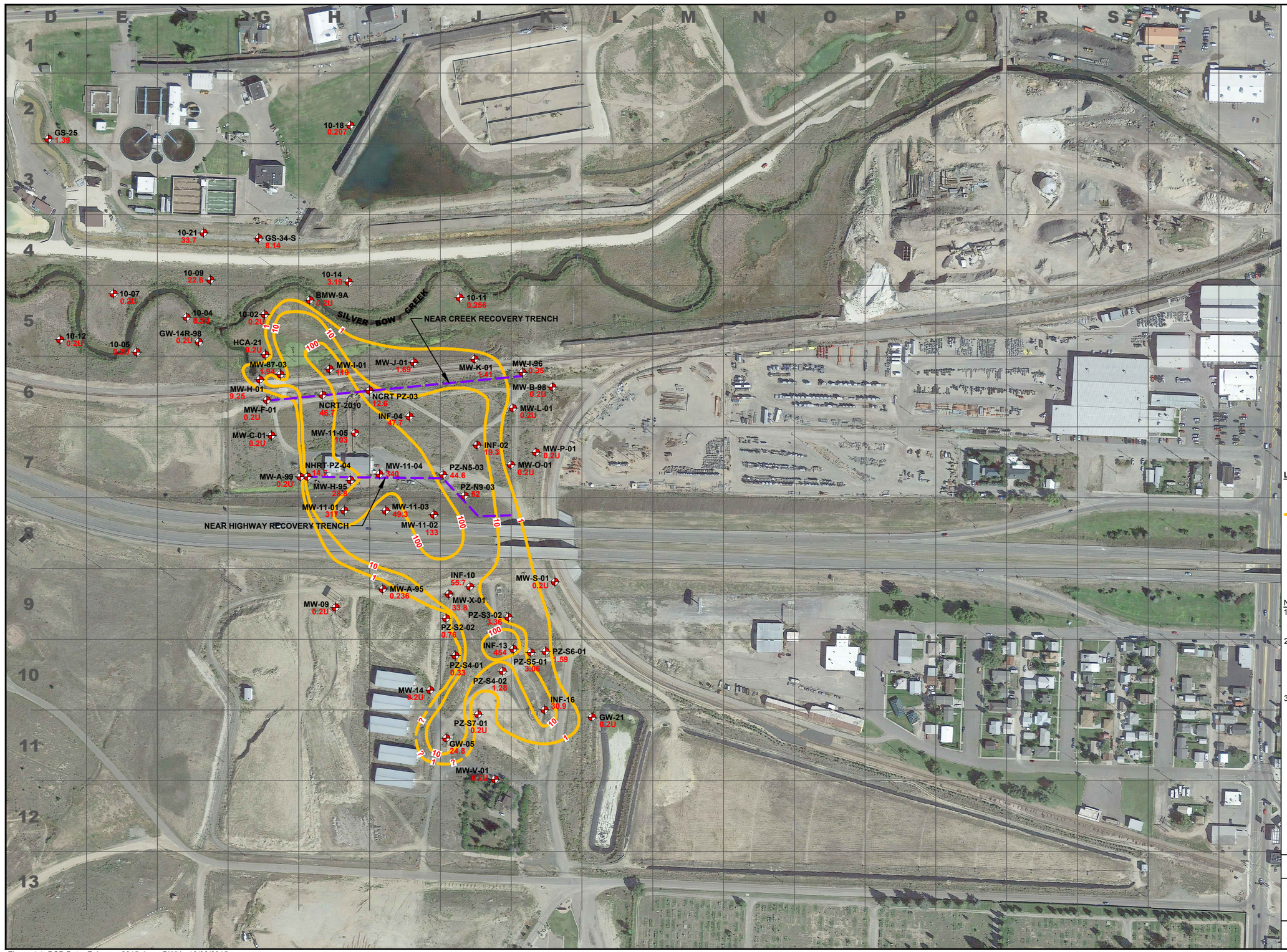
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.3
ON-SITE GROUNDWATER LEVEL DATA - JULY 31, 2015

TETRA TECH

Figure 4.3_On-Site GW Data_July 2015.dwg - DWH - 12/22/2015



LEGEND

- MONITORING WELL
- PCP ISOCONTOUR - DASHED WHERE INFERRED ? WHERE UNKNOWN (µg/L)
- U — ANALYZED FOR BUT NOT DETECTED ABOVE THE METHOD DETECTION LIMIT
- µg/L — MICROGRAMS PER LITER

NOTES:

1) PENTACHLOROPHENOL (PCP) ISOCONTOURS ARE INTERPRETED; OTHER INTERPRETATIONS ARE POSSIBLE.

2) THE PCP PLUME IS NOT INTERPRETED TO FLOW THROUGH THE NEAR CREEK RECOVERY TRENCH (NCRT). RATHER, CONTAMINATED GROUNDWATER NEAR THE HISTORICAL SILVER BOW CREEK CHANNEL IS INTERPRETED TO BE MIGRATING TOWARD THE NCRT.

3) PLUME AREA BASED ON 1 µg/L CONTOUR INTERVAL: 16.5 ACRES

AERIAL IMAGERY SOURCE:
GOOGLE EARTH PRO (2013) DJA SURVEY JUNE 2015

N

150 0 150 300

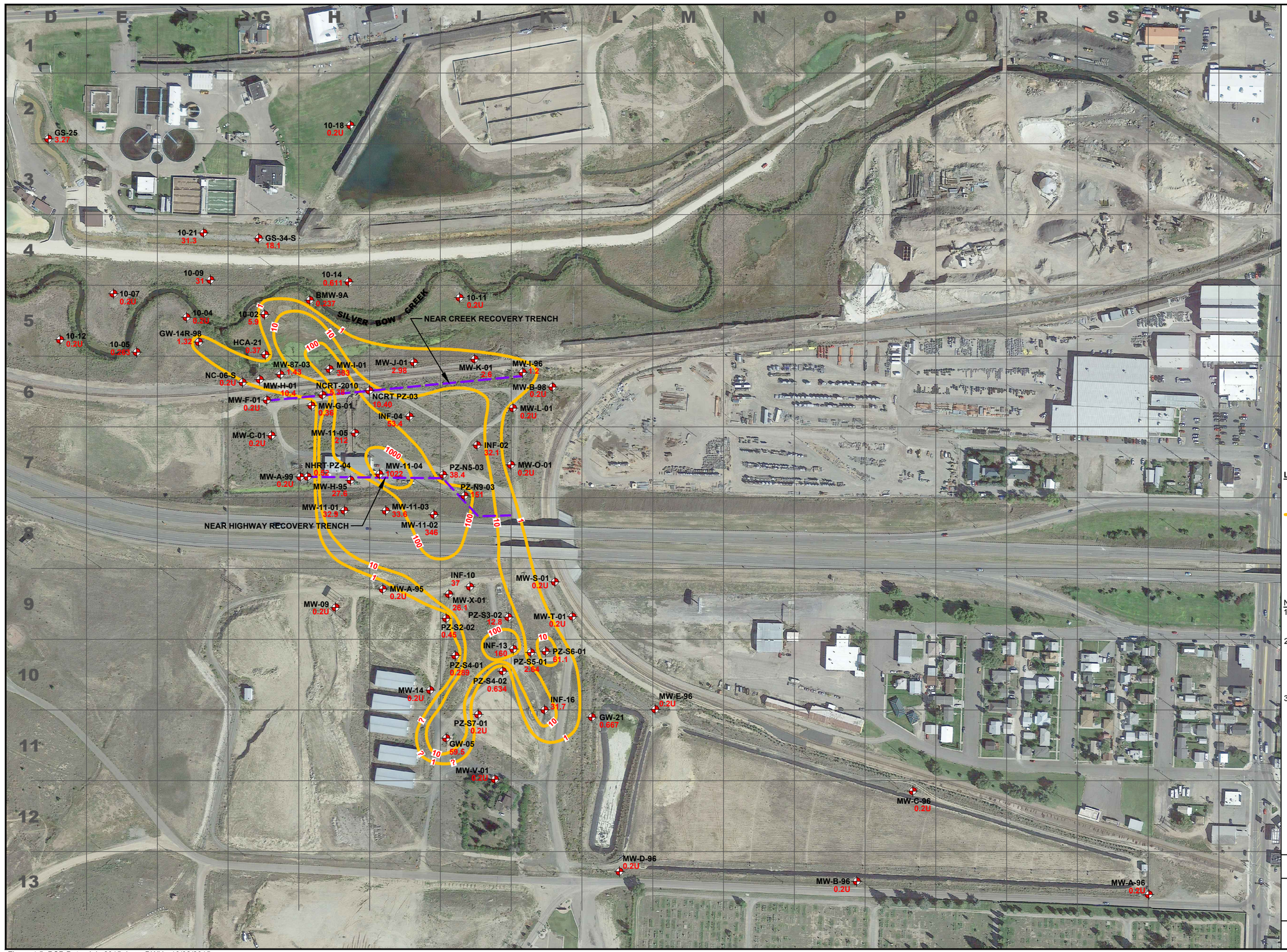
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.4
PCP DATA - FEBRUARY 2, 2015

TETRA TECH

Figure 4.4_PCP Data_February 2015.dwg - DWH - 10/02/2015



LEGEND

- MONITORING WELL
- PCP ISOCONTOUR - DASHED WHERE INFERRED ? WHERE UNKNOWN (µg/L)
- U — ANALYZED FOR BUT NOT DETECTED ABOVE THE METHOD DETECTION LIMIT
- µg/L — MICROGRAMS PER LITER

NOTES:

1) PENTACHLOROPHENOL (PCP) ISOCONTOURS ARE INTERPRETED; OTHER INTERPRETATIONS ARE POSSIBLE.

2) THE PCP PLUME IS NOT INTERPRETED TO FLOW THROUGH THE NEAR CREEK RECOVERY TRENCH (NCRT). RATHER, CONTAMINATED GROUNDWATER NEAR THE HISTORICAL SILVER BOW CREEK CHANNEL IS INTERPRETED TO BE MIGRATING TOWARD THE NCRT.

3) PLUME AREA BASED ON 1 µg/L CONTOUR INTERVAL: **16.6** ACRES

AERIAL IMAGERY SOURCE:
GOOGLE EARTH PRO (2013) DJA SURVEY JUNE 2015

N

150 0 150 300

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.5
PCP DATA - JULY 31, 2015

TETRA TECH

Figure 4.5_PCP Data_July 2015.dwg - DWH - 10/02/2015

Attachment 5

Email (2/25/16) about Sampling and Analysis of Dioxin in Groundwater

Greenwald, Rob

From: Roos, Kathie
Sent: Thursday, February 25, 2016 12:46 PM
To: David Bowers (dbowers@mt.gov); DeWitt, Lisa
Cc: Greenwald, Rob; Abrahams, Jennifer; Buffalo, Daniel; Bowler, Tom; Dunkle, Travis; McCoy, Colin
Subject: Laboratory Method Blank Evaluation and Effects of Turbidity - Dioxin
Attachments: Dioxin Topics: Please review and provide comments- pls cc everyone; Table 1_Dioxin Lab Blanks_2009-2015_Rev1.xlsx; Table 2 _Dioxin Groundwater_2001-2015.xlsx; Table 3_Dioxin TEQ_unfiltered-filtered_turbidity.xlsx

David and Lisa:

Provided below is an email that has been updated to incorporate comments made on the attached email. As recommended below, the information in this email will be evaluated during the five year review process. Please call or email with any questions or comments.

This email presents (1) an evaluation of the calculated dioxin TEQs for laboratory method blanks relative to the Montana DEQ-7 groundwater standard (2.0 pg/L), (2) an evaluation regarding the potential relationship between higher values for dioxin TEQ in groundwater at the site and higher values of turbidity, and (3) recommendations going forward.

1. **Evaluation of Laboratory Method Blanks**

Calculated dioxin TEQs for laboratory method blanks were evaluated after noticing that many laboratory method blanks exhibited dioxin TEQ values above the Montana DEQ-7 dioxin TEQ standard for groundwater (2.0 pg/L). As shown on Table 1, seventeen laboratory method blanks (laboratory-grade distilled water using clean, laboratory-grade glassware) were analyzed during the field efforts associated with the 2009 to 2015 period of record. Analyses were conducted using the lowest possible detection limits available at the time of the analysis.
After individual dioxin congener data were received from the laboratory, dioxin TEQs were calculated using two different methods, including: (1) 2005 WHO methodology which includes using PRL/2 where ND; using estimated maximum possible concentration (EMPC)/2 when reported; and using 2005 toxicity equivalency factors (TEFs) as specified in DEQ-7, (herein referred to as "the DEQ-7 methodology") and (2) MPTP ROD methodology using 0 where ND (herein referred to as the "MPTP ROD methodology") and ROD TEFs. Table 1 provides a summary of dioxin TEQs for all laboratory method blanks. The minimum dioxin TEQ using the DEQ-7 methodology was 0.65 pg/L. The maximum dioxin TEQ was 4.53 pg/L. The average dioxin TEQ for laboratory method blanks was 2.04 pg/L. Using the ROD methodology, the minimum dioxin TEQ for laboratory method blanks was 0.00 pg/L. The maximum dioxin TEQ was 0.42 pg/L and the average dioxin TEQ was 0.06 pg/L.

Of significance is the fact that the average dioxin TEQ for laboratory method blanks using the DEQ-7 methodology (2.04 pg/L) is greater than the Montana DEQ-7 dioxin standard for groundwater (2.0 pg/L). Since that is the methodology specified in DEQ-7, it seems clear that the currently available laboratory detection limits for dioxin are still too high to support use of the 2.0 pg/L Montana DEQ-7 dioxin standard for groundwater.

Additionally, based on the maximum dioxin TEQ value for this method blank data set (4.53 pg/L), it is not unreasonable to conclude that a dioxin TEQ value (using the DEQ-7 methodology) of about 5 pg/L may be an appropriate "noise threshold" for dioxin TEQs using the currently lowest available detection limits. That is, a groundwater sample collected from a monitoring well that exhibits a dioxin TEQ value less than 5 pg/L (using the DEQ-7 methodology) may have little relevance in terms of identifying the presence of dioxin contamination in groundwater at that location. This conclusion is supported by the fact that laboratory-grade distilled water has exhibited the presence of dioxin with an associated TEQ up to about 5.0 pg/L (using the DEQ-7 methodology).

2. Evaluation of the Potential Effect of Turbidity on Dioxin TEQs

Table 2 provides a summary of dioxin TEQ data in groundwater for the August annual monitoring events conducted at the MPTP site for the 2001 to 2015 period of record. Dioxin samples were collected and analyzed from 17 monitoring wells, and the dioxin TEQ for each well was calculated from individual congener data using the MPTP ROD methodology (the dioxin TEQ using the DEQ-7 methodology was not calculated for this table). Only four of 78 samples (5 percent) exceeded the MPTP ROD groundwater cleanup level (30 pg/L). Reviewing these data, there is no obvious spatial or temporal trend that would strongly support a conclusion that there is a mobile or discrete "plume" of dioxin at the site (Tetra Tech 2013). Specifically, there are no obvious trends in concentration over time at any particular well location, and there is no discrete "dioxin plume" or plume boundary that can be inferred from the data.

After some internal technical discussion regarding the existing data, an alternative hypothesis to explain the few sporadically elevated concentrations of dioxin TEQ in groundwater was formulated, and then tested. Specifically, it was hypothesized that higher values of dioxin TEQ in groundwater may be associated with higher values of turbidity, particularly (but not only) at (1) monitoring wells that were installed directly in or adjacent to areas where contaminated soil was not previously removed during historic EPA emergency response actions, or (2) monitoring wells that have not been fully developed or that might still contain minor amounts of particulate or sediment. The above hypothesis was formulated also knowing that dioxins are immobile in soil and readily adsorb to soil particles (CDM 2001). Turbidity measurements were not collected during the sampling events summarized on Table 2, so no correlation of dioxin versus turbidity can be made with those data.

To test the stated hypothesis, 14 dioxin samples were collected at the MPTP site on October 5, 2015 (Table 3). Turbidity measurements were collected for each monitoring well prior to sampling. One sample aliquot was sent to Pace Analytical Laboratory and analyzed for dioxins using EPA Method 8290. These samples were not filtered. Dioxin TEQs were calculated for each unfiltered sample using the laboratory results for individual congeners using both the DEQ-7 methodology and the MPTP ROD methodology. Table 3 indicates that two of the 14 unfiltered samples (INF-16 and MW-11-04) exhibited dioxin TEQs greater than 100 pg/L (using both methodologies) as well as turbidity values greater than 1.0 NTU. For this analysis, a turbidity reading equal to or greater than 1.0 NTU is considered to be relatively turbid (a turbidity value of 1.0 NTU may not be considered high turbidity in general, but based on the properties of this contaminant, and the extremely low DEQ-7 standard for this contaminant, a turbidity of 1.0 NTU could represent a high enough turbidity to tangibly impact the dioxin TEQ results for unfiltered samples).

After initial review of the dioxin TEQ data for the unfiltered groundwater samples, a second aliquot of eight selected groundwater samples was sent (within holding time limits) to Pace for re-analysis of dioxin using EPA Method 8290. However, prior to extraction and analysis these samples were filtered by the laboratory to remove any particulates, if present. Each sample was passed through a disposable celltreat 0.45 micron bottle top filter; sample flow through the filter was facilitated by the use of an attached vacuum pump.

The eight samples selected included the two samples exhibiting highly elevated dioxin TEQs (INF-16 and MW-11-04) plus several samples that exhibited dioxin TEQs less than 5 pg/L. Calculated TEQs for filtered results using both methods are also provided in Table 3.

Review of the data provided in Table 3 indicates that the unfiltered dioxin TEQs for monitoring wells INF-16 and MW-11-04 were greater than 100 pg/L, but that the filtered dioxin TEQs for these same samples were less than the 5 pg/L "noise threshold." Note that samples from monitoring wells INF-16 and MW-11-04 exhibited elevated (i.e. greater than 1.0 NTU) values for turbidity (4.09 NTU at INF-16 and 22.2 NTU at MW-11-04) whereas most other samples exhibited turbidity values less than 1.0 NTU. Furthermore, the dioxin TEQs for all unfiltered samples were greater than the dioxin TEQ for filtered samples. A few other samples exhibiting higher turbidity values did not exhibit high dioxin TEQ values suggesting no dioxin was associated with particulates at those locations. Based on this analysis it can reasonably be concluded that (1) higher values of dioxin TEQ in groundwater appear to be associated with higher values of turbidity if dioxin is present on the particulates, and (2) dioxin in groundwater at these wells is not mobile; rather, it appears that dioxins are sorbed to particulate matter in the well bore. This could explain elevated levels of dioxin TEQ at specific wells when no apparent "plume" of dioxin is present, and could also explain highly variable concentrations of dioxin over time at the same well (i.e., due to different levels of turbidity in the samples).

This conceptual model does not preclude the potential that elevated dioxin TEQ at specific locations could occur for other reasons. For instance, per Table 3, the recent sample at the NHRT indicated a slightly elevated dioxin TEQ value (approximately 6 pg/L using both methods) and a turbidity value of 0.06 NTU (much lower than the threshold of 1.0 NTU discussed above). Small quantities or sheens of free product are sometimes observed at the NHRT and dioxin could also be associated with such oil. This explanation for elevated dioxin TEQ at the NHRT and the turbidity explanation for elevated dioxin TEQ at specific monitoring wells are not mutually exclusive.

3. Recommendations Going Forward

<u>Incorporating Method Blank Evaluation into Dioxin Evaluation:</u>

- Evaluate the appropriateness of the co-application of the DEQ-7 methodology and the Montana DEQ-7 dioxin standard for groundwater (2.0 pg/L) in light of the above analysis for laboratory method blanks that shows current detection limits are not sufficiently low enough to be meaningful with respect to that standard.
- Determine if TEQ values less than 5.0 pg/L (using the DEQ-7 methodology) which are most likely below the observed "noise threshold" should be used to identify the presence of dioxin contamination in groundwater.
- Discuss these issues in the upcoming five year review (5YR). If the 5YR includes a recommendation to use a lower standard than the ROD standard of 30.0 pg/L, that recommendation should also recognize the problems with adopting the DEQ-7 standard of 2.0 pg/L without some accommodation for this issue.

<u>Evaluation of the Potential Effect of Turbidity on Dioxin TEQs:</u>

- Record turbidity for all samples that will be analyzed for dioxin.
    - This would allow for a long-term relationship to be established between dioxin TEQ results and turbidity values at specific wells (it would not be correct to refer to that relationship as a "correlation" because a sample can have high turbidity but low dioxin TEQ if the particulates near that well are not impacted by dioxin).
- Collect triple-volume aliquots for groundwater samples to be submitted for dioxin analysis for specific sample locations where the turbidity is greater than 3 NTU. Collect double-volume aliquots for all other samples to be submitted for dioxin analysis.
- Analyze the first aliquot by EPA Method 8290.
    - The initial aliquot will not be filtered.
- Calculate TEQs for initial results using both the DEQ-7 and MPTP ROD methodologies, and reviewed. Submit a second aliquot to the laboratory for all samples exhibiting a dioxin TEQ greater than 5 pg/L (using either method of calculation) coincident with a turbidity value greater than 2.0

NTU. These samples will be filtered by the laboratory using a disposable celltreat 0.45 micron bottle top filter (as described above) prior to extraction and analysis by EPA Method 8290 and analyzed within the established holding time.
    - The extra aliquot (third at some wells and second at other wells) is collected in case of breakage during transport of samples to the laboratory.
- Report both unfiltered and filtered results.
- Discuss these issues in the upcoming 5YR.

References

CDM. 2001. Technical Memorandum Vadose Zone Soils Dioxin/Furan Mobility Evaluation, September.
Tetra Tech 2013. PowerPoint presentation to CTEC. October 29.

Take care,

Kathie M. Roos, P.E.
Engineer | Project Manager
Main: 406.441.3262 | Cell: 406.431.2784
7 West 6th Avenue, Suite 612 | Helena, Montana 59601

Tetra Tech | Complex World, Clear Solutions™
www.tetratech.com

TABLE 1
SUMMARY OF DIOXIN TEQs IN LABORATORY METHOD BLANKS
FOR THE MPTP SITE 2009 TO 2015

Analysis Date	Laboratory	Lab Sample ID	Analytical Method	Data Qualifiers[a]	TEQ (pg/L) DEQ-7 Methodology	TEQ (pg/L) MPTP ROD Methodology
10/31/2015	Pace	BLANK-47558	8290	I, J	2.41	0.00
10/15/2015	Pace	BLANK-47241	EPA Method 8290	I, J	0.81	0.00
10/14/2015	Pace	BLANK-47253	EPA Method 8290	J	3.15	0.04
9/6/2015	Pace	BLANK-46736	EPA Method 8290	I, J	1.16	0.42
9/3/2015	Pace	BLANK-46716	EPA Method 8290	I, J	3.75	0.22
8/21/2015	Pace	BLANK-46522	EPA Method 8290	I, J	2.81	0.00
9/9/2014	Pace	BLANK-41817	EPA Method 8290	none	3.28	0.00
8/30/2014	Pace	BLANK-41717	EPA Method 8290	I, J	1.43	0.01
8/21/2013	Pace	BLANK-37461	EPA Method 8290	I, J	0.65	0.17
8/24/2013	Pace	BLANK-37491	EPA Method 8290	J	0.75	0.03
8/27/2013	Pace	BLANK-37513	EPA Method 8290	I, J	1.15	0.05
8/31/2012	Pace	BLANK-33712	EPA Method 8290	J	1.37	0.08
8/31/2011	Pace	BLANK-30051	EPA Method 8290	I, J	1.31	0.03
9/6/2011	Pace	BLANK-30117	EPA Method 8290	none	4.53	0.00
8/25/2010	TestAmerica	G0H210000-062	EPA Method 8290	none	1.34	0.00
9/8/2010	TestAmerica	G0H310000-290	EPA Method 8290	none	2.96	0.00
8/28/2009	TestAmerica	G9H200000-504B	EPA Method 8290	none	1.87	0.00
			2009 to 2015 Count		17	17
			2009 to 2015 Minimum		0.65	0.00
			2009 to 2015 Maximum		4.53	0.42
			2009 to 2015 Average		2.04	0.06

Notes:

a	At least one of the dioxin congeners in the data set are flagged with the data qualifier shown
DEQ	Montana Department of Environmental Quality
DEQ-7 Methodology	2005 WHO Using PRL/2 where ND
EPA	U.S. Environmental Protection Agency
I	Interference present
J	Estimated value
MPTP ROD Methodology	DEQ ROD Using 0 where ND
ND	Not detected
none	Data set did not include any data qualifiers
Pace	Pace Analytical Services, Inc.
PRL	Project reporting limit
ROD	Record of Decision
TEQ	Toxicity equivalence quotient
WHO	World Health Organization

TABLE 2
HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR GROUNDWATER SAMPLES
(µg/L)

Sample Date	10-12 (µg/L)	BMW-01A (µg/L)	BMW-01B (µg/L)	GW-12 (µg/L)	GW-14R-98 (µg/L)	HCA-21 (µg/L)	INF-04 (µg/L)	INF-05 (µg/L)	INF-06 (µg/L)	MW-11-04 (µg/L)	MW-B-98 (µg/L)	MW-D-96 (µg/L)	MW-E-01 (µg/L)	MW-L-96 (µg/L)	MW-U-01 (µg/L)	MW-V-01 (µg/L)	NWW (µg/L)	ROD Cleanup Level (µg/L)
8/13/2001	--	--	--	--	--	--	--	--	3.83E-06	--	--	--	7.70E-08	2.10E-08	--	--	--	3.00E-05
8/12/2002	--	--	--	--	--	--	--	--	2.00E-07	--	--	--	2.10E-07	1.70E-07	--	--	--	3.00E-05
8/4/2003	--	--	--	--	--	--	--	--	4.90E-08	--	--	--	1.10E-07	0	--	--	--	3.00E-05
8/2/2004	--	--	--	--	--	--	--	--	7.00E-07	--	--	--	**4.35E-05**	0	--	--	--	3.00E-05
8/1/2005	--	--	--	--	--	--	--	--	9.20E-08	--	--	--	2.70E-06	5.30E-07	--	--	--	3.00E-05
8/21/2006	--	--	--	7.90E-08	--	--	1.29E-05	0	7.20E-08	--	7.80E-08	9.20E-08	**5.96E-05**	0	--	--	--	3.00E-05
8/27/2007	--	--	--	2.80E-07	--	--	6.90E-07	7.00E-08	0.00E+00	--	0	0	1.00E-07	0	--	--	--	3.00E-05
8/25/2008	--	--	--	0	--	--	1.26E-05	8.00E-08	0.00E+00	--	0	6.50E-07	1.30E-07	0	--	--	--	3.00E-05
8/10/2009	--	--	--	--	0	--	1.40E-07	--	--	--	0	--	--	--	0	--	--	3.00E-05
8/16/2010	--	--	--	--	0	--	**4.50E-05**	--	--	--	0	--	--	--	0	--	--	3.00E-05
8/15/2011	--	--	--	--	1.05E-06	--	4.09E-06	--	--	--	9.30E-09	--	--	--	--	2.82E-08	1.70E-08	3.00E-05
8/13/2012	--	--	--	--	1.18E-07	--	2.75E-05	--	--	--	1.04E-07	--	--	--	--	3.30E-08	7.40E-08	3.00E-05
8/13/2013	4.50E-08	8.81E-08	1.12E-07	--	6.70E-07	8.04E-08	5.59E-06	--	--	9.91E-06	--	--	--	--	--	--	--	3.00E-05
8/11/2014	2.70E-08	2.08E-08	1.83E-08	--	1.42E-07	7.77E-07	1.38E-04	--	--	7.15E-06	--	--	--	--	--	--	--	3.00E-05
8/10/2015	1.04E-07	7.50E-09	2.70E-08	--	9.03E-06	4.23E-07	6.31E-07	--	--	6.46E-06	--	--	--	--	--	--	--	3.00E-05

HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR GROUNDWATER SAMPLES
(pg/L)

Sample Date	10-12 (pg/L)	BMW-01A (pg/L)	BMW-01B (pg/L)	GW-12 (pg/L)	GW-14R-98 (pg/L)	HCA-21 (pg/L)	INF-04 (pg/L)	INF-05 (pg/L)	INF-06 (pg/L)	MW-11-04 (pg/L)	MW-B-98 (pg/L)	MW-D-96 (pg/L)	MW-E-01 (pg/L)	MW-L-96 (pg/L)	MW-U-01 (pg/L)	MW-V-01 (pg/L)	NWW (pg/L)	ROD Cleanup Level (pg/L)
8/13/2001	--	--	--	--	--	--	--	--	3.83	--	--	--	0.077	0.021	--	--	--	30.00
8/12/2002	--	--	--	--	--	--	--	--	0.20	--	--	--	0.21	0.17	--	--	--	30.00
8/4/2003	--	--	--	--	--	--	--	--	0.049	--	--	--	0.11	0.00	--	--	--	30.00
8/2/2004	--	--	--	--	--	--	--	--	0.70	--	--	--	**43.45**	0.00	--	--	--	30.00
8/1/2005	--	--	--	--	--	--	--	--	0.092	--	--	--	2.695	0.53	--	--	--	30.00
8/21/2006	--	--	--	0.079	--	--	12.92	0	0.072	--	0.078	0.092	**59.63**	0.00	--	--	--	30.00
8/26/2007	--	--	--	0.28	--	--	0.69	0.07	0	--	0	0	0.10	0	--	--	--	30.00
8/25/2008	--	--	--	0	--	--	12.64	0.08	0	--	0	0.650	0.13	0	--	--	--	30.00
8/10/2009	--	--	--	--	0	--	0.14	--	--	--	0	--	--	--	0	--	--	30.00
8/16/2010	--	--	--	--	0	--	**45.0**	--	--	--	0	--	--	--	0	--	--	30.00
8/15/2011	--	--	--	--	1.05	--	4.09	--	--	--	0.009	--	--	--	--	0.028	0.017	30.00
8/13/2012	--	--	--	--	0.12	--	27.50	--	--	--	0.104	--	--	--	--	0.033	0.074	30.00
8/12/2013	0.05	0.09	0.11	--	0.67	0.08	5.59	--	--	9.91	--	--	--	--	--	--	--	30.00
8/11/2014	0.03	0.02	0.02	--	0.14	0.78	**138.00**	--	--	7.15	--	--	--	--	--	--	--	30.00
8/10/2015	0.10	0.01	0.03	--	9.03	0.42	0.63	--	--	6.46	--	--	--	--	--	--	--	30.00

Notes:

0	Dioxin cogeners were below the reporting limit and set to 0 for the calculation of TEQ, resulting in a TEQ equal to 0.
--	Monitoring well did not exist or was not sampled on this date
pg/L	Picograms per liter
µg/L	Micrograms per liter
Bold	Concentration exceeds the ROD groundwater cleanup level
MPTP	Montana Pole and Treating Plant
MPTP ROD Methodology	MPTP ROD methodology using 0 where ND
ROD	Record of Decision
TEQ	Toxicity equivalent quotient (calculated using MPTP ROD methodology)

TABLE 3
COMPARISON OF UNFILTERED AND FILTERED DIOXIN TEQ DATA
AND VALUES FOR TURBIDITY

Sample Date	Monitoring Well	**UNFILTERED** DEQ-7 Methodology Dioxin TEQ (pg/L)	**UNFILTERED** MPTP ROD Methodology Dioxin TEQ (pg/L)	**FILTERED** DEQ-7 Methodology Dioxin TEQ (pg/L)	**FILTERED** MPTP ROD Methodology Dioxin TEQ (pg/L)	PCP (ug/L)	Turbidity (NTU)
10/5/2015	10-01	1.2	0.05	-	-	11.2	0.36
10/5/2015	10-02	1.0	0.02	-	-	16.2	2.79
10/5/2015	GW-09	1.5	0.61	-	-	0.2U	0.66
10/5/2015	GW-14R-98	3.0	2.04	1.4	0.011	1.06	7.2
10/5/2015	INF-13	1.9	0.61	1.9	0.531	21.8	0.4
10/5/2015	INF-14	1.7	0.43	1.6	0.027	0.2U	0.32
10/5/2015	INF-15	1.2	0.36	1.4	0.000	0.2U	0.61
10/5/2015	INF-16	103.6	139.66	4.3	3.371	24.1	4.09
10/5/2015	INF-17	3.3	2.72	1.1	0.036	1.06	0.39
10/5/2015	INF-18	2.2	1.41	0.97	0.000	0.2U	0.34
10/5/2015	MW-11-04	125.7	169.31	1.1	0.175	35,700	22.2
10/5/2015	MW-W-01	1.0	0.01	-	-	0.2U	0.48
10/5/2015	NCRTEFF	3.7	3.74	-	-	5.02	1.73
10/5/2015	NHRTEFF	5.8	5.95	-	-	167	0.06

Note:

-	Filtered sample was not submitted to laboratory
Yellow	Indicates samples exhibiting relatively higher turbidiy coupled with relatively higher dioxin TEQ in the unfiltered sample
DEQ-7 Methodology	2005 WHO methodology and using PRL/2 where ND
DEQ	Montana Department of Environmental Quality
MPTP ROD Methodology	DEQ ROD methodology using 0 where ND
ND	Not detected
none	Data set did not include any data qualifiers
NTU	Nephelometric turbidity units
Pace	Pace Analytical Services, Inc.
PRL	Project reporting limit
ROD	Record of Decision
TEQ	Toxicity equivalence quotient
WHO	World Health Organization

Attachment 6

Interview Summary Forms

MPTP 5-Year Review Community Interview Questions

Person interviewed: Ed Fisher and Bob O'Bill, Residents of Boulevard Neighborhood
Interviewers: Jennifer Abrahams and Rob Greenwald, Tetra Tech
Date/Time: March 1, 2016 at approximately 3:30 PM

1. What is your overall impression of the MPTP remediation project?

Ed indicated that he feels the residents were not told the whole story from the start about the inconveniences and impacts during the remedy. He noted the dust and odor from soil removal as an example. He said planting trees was meant to pacify the neighborhood but the trees died despite an irrigation system being added. He acknowledges that the impacts he is referring to were in the past, not within the last 5 years. However, he said after the trees died nothing was done to replace them, and doing something to replace them would have been preferable. He said the two of his neighbors who were most bothered by the remedial actions are no longer there, one moved and one passed away.

Bob said he thinks those responsible for the remedy have done a fairly good job. Like Ed, he indicated the neighborhood had to put up with a lot over the years. He said he does not want an asphalt plant on the MPTP property in the future. Both indicated frustration that land use decisions have not resulted in a final plan (see Item 6 below).

2. What effects have site activities/operations had on the surrounding community?

Ed and Bob both indicated dust and odor from LTU activities was historically an issue, but not within the last 5 years. They are not sure if anyone moved as a result of those issue, but it is possible. They stated that the residents currently in the neighborhood are OK with what has gone on at the site.

3. Are you aware of any community concerns regarding the MPTP Site?
   YES

   If yes, what are they?

See answers to #1 and #2 above. Additionally, Ed and Bob indicated that moving forward people are concerned about their property values and how that might be impacted by future land use at the site. Additionally, they are concerned how future land use at the site could impact quality of life in their neighborhood.

With respect to potential land uses at the site, they both indicated preference for a park in the area where the LTU is located (close to the residences) and a fire training facility on part of the remaining property. They prefer those uses to relocating the County shop to the site, which was recently discussed as a potential option, but they were not specifically against having the County shop there. They felt the County shop might impact other nearby neighborhoods more than them.

They also indicated it is not clear to them why contaminants on other parts of the site were brought to the relatively clean area near their homes (the LTU) to be remediated, because when the plant operated they were not really impacted, and subsequent impacts were really due to bringing the impacted soil near their homes.

4. Do you feel the remedy (including institutional controls) at the MPTP site is effective? ***YES***

In general "yes" though Ed was not sure he knows enough to really answer. They feel conditions on the site have significantly improved as a result of the remediation but they feel it is taking much longer than they first were led to believe.

5. Do you feel well informed about site progress and activities? ***YES (somewhat)***

If no, how would you like to receive information and how often?

Historically they said they have asked questions to the plant operator and were satisfied they were getting truthful answers. They feel like the information they were provided over the years about length of time for the remedy was incorrect, since they thought it would be like a 10 year project and now it is 20+ years. They don't think more meetings are needed because "nothing ever comes of them" and that "BSB doesn't send people with needed authority to such meetings".

6. What other comments or suggestions do you have?

They feel the three agencies (DEQ, EPA, BSB) should work better together and with the community to come up with solid plans for future land use at the site. They don't understand digging up the LTU rather than just leaving it in place and covering it up. Additionally, moving the LTU soils before covering them up requires demolishing 4 buildings on the west side of the property where soils will go, and they think those buildings could maybe be used for something if the LTU soils were left where they are. Ed and Bob would prefer that the LTU offload and subsequent cover work be done in concert with a specific land use plan, so that DEQ can account for infrastructure needs as they do the LTU work, and they feel BSB has had trouble deciding exactly what to do with the land. They indicated DEQ has a map indicating what the community prefers regarding land use, and they both feel that when it comes to future land use decisions the neighborhood should "get a break" with respect to what they want, since they had to put up with so much over the years.

MPTP 5-Year Review Community Interview Questions

Person interviewed: Joe Griffin, Citizen's Advocate (formerly with DEQ)
Interviewers: Jennifer Abrahams and Rob Greenwald, Tetra Tech
Date/Time: March 2, 2016 at approximately 9:00 AM

1. What is your overall impression of the MPTP remediation project?

He has been following the site a long time. Initially there were lots of air issues, especially odor, but those have been dealt with (including air monitoring that indicated no issues). Feels that current project manager for DEQ (Lisa DeWitt) did a good job when she first took over the site to find out community concerns. Overall Joe believes there has been a lot of improvement at the site, the pump-and-treat system is doing its job, and older LTU issues such as odor have been dealt with.

2. What effects have site activities/operations had on the surrounding community?

Based on community meeting in 2013 Joe believes some in the community are not satisfied with the remedy approach in the ROD, but community members don't realize changing that decision document is hard or impossible.

3. Are you aware of any community concerns regarding the MPTP Site?
   YES

   If yes, what are they?

Much of the historical concern was regarding odors, but that has been addressed. He thinks that some community members feel that White Rot Fungi could have been added to the LTU to try to treat dioxins. Current concerns primarily relate to potential land uses, and that some (particularly John Ray) express concerns about leaving soil with dioxins on-site.

4. Do you feel the remedy (including institutional controls) at the MPTP site is effective?
   YES

Joe indicated that he believes the uses of engineering and institution controls is needed for the dioxins due to technical impracticability of remediating the dioxins, and he believes it will be important that the engineering and institutional controls be well managed now and in the future. He believes the Controlled Groundwater Area (CGA) is not easily managed.

5. Do you feel well informed about site progress and activities? ***YES***

   If no, how would you like to receive information and how often?

6. What other comments or suggestions do you have?

Joe is not confident that the CGA is an effective institutional control based on the way it is managed (i.e., limited control over existing wells).

MPTP 5-Year Review Community Interview Questions

Person interviewed: Julia Crane, BSB Planning Department
Interviewers: Jennifer Abrahams and Rob Greenwald, Tetra Tech
Date/Time: March 2, 2016 at approximately 10:00 AM

1. What is your overall impression of the MPTP remediation project?

Remedy is potentially almost finished. Julia questions if the site is completely safe with respect to soils, she recognizes groundwater treatment will continue "in perpetuity". She is working on potential land uses for the site. Julia indicated that in 2014 the County put forth a plan for potentially re-locating the County shop to the site, but that DEQ could not move forward fast enough. She feels DEQ needs to provide better information to the governing body regarding the institutional controls and how they will keep the site safe.

2. What effects have site activities/operations had on the surrounding community?

She believes there has been anger and irritation in the past regarding odors (more than five years ago), and also with the duration of the remedy because the timeline has expanded. She would like better communication between BSB and DEQ regarding remedy timeframes, and thinks it will be great if DEQ communicates clearly with neighbors prior to initiating the LTU offload.

3. Are you aware of any community concerns regarding the MPTP Site?
   YES

   If yes, what are they?

Duration of remedy, end land use, impacts on neighborhood, effectiveness of the remediation. Is it safe for human health and the environment?

4. Do you feel the remedy (including institutional controls) at the MPTP site is effective?
   YES

Site is fenced which Julia feels is effective. She believes the Controlled Groundwater Area (CGA) is working properly.

5. Do you feel well informed about site progress and activities? ***NO***

If no, how would you like to receive information and how often?

Julia believes there was a real lack of communication from DEQ starting in mid-2014, but that has improved recently because BSB started communicating with others in DEQ (Tom Stoops). She suggests a brief monthly update report distributed via email and posted on a website. She believes BSB needs to be more closely in the loop regarding DEQ plans for the upcoming LTU offload, storm water improvements, etc.

6. What other comments or suggestions do you have?

Julia is concerned by the poor degree of communication between DEQ and BSB, and believes BSB does not always receive needed information. Julia stated that BSB would like to be an active partner with DEQ regarding land use and design, since this is such a large parcel that can be an integral part of the community.

MPTP 5-Year Review Community Interview Questions

Person interviewed: Bill Macgregor, Vice President of Butte Citizens Technical Environmental Committee (CTEC)
Interviewers: Jennifer Abrahams and Rob Greenwald, Tetra Tech
Date/Time: March 2, 2016 at approximately 11:00 AM

1. What is your overall impression of the MPTP remediation project?

Believes the land-farming approach for soil remediation was innovative but Bill had high hopes initially that this approach could also address the dioxin. He is pleased this approach was taken but he thought this approach was intended to be in conjunction with White Rot Fungi – he prefers attempting something in-situ like that for dioxin. He thought that approach for dioxin was discussed 20 to 25 years ago (he specifically mentioned Rick Appleman and Jerry Gless) and would be incorporated. He indicated he has mixed feelings about sending dioxin impacted soils off-site for incineration (sending problem to other places) versus leaving soils with dioxin on-site which has its own set of risks.

2. What effects have site activities/operations had on the surrounding community?

He stated the LTU "sequestered" a portion of land. He noted the previous odor complaints regarding the LTU, but also noted those issues have not occurred within the last five years. Currently he believes primary concerns are future land use, skepticism regarding effectiveness of institutional controls, and not having a real voice in what happens at the site.

3. Are you aware of any community concerns regarding the MPTP Site?
   YES

   If yes, what are they?

Future land use, can we trust institutional controls, and improving the understating of dioxin being left onsite. Bill indicated it would be helpful for DEQ to provide detailed information about the planned institutional controls such as what people need to avoid doing, what are the risks, etc. (he referred to this as "comparative information").

4. Do you feel the remedy (including institutional controls) at the MPTP site is effective?
   YES

Bills says he would prefer a "perfect" cleanup but the improvements to the site are undeniable. It is not perfect but is much better than it was. However, he cannot fully answer this because future land use has not yet been resolved.

5. Do you feel well informed about site progress and activities? ***NO (but feels he is likely better informed than many)***

   If no, how would you like to receive information and how often?

Bill believes a website could be established with a message board or blog to foster communication and allow sharing/comparison of data. He feels that the previous meetings have been more "talking at" than "talking with" and more meetings could be useful if they were truly collaborative in nature.

6. What other comments or suggestions do you have?

Bill believes public meetings have been more antagonistic than collaborative – he suggests consideration of a third-party "trained facilitator" for such meetings to make them less antagonistic and more constructive. He said setting aside a budget for such a facilitator would improve chances of success for issues such as the future land use. He also noted a company called Mycotech could be a source of information regarding fungal remediation of dioxin. Finally, he said that in the past CTEC has been provided a draft of the five-year review, and he encouraged that CTEC be provided a draft copy to review.

MPTP 5-Year Review Community Interview Questions

Person interviewed: Dr. John Ray, Concerned Citizen
Interviewers: Jennifer Abrahams and Rob Greenwald, Tetra Tech
Date/Time: March 2, 2016 at approximately 1:00 PM

1. What is your overall impression of the MPTP remediation project?

Dr. Ray is concerned that dioxin will be left on-site, providing for a perpetual threat. He is also concerned about storm water flow across the site. He noted previous concerns with odors but that those seem to have been resolved more than five years ago. He said final land use decisions are contingent on these issues.

2. What effects have site activities/operations had on the surrounding community?

He noted the previous odor complaints, but also noted those issues have not occurred within the last five years. He also noted concerns about why trees previously planted by DEQ did not survive. He believes people in the community are concerned about land use at the site.

3. Are you aware of any community concerns regarding the MPTP Site?
   YES

   If yes, what are they?

Concerns about contaminants left on-site. When asked if he prefers leaving soil with dioxin on-site versus incineration, he said that he conceptually prefers incineration but realizes this is a "cash-out" site and that incineration would likely blow the budget. Accordingly, he believes leaving soil with dioxin on-site is the more likely outcome, and as a result he is very concerned about the effectiveness of the cap covering the soils with dioxins, and also the potential for storm water to contact the soils and transport dioxin to Silver Bow Creek. He indicated the last time he toured the site he believes there was a storm water issue on the southern part of the site along Greenwood Avenue, and he is not convinced storm water management is adequate across the site. He is concerned with rushing into a land use plan before these issues are adequately addressed, and wants more assurance that that capping will be effective (and he questions how that effectiveness will be monitored and maintained).

4. Do you feel the remedy (including institutional controls) at the MPTP site is effective?
   NO

See item #3 above. Also, Dr. Ray indicated that they type of capping he has seen proposed for Parrot Tailings (a 3-foot cap) would be more effective than what is being planned for the MPTP site, but he also acknowledged that such a cap could be very costly and might not be feasible given the budget of this site.

5. Do you feel well informed about site progress and activities? ***NO***

   If no, how would you like to receive information and how often?

He suggests regular progress reports published at regular intervals (such as every three months or every six months or perhaps just yearly). He prefers mail, but indicated using a website at DEQ or EPA would be an improvement relative to current communication. He also thinks more personal outreach is needed to residents near the site, because residents often feel blind-sided. He believes site updates could be added to agenda of meetings for other groups in town. He also encouraged a meeting at the fire hall before the five-year review is published to invite public participation.

6. What other comments or suggestions do you have?

It was noted during the interview that Dr. Ray has previously sent numerous comments via email regarding his concerns. As part of those previous comments Dr. Ray has indicated that he believes DEQ and their contractor (Tetra Tech) performing the five-year review does not provide for an independent review of the remedy.

Dr. Ray encourages DEQ to include a comment period for the five-year review so that the public can provide input. He believes the newspaper ads notify the public of the five-year review but do not explicitly ask for comments or promise responses.

Dr. Ray is hopeful the final end use of the property will be a productive use that does not compromise the remedy.

MPTP 5-Year Review Community Interview Questions

Person interviewed: Travis Dunkle, Tetra Tech (Treatment Plant Operator)
Interviewers: Jennifer Abrahams and Rob Greenwald, Tetra Tech
Date/Time: March 2, 2016 at approximately 2:30 PM

1. What is your overall impression of the MPTP remediation project?

Travis is primarily focused on the groundwater remediation, and he believes the remedy is working well. The pump-and-treat system is pretty standard, and the GAC removes contaminants effectively.

2. What effects have site activities/operations had on the surrounding community?

Travis has no real interaction with the community. He noted that the dewatering at the nearby wastewater treatment plant included some water with PCP, so the site had some impact on the dewatering. Similarly, Hollow Construction (south of the site) needed to work on a clogged culvert at their facility to prevent storm water from going onto the MPTP site from the south.

3. Are you aware of any community concerns regarding the MPTP Site?
   YES

   If yes, what are they?

During previous LTU tilling and offloads the Boulevard Community was concerned about odor, dust, and noise. There is some concern about property values and how that may be impacted by future land use. There are general concerns about specific plans for re-use especially in the area of the LTU which is close to the homes.

4. Do you feel the remedy (including institutional controls) at the MPTP site is effective?
   YES

Travis is primarily involved with water and not soils, and he believes the groundwater remedy is effective. He also believes the LTU was successful reducing PCP concentrations in soil, although it will not achieve cleanup levels for dioxins.

5. Do you feel well informed about site progress and activities? ***YES***

   If no, how would you like to receive information and how often?

6. What other comments or suggestions do you have?

He believes some improvements to the site storm water management are needed, but he believes the current storm water management is effective.

MPTP 5-Year Review Community Interview Questions

Person interviewed: Jon Sesso, BSB Director of Planning
Interviewers: Jennifer Abrahams and Rob Greenwald, Tetra Tech
Date/Time: March 2, 2016 at approximately 3:30 PM

1. What is your overall impression of the MPTP remediation project?

He believes the remedy has taken too long, especially the soil remedy. He stated it is a bad example for how EPA/DEQ should interact with the public. He feels the reason the public wants to change parts of the remedy now is because the remedy did not get finished quick enough. He thinks some portion of the public forgets that they supported the bioremediation approach when it was first suggested. He feels that good initial progress was marred by issues such as odors, and the community was not prepared in advance for those issues. He stated he might have thought a month ago the end was in sight for the soil remedy and re-use with regard to the potential relocation of the County shops, but BSB could not move forward because "DEQ could not get it done". Jon also believes DEQ and its contractor are taking too long to resolve issues regarding floodplain definition and storm water management.

2. What effects have site activities/operations had on the surrounding community?

Most significant were previous odor and dust issues – resolved long ago. Jon stated that the PCP from the MPTP site impacted the dewatering that was required for construction at the wastewater treatment plant north of Silver Bow Creek, resulting in extra construction costs of millions of dollars.

3. Are you aware of any community concerns regarding the MPTP Site?
   YES

   If yes, what are they?

Jon indicated there are concerns about dioxin left on site, and he believes DEQ needs to do a better job of explaining to the public that the remaining dioxin on-site will not be a threat with proper engineering and institutional controls. He believes DEQ needs to be more forceful to convince the public on that issue.

4. Do you feel the remedy (including institutional controls) at the MPTP site is effective?
   YES

He said he believes "yes" though he does not consider himself an expert. He believes the remedy will be protective of human health and the environment as long as it is executed properly, and he is more concerned with how long it is taking.

5. Do you feel well informed about site progress and activities? ***NO***

   If no, how would you like to receive information and how often?

Jon indicated he feels like he should be the most informed person, but does not believe he is well informed. He said meetings are not as inclusive as they should be. He suggests more site-specific meetings (as opposed to piggy-backing onto other meetings) since this site needs to be differentiated from

other Superfund sites in town. However, a frequency was not suggested. In addition, Jon also believes more frequent informal status update calls from DEQ to BSB would foster improved communication.

6. What other comments or suggestions do you have?

Jon indicated he is frustrated that various past ideas for potential land use at the site have not panned out. He also indicated that he believes it was a mistake to remove the sheet piling (associated with a previous phase of remedial action) when the current remedy was implemented.

Jon indicated that everyone is interested in the upcoming LTU offload and floodplain and storm water management work, and that it is important that there be strong communication back and forth on these items.

MPTP 5-Year Review Community Interview Questions

Person interviewed: Ian Magruder, Consultant for CTEC
Interviewers: Jennifer Abrahams and Rob Greenwald, Tetra Tech
Date/Time: March 4, 2016 at approximately 9:00 AM (via phone)

1. What is your overall impression of the MPTP remediation project?

He is happy it is progressing and appears to be heading towards remedy completion. People are happy there are no longer issues with odors from the LTU. People are frustrated that dioxin standards in soil will not be met, but Ian believes incineration will not be a feasible option, so the real issue is how to assure capping and institutional controls are effective. He does not feel expert enough to understand the potential use of White Rot Fungi for dioxin at the site.

2. What effects have site activities/operations had on the surrounding community?

Odors previously, but not in last five years.

3. Are you aware of any community concerns regarding the MPTP Site?
   YES

   If yes, what are they?

He said his answer is "yes" but that is based on old information. He indicated a resident named Charles Green submitted a letter to DEQ in April 2011 that summarized the community concerns (that was prior to the previous five year review). He doesn't want to speak for the neighborhood regarding current concerns, but recommended Charles Greene be interviewed as part of the 5-Year Review process.

4. Do you feel the remedy (including institutional controls) at the MPTP site is effective?
   YES

He noted fence around the site, but stated that people want to know about the final land use and final institutional controls, and how the effectiveness of the institutional controls will be evaluated.

5. Do you feel well informed about site progress and activities? ***NO***

   If no, how would you like to receive information and how often?

Ian indicated the last public meeting was in 2013, which is a long time ago. He would like an email summary of status and progress at least annually. He thinks that should include an update regarding issues and recommendations from the previous five-year review. He is not sure that more frequent meetings would be useful, but CTEC should make that decision.

6. What other comments or suggestions do you have?

Ian commented that in 2013 DEQ made a presentation to CTEQ and indicated an EPA Risk Assessor would look into the issue of standards for dioxin (ROD versus DEQ-7), and he wants that addressed in

the five-year review. He wanted to know if capping had actually begun or been designed, and wanted to know what type of risk assessment was done to ensure safety of end use. He indicated the five-year review should include a summary of PCP detections north of Silver Bow Creek detected after dewatering at the wastewater treatment plant. He indicated the five-year review should address the status of evaluating the floodplain and whether or not waste will be stored in the 100-year floodplain.

MPTP 5-Year Review Community Interview Questions

Person interviewed: Trevor Selch, Fisheries Pollution Biologist (Montana Fish, Wildlife and Parks)
Interviewers: Jennifer Abrahams and Rob Greenwald, Tetra Tech
Date/Time: March 9, 2016 at approximately 8:30 AM (via phone)

1. What is your overall impression of the MPTP remediation project?

He has had very little involvement with the MPTP site – he reviewed some documents more than 5 years ago but nothing recently. He checked with another biologist in his office and that person had the same response.

2. What effects have site activities/operations had on the surrounding community?

No idea.

3. Are you aware of any community concerns regarding the MPTP Site?
   NO

   If yes, what are they?

4. Do you feel the remedy (including institutional controls) at the MPTP site is effective?
   YES

He said nothing significant regarding impacts to Silver Bow Creek pertaining to the MPTP site has come to his attention, which suggests the remedy at MPTP is effective.

5. Do you feel well informed about site progress and activities? ***NO***

   If no, how would you like to receive information and how often?

He would prefer an annual email summary of site status and progress, but if something significant occurs that pertains to creek impacts than he would expect a specific event-driven email or meeting to address that.

6. What other comments or suggestions do you have?

Trevor asked why public input is being sought for the MPTP five-year review but not for the other surrounding Superfund sites. He said that Silver Bow Creek was previously restored and ammonia from the Butte wastewater treatment was an issue for Silver Bow Creek that has been dealt with by recent construction at that facility, and the way Trevor sees it the most important threat or impact to Silver Bow Creek is now copper from mine tailings coming off Butte Hill and not the MPTP site.

MPTP 5-Year Review Community Interview Questions

Person interviewed: Dave Palmer, County Commissioner
Interviewers: Jennifer Abrahams and Rob Greenwald, Tetra Tech
Date/Time: March 11, 2016 at approximately 12:00 noon (via phone)

1. What is your overall impression of the MPTP remediation project?

Remedy has taken an awful long time, but these things take time. He indicated he felt the soils remediation in particular took a long time, soils were on LTU for extended period and turned over for aeration multiple times. Mr. Palmer said the soil stockpiled at the site from when the highway was lowered looks like a mess. It was mentioned to him that the plan is to use that dirt as cover material after the LTU offload is completed.

2. What effects have site activities/operations had on the surrounding community?

Not aware of anything significant other than the long duration. He indicated he is not sure about the level of interaction or communication with the Boulevard Community or the Williamsburg Community.

3. Are you aware of any community concerns regarding the MPTP Site?
   YES

   If yes, what are they?

Mr. Palmer believes EPA remedy for Parrot Tailings may have flawed aspects, and since that remedy and the Montana Pole remedy both include waste left in place, it leaves a general uncertainty in the community regarding remediation and the agencies involved at Montana Pole. However, he did not provide any specific community concerns regarding the Montana Pole remedy.

4. Do you feel the remedy (including institutional controls) at the MPTP site is effective?
   YES

5. Do you feel well informed about site progress and activities? ***YES, But…***

   If no, how would you like to receive information and how often?

Mr. Palmer believes communication could be better, he suggested more public meetings. He said frequency should be at least twice per year, but quarterly would be even better so issues raised at one meeting could be addressed the next meeting.

6. What other comments or suggestions do you have?

Mr. Palmer re-iterated he feels it is important to keep the public informed, especially regarding final remedy outcomes and land use (including landscaping).

MPTP 5-Year Review Community Interview Questions

Person interviewed: Dan Foley, County Commissioner
Interviewers: Jennifer Abrahams and Rob Greenwald, Tetra Tech
Date/Time: March 11, 2016 at approximately 2:30 PM (via phone)

1. What is your overall impression of the MPTP remediation project?

Mr. Foley said he has a lot of questions. Not a lot of confidence the remedy is effective or safe. He said that people have dealt with the site a long time, and a lot of community questions have not been answered. He feels the communication between DEQ and the community has not been very good. The Commission is not convinced the site is safe, he has not seen the responses to questions submitted by the public.

2. What effects have site activities/operations had on the surrounding community?

He indicated there has been less activity at the site, but that odors had previously been a concern (not in the last five years). He indicated not everyone is content with just capping soils containing dioxins, and some have a perception that cost is being put ahead of protectiveness. He would like the five year review to document why the White Rot Fungi was not included in the remedy.

3. Are you aware of any community concerns regarding the MPTP Site?
   YES

   If yes, what are they?

He believes the community has recently become more aware of the site due to the discussion regarding the potential for the County shop to move there, as well as concerns regarding the Parrot Tailings site. He feels communications with DEQ are minimal and he believes some of the public has poor access to information that is included in the five-year reviews.

4. Do you feel the remedy (including institutional controls) at the MPTP site is effective?
   NO

Mr. Foley said he is not a scientist, but enough people have raised questions about the remedy that it makes him question the effectiveness of the remedy. He also believes the public does not get good answers about how long the remedy will take.

5. Do you feel well informed about site progress and activities? ***NO***

   If no, how would you like to receive information and how often?

Mr. Foley believes there should be community meetings on a regular basis, perhaps quarterly, as well as periodic interviews in newspapers. He said email is good for some people including himself, but some people in the community do not have access to email. He indicated a responsiveness summary in the five

year review does not replace other types of communication for that reason, since not everyone is likely to have access to it easily.

6. What other comments or suggestions do you have?

Agencies need to be more responsive to let the community know the remedy is safe.

MPTP 5-Year Review Community Interview Questions

Person interviewed: Carl Hafer, Butte resident
Interviewers: Jennifer Abrahams, Tetra Tech
Date/Time: April 15, 2016 at approximately 2:30 PM (via phone)

1. What is your overall impression of the MPTP remediation project?

Mr. Hafer referred to the remediation project as "established" and said he thinks the remediation will be completed in the summer of 2016. He observed a contractor at the site in April 2016 screening the material stored on site from the Montana Department of Transportation (MDT) bridge replacement project; Mr. Hafer took that as confirmation that the soil remediation is close to completion.

2. What effects have site activities/operations had on the surrounding community?

He said the odors at the site are no longer an issue. Although there are activities at the site (such as the material screening mentioned above) these activities have no impact on the surrounding community.

3. Are you aware of any community concerns regarding the MPTP Site?
   YES

   If yes, what are they?

When Butte-Silver Bow County said the MPTP site was first choice for re-locating the County shops, community members were upset because they did not think the MPTP site was clean.

4. Do you feel the remedy (including institutional controls) at the MPTP site is effective?
   YES

Mr. Hafer said when the remedy is complete, the site will be appropriate to use for commercial and industrial purposes.

5. Do you feel well informed about site progress and activities? ***YES***

6. What other comments or suggestions do you have?

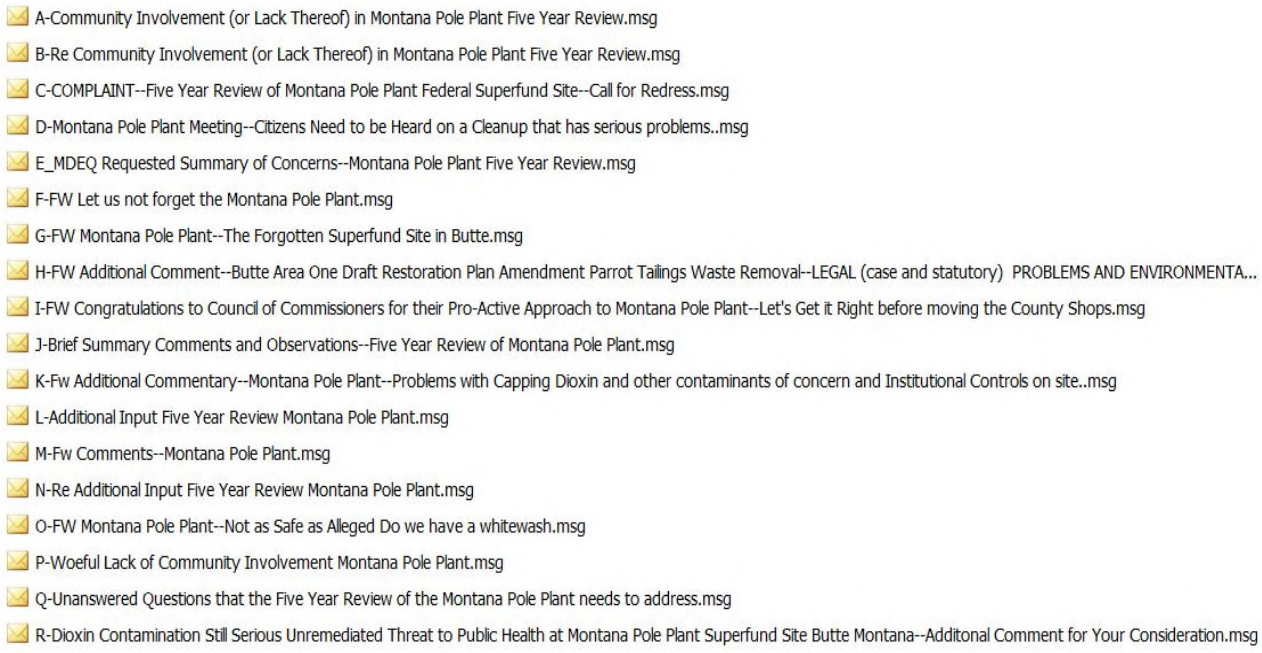
Mr. Hafer believes that the MPTP site, as well as all the other Superfund Sites in Butte, MT, would benefit from having central coordination that understands the complete scope of remediation. He thinks the remediation at each of the Superfund Sites in Butte has suffered from being too compartmentalized and each task seems to have been performed in isolation, instead of as a component of a complete remedy.

Attachment 7

Letters Received and Responsiveness Summary

The following public comments from Dr. John Ray were received via email:

Email "A" (April 6, 2016)	Email "G" (January 27, 2016)	Email "M" (March 3, 2016)
Email "B" (April 10, 2016)	Email "H" (January 28, 2016)	Email "N" (March 3, 2016)
Email "C" (April 14, 2016)	Email "I" (February 1, 2016)	Email "O" (March 17, 2016)
Email "D" (April 27, 2016)	Email "J" (March 3, 2016)	Email "P" (March 21, 2016)
Email "E" (September 19, 2016)	Email "K" (March 3, 2016)	Email "Q" (March 28, 2016)
Email "F" (January 26, 2016)	Email "L" (March 3, 2016)	Email "R" (April 4, 2016)



There are 18 emails; each email was assigned a unique letter identifier ("A" through "R"). Individual comments in each email were sequentially numbered (i.e. 1, 2, 3, 4…). For this compilation, each email comment is referred to by a unique alphanumeric code; for example, the 5th comment in email "C" is noted as comment "(C5)." This system of nomenclature allows easy access back to the exact location of the original comment.

Comments were organized by topic as shown in Table 1 below. Email comments associated with a particular topic were paraphrased and sequentially numbered (1 to 32) as shown below. The alphanumeric codes for all email comments [i.e. "(C5)"] were listed below each of the 32 paraphrased comments listed in Table 1.

Typographical errors in the original email comments have not been corrected. For consistency, comments have been compiled using a uniform font, font size, style, and margin settings. Many of the emails contained multiple attachments containing multiple pages of comments; all attached comments are included in this compilation. Many email comments were similar in nature, or were repeated

verbatim several times (sometimes even in the same email, or in the attachments to an email). Every comment in every email has been included in the compilation of comments below.

TABLE 1
TOPICS AND PARAPHRASED COMMENTS

Topic	Comments (Paraphrased)
Agency Accountability	1-2
Community Involvement	3-5
Dioxin (and other COCs)	6-13
Cleanup and Cleanup Levels	14-16
Storm Water and Erosion	17
Remedy - Institutional Controls	18
Remedy - Capping	19-20
Five-Year Review	21-24
Reuse of the Site	25
Floodplain Issues	26
Air Quality	27-29
Tree-line Mortality	30
Parrott Tailings	31
Risk Assessment	32

Agency Accountability

1. The agencies are not as accountable to the public as they should be. The agencies ignore public comments. There is a lack of transparency in the cleanup process and decision making process. EPA and DEQ do not take existing threats to human health and the environment seriously.
(A1), (D1), (D6), (D14), (D29), (D56), (D61), (D65), (D71), (D72), (F19), (F24), (F25), (J1), (M21), (M26), (M27), (O6), (O11), (O12), (P3), (P4), (R1), (R18)

   Department of Environmental Quality (DEQ) Response: This year DEQ finalized a new Community Involvement Plan that specifically addresses concerns regarding transparency in the cleanup and decision-making processes. The public outreach tools found in the Community Involvement Plan will be important as DEQ rolls out the Five-Year Review and the subsequent Explanation of Significant Difference that will propose changes to the Record of Decision. DEQ will also use the public outreach tools to aid with the public comment process for the Explanation of Significant Difference. Finally, the public outreach tools will be used to communicate different aspects of the final off-load construction design, which includes consolidating all waste under an engineered cap, and run-on and run-off storm water management, , and ongoing consideration of land use and related institutional controls.

2. The Five-Year Review is biased because (1) DEQ selects the people who will be interviewed, (2) the agencies conduct its own assessment without third-party or independent oversight, and public notice or misleading, and (3) public involvement in the Five Year Review process has been minimal. Aspects of the process appear clandestine completed in secrecy.
(A7), (B10), (B13), (C1), (C3), (C6), (D13,) (D14), (D61), (E10) (J2), (J3), (O5), (P2), (R16), (R18), (R21)

DEQ Response:

(1) DEQ initiated the interview process for the fourth five-year review by selecting what it believed to be a representative cross-section from the Butte community. After further input, DEQ advertised that it would conduct additional interviews to anyone who wished to participate. The notice, which included solicitation for interviews, appeared in the Montana Standard on February 29, 2016, March 1, 2016, March 6, 2016, April 14, 2016, and April 17, 2016.

(2) Per the Environmental Protection Agency's (EPA) Office of Superfund Remediation and Technology Innovation, independence in a five-year review is achieved through the varying levels of review required by individuals who have no connection to the site in question, even though they are employed by the Agencies. The "Comprehensive Five-Year Review Guidance" (OSWER 9355.7-03B-P, June 2000) indicates that the project manager is part of the review team conducting a five-year review at any site. While the agencies can use contracted services or other agencies to provide assistance in conducting five-year reviews, EPA and/or DEQ are ultimately responsible for making the determination whether the remedy is protective as required by the CERCLA law. The participation of the project manager in the five-year review is standard practice.

(3) DEQ is working to increase public involvement overall for the Montana Pole and Treating Plant (Montana Pole) site and specifically with regard to the Five-Year Review process. DEQ just completed a new Community Involvement Plan for MPTP. The planned rollout of the Five-Year Review will include a summary that is tailored towards the general public; an article in the Montana Standard as well as announcements of the release of the Fourth Five-Year Review; presentations to Citizens Technical Environmental Committee (CTEC), Butte-Silver Bow (BSB) Council of Commissioners, and other public meetings; plus other outreach strategies.

Community Involvement

3. Community involvement for the Five-Year Review process and for the project in general, has been inadequate and ineffective; nor does it follow relevant guidance. What steps will be taken in the future to include the public in the decision-making process?
(A2), (A7), (B1), (B10), (B13), (C1), (C2), (C5), (C6), (C7), (D1), (D3), (D6), (D14), (D29), (D72), (E11), (J2), (M39), (O12), (O19), (P1), (P2), (P3), (P4), (P6), (Q8), (R2), (R12), (R18), (R21)

DEQ Response: No community involvement activities during the five-year review are mandated in CERCLA or addressed in the National Contingency Plan. However, at a minimum, the Comprehensive Five-Year Review Guidance recommends the following:

- *Inform the community and other potentially interested parties that a five-year review will be conducted, using the most appropriate communication method or activity for the specific community.*

- *Inform the community and other potentially interested parties that a five-year review was conducted at the site.*
- *Prepare a brief summary of the results, inform the community that the five-year review report is complete and available for review, post the report on a site webpage, and make the report and the summary available to the public in the information repository.*

A public notice was published in the Montana Standard notifying the public that the Five-Year Review was being conducted and provided contact information for DEQ and EPA should anyone wish to provide comments. The notice was published on February 29, 2016, March 1, 2016, March 6, 2016, April 14, 2016, and April 17, 2016. An open house was held on April 27, 2016, at the fire station in the Boulevard neighborhood adjacent to the site.

Nearby residents, local officials and other interested parties were interviewed in order to document any perceived problems or successes with the remedy that has been implemented to date. The Five-Year Review includes interview summary forms and key themes or items identified.

The planned community outreach for the release of the Five-Year Review includes a summary of the results, public service announcements and other notifications that the report is complete, and posting the report online and making it available in the information repository.

Additionally, the Montana Pole Community Involvement Plan was updated in 2016. Interviews were held with community members and local officials to determine the best methods of communication for the site. DEQ takes these comments seriously and is dedicated to working closely with the community and providing timely and accurate information to the public.

4. Newspaper announcements should better define the scope of public meetings and public review periods; outreach also needs to be directed toward neighborhoods.
(A2-A6), (B12), (D60), (J2), (P2), (P5), (R3), (R17)

M*DEQ Response: Notices were published in the Montana Standard (see question #3 for specific dates). One provided notification that a Five-Year Review was to be conducted, per the Comprehensive Five-Year Review Guidance. After receiving feedback, DEQ published a second notice specifically inviting people in the area to provide information they may have about the site, including some examples of things DEQ was interested in knowing about. Examples provided included:*

- *Ways the cleanup at the site has helped or hurt the neighborhood;*
- *Broken fences, unusual odors, dead plants, materials leaving the site or other problems;*
- *Buildings or land around the site being used in new ways;*
- *Any unusual activity at the site such as dumping, vandalism or trespassing.*

A notice was also placed regarding the open house which was held during the public input period for the five year review. It included the date, time, location, and format, with contacts for additional information.

A newsletter was also sent to all contacts listed in the DEQ MPTP hard copy and email mailing lists, including everyone in the surrounding Boulevard and Williamsburg neighborhoods. The newsletter provided notification that the open house was to be conducted. The Montana Standard wrote an article that mentioned the open house.

After updating the Community Involvement Plan update, DEQ recognizes that there are other ways that the community could have been informed of the Five-Year Review and open house. Some future avenues of notification could include and are not limited to:

- *Utilizing BSB's social media;*
- *Press releases;*
- *Email notifications and reminders separate from newsletters.*

5. Meetings are generally a one-way flow of information that attempts to "sell the cleanup" rather than solicit input from the public. The public is excluded from meaningful involvement and two-way communication at public meetings.
(A1), (A2), (B2), (B13), (D60), (J2), (R21)

DEQ Response: In regards to the 4th Five Year Review, DEQ held an open house on April 27, 2016. The open house included information stations staffed by experts working on the cleanup that allowed for people to talk about and obtain information on various aspects of the site. A short presentation was held in the middle of the open house to provide additional information for people that preferred that format. People were encouraged to talk directly with staff about their concerns and to ask questions. This format allowed members of the public to be able to ask their questions to the most qualified staff members.

Over time, DEQ has also met informally with members of the surrounding neighborhoods to discuss the Montana Pole site, as well as provided information and updates at the CTEC meetings.

In the future and based on feedback for the Community Involvement Plan, DEQ will take into consideration different venues and formats for conducting meetings and the potential for holding multiple meetings at different times to allow for a greater number of people to attend.

Dioxin (and other COCs)

6. Dioxin cleanup levels for soil, groundwater, and plant discharge water at the Montana Pole and Treating Plant (MPTP) site are not being met and will not be met in the near future, presenting a continuing threat to human health and the environment.
(B3), (B4), (B6), (B7), (C2), (D16), (D18), (D32), (D37), (D39), (D41), (D51), (D56), (E2), (F16), (F17), (F20), (J6), (M10), (M11), (M18), (R6)

DEQ Response: With respect to soil, DEQ agrees that the cleanup level for dioxin is not being met by the biological treatment at the land treatment unit. This issue is identified in this Fourth Five-Year Review, which states:

"Leaving soils with dioxins above Record of Decision soil cleanup standards may be appropriate when implemented with appropriate engineering controls (e.g., soil cover designed in compliance with Applicable or Relevant and Appropriate Requirements, as well as appropriate storm water management) and institutional controls. However, this was not a remedy identified in the Record of Decision. A decision document is needed to sufficiently address placement of soils on-Site with dioxin concentrations above the Record of Decision standard; the decision document should occur prior to the final design and implementation of the offload and cover."

The Five-Year Review recommends that a decision document be prepared to address placing treated soil on-site that contains dioxins above cleanup levels, before final design and

implementation of the remaining land treatment unit offload and placement of cover. The decision document will address protectiveness and other requirements of the Superfund law with respect to soil left on-Site with dioxin concentrations above cleanup levels, such as requirements for capping, storm water management, and any other pertinent engineering and institutional controls.

With respect to groundwater and plant discharge water, the Fourth Five-Year Review discusses in detail that there is a need to update cleanup levels for dioxin. For groundwater, the Record of Decision cleanup level of 30 picograms/liter (pg/L) is higher than the current DEQ-7 standard of 2 pg/L. For plant discharge water, the Record of Decision standard of 10 pg/L is higher than the current DEQ-7 standard in surface water of 0.005 pg/L. However, the Five-Year Review also explains that this issue is complicated because the average dioxin TEQ for laboratory method blanks (laboratory-grade distilled water using clean, laboratory-grade glassware) from 2009 to 2015 using the DEQ-7 methodology (2.04 pg/L) is greater than DEQ-7 dioxin standard for groundwater or surface water. An assessment of observed concentrations in groundwater or plant discharge water to cleanup levels is not meaningful until these cleanup levels for dioxin are clarified, especially the surface water cleanup level. Therefore, the Fourth Five-Year Review identifies updating cleanup levels (including dioxin in groundwater and plant discharge water) as an issue and recommends these cleanup levels be clarified in a decision document.

Despite these issues, the following observations are pertinent:

- *With respect to groundwater, there is no evidence of a mobile groundwater plume of dioxin. As stated in the Fourth Five-Year Review, "there are no obvious trends in [dioxin] concentration over time at any particular well location, and there is no discrete 'dioxin plume' or plume boundary that can be inferred from the data." This statement is true regardless of whether the groundwater cleanup level is 30 pg/L or 2 pg/L. The Five-Year Review further states: "The conceptual model of the Site is that dioxin is not mobile in groundwater. It is possible that some dioxins are adhered to very fine particles and thus may at times be detected in liquid matrix samples that exhibit relatively high turbidity, and it is also possible that some dioxins are introduced to the trenches in sheens of oils, though in recent years observations of sheens have been limited to just a few instances at the near-highway recovery trench and are not commonplace." If dioxin were mobile in groundwater, there would be consistent detections in numerous monitoring wells, as is the case with pentachlorophenol, but consistent dioxin detections are not observed for dioxin in groundwater.*

- *With respect to plant discharge water, the Fourth Five-Year Review indicates that "the dioxin Toxic Equivalents effluent concentration in the last five years has been below 1 pg/L (using Record of Decision methodology), well below the Record of Decision discharge limit of 10 pg/L." If these same dioxin concentrations in plant discharge had been calculated using the DEQ-7 methodology, the dioxin Toxic Equivalents values would have been as follows: 2010 - 2.9 pg/L; 2011 - 4.7 pg/L; 2012 – 1.4 pg/L; 2013 – 1.2 pg/L; 2014 – 2.0 pg/L; 2015 – 1.7 pg/L; 2016 – 1.0 pg/L. These values have a minimum of 1.0 pg/L, a maximum of 4.7 pg/L, and an average of 2.1 pg/L. These statistics are almost identical to the dioxin Toxic Equivalents statistics calculated for laboratory method blanks (as discussed in Attachment 5 of the*

Fourth Five-Year Review), which yielded a minimum dioxin Toxic Equivalents of 0.7 pg/L, a maximum of 4.5 pg/L, and an average of 2.0 pg/L. In other words, using the DEQ methodology, the plant discharge water has similar dioxin Toxic Equivalents values as the laboratory method blanks (distilled water). Comparison of plant discharge to a DEQ-7 standard of 0.005 pg/L is not meaningful if the average value from laboratory blanks using the DEQ-7 methodology is approximately 2 pg/L. Furthermore, the surface water sampling in Silver Bow Creek (upstream of, adjacent to, and downstream for the MPTP Site) does not indicate any degradation of surface water quality caused by dioxin from plant discharge water. The Fourth Five-Year Review states the following with respect to surface water sample in the last 5 years: "The highest dioxin Toxic Equivalents level [in Silver Bow Creek] was at upstream location SW-09 in 2013, when the concentration was 1.86 pg/L. That location is upstream from the Site and suggests the higher concentration at that location is not related to the dioxins associated with MPTP. All other dioxin Toxic Equivalents values at these surface water sampling locations in the last five years were less than 0.5 pg/L, and typically less 0.1 pg/L.". Again, all of these values are below the average value detected from laboratory method blanks from 2009 to 2015 (2.04 pg/L).

- *With respect to soil and groundwater, institutional controls, including the Site fence and the Controlled Groundwater Area, prevent people from contacting and being exposed to contaminated soils and groundwater, and these institutional controls will be maintained (see response to Comment #7).*

Based on the items discussed above, DEQ and EPA do not agree that the levels of dioxin in soil, groundwater, and plant discharge present a continuing threat to human health and the environment as long as adequate engineering and institutional controls are implemented and maintained. These issues will be addressed for the long-term in the forthcoming decision document and associated design.

7. Dioxin is a highly toxic and deadly carcinogen for which there are no safe exposure levels. Other Site contaminants (furans, PCPs and PAHs) also pose serious risks.
(D8), (D17), (D26), (D50), (D67), (E2), (F8), (F15), (F21), (G2), (I4), (I9), (I12), (I13), (J7), (K2), (M8), (M22), (M37), (06), (07), (024), (R4)

DEQ Response: Cleanup levels for dioxin and other Site contaminants were established in the Record of Decision, some of which will be updated in a forthcoming decision document per the Fourth Five-Year Review. These cleanup levels consider risks based on potential exposure to specific concentrations of contaminants. As part of the remedy, risks to receptors from contaminants can also be addressed with engineering and institutional controls that prevent exposure to contaminants that exceed the cleanup levels. The Fourth Five-Year Review concludes in the Protectiveness Statement that "The remedy for Operational Unit-1 (the only operational unit for this Site) currently protects human health and the environment because exposure pathways that could result in unacceptable risk are being controlled by soil containment, hydraulic capture of impacted groundwater, access controls, and a Controlled Groundwater Area (an institutional control)." The Five-Year Review also recommends certain additional actions to ensure protectiveness is maintained for the long term. Specifically, the Five-Year Review recommends the following for the remedy to remain protective in the long-term:

- *"Prepare a decision document, prior to final design and implementation of the remaining land treatment unit offload and placement of cover, to document and/or incorporate the following: 1) Placing treated soil on-Site that contains dioxins above cleanup levels; 2) Updating Record of Decision cleanup or discharge standards; 3) Identifying objectives and performance standards for cover [on treated soils] and [the associated] ICs; 4) Finalizing points of compliance for surface water and groundwater; and 5) Clarifying other remedy items as needed or appropriate (e.g., potentially remaining sources of pentachlorphenol beneath the Interstate or elsewhere on the Site).*

- *"Develop and implement permanent institutional controls including deed restrictions and/or environmental covenants for all appropriate areas to prevent future on-Site residential use, and restrict land use where waste is left in place above levels that allow for unlimited use/unrestricted exposure. The institutional controls should also address protection of remedy components such as the [Corrective Action Management Unit] facility that is planned [for the on-Site management of treated soils impacted by dioxin]. These efforts are currently in progress."*

8. Dioxin will remain in soils and dioxin cleanup levels for soil are not being met; dioxin will continue to contaminate Silver Bow Creek.
(B3), (D8), (D18), (D42), (D62), (D63), (E2), (F2), (F9), (G1), (I5), (I6), (I11), (M9), (M10), (M17), (M24)

   DEQ Response: See response to comment #6.

9. The current dioxin discharge from the MPTP Site into Silver Bow Creek does not meet water quality standards; discharge is 100 times the water quality standard.
(B4), (B6), (D19), (D21), (D28), (D56), (D57), (D69), (F16), (F17), (F23), (M17), (M18), (M24), (O9), (O32), (O33), (R7), (R9)

   DEQ Response: See response to comment #6.

10. Treatment of dioxin-contaminated soil using white rot fungi, or an alternate proven active biological treatment technology should considered (instead of encapsulation of waste in place).
(D36), (D45), (F4), (J8), (M3), (M34), (O20), (O21)

    DEQ Response: White-rot fungus has been used to remediate organic soil contaminants, including dioxins. A major limitation of the fungal remediation is the sensitivity to biological process operations; white-rot fungus does not grow below 50 °F, and no significant growth rate occurs between 86 ° and 102 °F (http://www.hawaii.edu/abrp/Technologies/fungus.html). The temperature limitations are problematic for on-Site application in Butte; when combined with the lack of published pilot-scale or full-scale application of white-rot fungi remediation of dioxins to the Site Record of Decision standard, this technology is not considered to be applicable to the Site. The EPA website Clu-In (https://clu-in.org/techfocus/default.focus/sec/Bioremediation/cat/Overview/) identifies that the structure of dioxins is resistant to chemical or biological degradation; many of the accepted dioxin remedial techniques rely on thermal destruction. The Record of Decision soil remedy of excavation and ex situ biological treatment was selected, in part, based on the Butte public opposition to incineration.

Comment D45 states "… an article entitled: 'Treatment of Dioxin Contaminate Soils,' Standberg, et al., published in November 2011 by the Swedish Environmental Research Institute provides compelling evidence of the efficacy of active biological treatment on wastes similar to those found at the Montana Pole and in a climate similar to Butte's climate." However, the cited article presents information only for biological treatment to remediate polycyclic aromatic hydrocarbons; there is no discussion regarding biological treatment of dioxins.

11. Does the Butte Alluvial and Bedrock Controlled Ground Water Area (BABCGWA) adequately protect the public and environment from drinking PCP- or dioxin-contaminated water?
(D40)

DEQ Response: The Butte Alluvial and Bedrock Controlled Ground Water Area (Controlled Groundwater Area) was established on October 30, 2009, by the Montana Department of Natural Resources and Conservation in accordance with §§ 85-2-506 & 507, Montana Code Annotated, in response to a petition submitted by the BSB County Health Department. The Controlled Groundwater Area prohibits new groundwater wells in the alluvial and bedrock aquifers without review and approval by the BSB Board of Health, EPA, and DEQ. Any owner proposing a new or replacement water well for limited irrigation or industrial use within the Controlled Groundwater Area must supply data to the BSB Water Quality District indicating that the uses will not be detrimental to the environment or to human health. There are no known water wells used for human consumption that are impacted by MPTP contaminants, and the Controlled Ground Area effectively prohibits the development of new domestic use wells, at least until safe levels of contamination are achieved in the MPTP groundwater. The Controlled Groundwater Area includes all impacted areas of the Montana Pole facility, but the boundaries of the Controlled Groundwater Area may be amended if degradation of groundwater expands, based on continued monitoring. DEQ believes that the Controlled Groundwater Area adequately protects the public from consumption of groundwater containing pentachlorophenol or dioxin above current established human health levels.

12. Dioxin <u>is</u> mobile in soil and groundwater. If dioxin isn't mobile, how did dioxin get into the recovery trenches? If it is not mobile, why is it present in groundwater? What are background levels of dioxin in groundwater at other urban areas? What is the long-term fate of dioxin in groundwater at the MPTP Site?
(D39), (D41), (D46), (D47), (D48), (D49), (F5), (F6), (F7), (M4), (M6), (M7), (M32), (M33), (O22), (O23)

DEQ Response: As discussed in the response to Comment #6, the conceptual model of the Site is that dioxin is not mobile in groundwater. It is possible that some dioxins are adhered to solids that are present in liquid matrix samples that exhibit relatively high turbidity (i.e. solids with strongly sorbed dioxin are not mobile but can enter the monitoring well during sampling), and it is also possible that some dioxins are introduced to the trenches in sheens of oils. However, in recent years observations of sheens have been limited to just a few instances at the near-highway recovery trench and are not commonplace. The literature also suggests potential for dioxin transport via transport of colloids (one substance dispersed through another substance). However, if dioxin were mobile in groundwater, there would be consistent detections in numerous monitoring wells, as is the case with pentachlorophenol, but consistent dioxin detections are not observed for dioxin in groundwater. Dioxin sampling in groundwater has been limited relative to pentachlorophenol sampling, but a good example is provided by wells 10-01 and 10-02, located near Silver Bow Creek (see Table 3 in Attachment 5 of the Fourth Five-Year

Review for concentration data). Pentachlorophenol concentrations in those wells are between 10 and 20 times the pentachlorophenol standard, but do not appear to be affected by dioxin because the dioxin concentrations are similar to those found in laboratory method blanks. These data points, coupled with the lack of dioxin impacts in surface water (see response to Comment #6), support the conceptual model that dioxin is not mobile in groundwater.

Dioxins are no longer produced or used commercially in the United States; dioxins are formed in the production of some chlorinated organic compounds. Additionally, dioxins are produced during combustion processes, including waste incineration (commercial, municipal, and backyard), burning fuels, and forest fires. DEQ has not identified federal or state government databases with background dioxin groundwater concentrations; therefore "a comparison of *dioxin levels in groundwater at Montana Pole with background levels of dioxin in groundwater at other urban areas" is not possible.*

Comment D46 states that page 14 of the Record of Decision "says that it is possible for dioxin in soils to migrate." This statement is not correct; instead, the Record of Decision states "The [dioxin] compounds adhere tightly to soil particles and do not migrate readily or leach into groundwater or surface water unless the contaminated soil particles themselves migrate via erosion processes (Freeman, 1989)" (p. 8).

Even though some solids with sorbed dioxin (below the water table) adjacent to monitoring well screens may be contained in samples along with groundwater, this sorbed dioxin is not mobile over any significant distance. While colloidal transport is conceptually possible, there is no current evidence of a discrete or mobile dioxin plume. Dioxin transport in oils is believed to be the most likely mechanism for dioxin impacts in the extraction trenches. The Fourth Five-Year Review notes that "within the last two years there have been several observations of minor oil sheens in the near-highway recovery trench." However, the Five-Year Review also notes that "when coupled with the observation that floating product (free oil) was not detected in any monitoring well during any sampling conducted in calendar years 2010 through 2015, these observations suggest that significant ongoing transport of free-phase light oil is not a major concern at Montana Pole..." Similarly, it is anticipated that dioxins in land treatment unit soils (to be offloaded) would not be mobile because carrier oils are no longer present in this material. Thus, the long-term fate of dioxin in groundwater at the Montana Pole Site is to remain in the subsurface, adhered strongly to soil particles (including below the water table) for a very long period of time. As remaining oils continue to bioremediate, the minor transport of dioxin via oils (such as to the recovery trenches) will diminish over time and any remaining dioxin from those oils will sorb to the soil matrix.

13. DEQ acknowledges that dioxin can be mobile in soils at the White Pine Sash Site, so why would dioxin not be mobile at the MPTP Site? There was gross misuse of comparisons at the public meeting where this was discussed.
(D49), (D53), (F7), (F12), (M7), (M12), (O23), (O28)

DEQ Response: The Record of Decision for the White Pine Sash site does not discuss in detail the mobility of dioxin in soil or groundwater, but notes that dioxin is a recalcitrant constituent that is difficult to treat, and that the selected active remedies for soil and groundwater at that site may not achieve cleanup standards for dioxin. The Record of Decision for that site further indicates that subsequent monitoring will be used to assess long-term attenuation of dioxin that remains after active remediation efforts (i.e. attenuation through naturally occurring processes), in

conjunction with institutional controls. A similar approach is likely to apply to the Montana Pole Site (to be determined in the forthcoming decision document).

Cleanup and Cleanup Levels

14. Some ROD cleanup levels are less protective than national or DEQ-7 standards for certain COCs; meeting these lax ROD cleanup levels does not protect human health or the environment. The Five Year Review does not explain how the need to meet current DEQ-7 standards was evaluated, or the rationale for not adopting the current national or DEQ-7 standards. The original remedy may need to be revisited to address the more protective standards.
(B5), (B6), (B7), (C9), (D20), (D23), (D38), (D39), (D52), (E7), (E8), (F11), (J5), (J12), (M11), (M36), (M39), (O16), (O19), (O27), (R8)

    DEQ Response: As part of the fourth Five-Year Review, cleanup levels were evaluated against DEQ-7 standards and EPA preliminary remediation goals, as well as undergoing new risk evaluation based on the most current toxicity data and risk assessment guidance. All proposed changes to cleanup levels will be presented in the decision document. The proposed cleanup levels, combined with post-treatment dioxin concentrations which will not reach the dioxin cleanup goal, will require changes to the original remedy, which will be detailed in the decision document.

15. The overall cleanup at the Site is ineffective; the Site is not safe; DEQ clings to a failed remedy; cleanup standards are not being met; contaminants are being released; and the remedies being considered are not protective. How can DEQ honestly claim that the Site is remediated and not pose a threat to human health or the environment? As currently being implemented, the remedy fails to provide a permanent, comprehensive cleanup that reduces the toxicity and mobility of contaminants.
(B9), (C2), (C9), (D4), (D5), (D6), (D7), (D8), (D9), (D16), (D18), (D23), (D25), (D28), (D41), (D52), (D56), (D60), (D62), (D66), (D70), (D74), (E1), (E2), (E6), (E13), (F1), (F9), (F16), (F23), (F26), (H1), (I1), (I2), (I7), (J4), (M9), (M10), (M11), (M28), (O1), (O9), (O14), (O26), (O32), (033), (P2), (R8), (R11), (R15), (R19)

    DEQ Response: DEQ and EPA disagree with these statements and questions for the following reasons. The cleanup of Montana Pole, as mandated by the Record of Decision, is not complete. As the various phases of the cleanup are implemented, engineering controls (e.g., fencing, earthen caps) and institutional controls are used to protect human health and mitigate exposure to on-site contaminants until the cleanup is completed. The final off-load design and construction, including a permanent cap, will complete the cleanup for the southern portion (all property south of the interstate) of the Montana Pole site.

    Groundwater cleanup is a long, slow process and the water treatment at Montana Pole is no different. The water treatment plant is undergoing further evaluation in an effort to enhance the effectiveness and streamline the cost of the water treatment process. Regardless, water treatment is expected to continue for at least another 50 years. Nevertheless, the discharge of treated groundwater to surface water is protective of human health.

    The northern portion (all property north of the interstate) of the Montana Pole site will also undergo additional investigation, design, and construction to complete the non-groundwater remediation for the northern property. In the meantime, the engineering controls will serve to protect against human exposure to on-site contaminants.

16. There is concern that DEQ has decided not to adhere to the cleanup standards in the ROD for the MPTP Site, and will waive them.
(B7), (D22), (E5), (R10)

DEQ Response: The Montana Pole cleanup will follow the cleanup standards put forth in the Record of Decision and as revised in the forthcoming decision document. Cleanup standards will either remain as they are in the Record of Decision or be revised in the decision document to a lower concentration.

Storm water and Erosion

17. The threats to the Site remedy from storm water and erosion need to be better addressed. How will storm water be controlled? How will soil erosion be controlled? Long-term storm water runoff and soil erosion plans are needed.
(B8), (C2), (D12), (D41), (D43), (D46), (D54), (D59), (D62), (D63), (E9), (F2), (F6), (F13), (G1), (G2), (H1), (I6), (I11), (I14), (J9), (J10), (K2), (M13), (M14), (M29), (O2), (O3), (O22), (O29), (Q5), (R13), (R14)

DEQ Response: DEQ and EPA agree with this comment. The Fourth Five-Year Review notes the following: "Phase 6 [of the remedy] is currently in the planning state, and will consist of removal and disposal of the soil treatment facilities on the south side of the Site, final engineering controls (soil cover, storm water management), re-vegetation of all disturbed areas, and implementation of appropriate institutional controls to maintain protectiveness of the remedy. In conjunction with these efforts, modeling was performed to estimate the floodplains at the Site...the previous land treatment unit offloads were not placed within the illustrated floodplain. Design of the final land treatment unit offload will need to consider the modeled floodplain locations and potential storm water management approaches to ensure the soils with dioxins are not within areas where flooding is expected. An update to storm water management planning and documentation is currently underway, and needs to consider locations of soils containing dioxins above Record of Decision cleanup standards (previous and planned)." Note that the Fourth Five-Year Review presumes a soil cover for treated soils, but the forthcoming decision document and associated design documents could incorporate a synthetic cover.

The Five-Year Review also notes that the treatment plant operator stated that storm water does not flow off the Site, even during large storms such as occurred in 2011.

It is anticipated that storm water management plan will be developed to manage storm water during construction of the soil cover. Post-construction erosion controls will be designed to reduce sheet flow velocity and flow concentration which will prevent erosion of the cover. The controls will be used until the vegetation or other surface features are established. Final Site grading will be designed to provide erosion control; as an example, slopes will be kept at a minimum. Storm water originating on-Site will be retained on-Site and will evaporate or infiltrate to groundwater that is collected and treated in the water treatment plant.

Storm water originating off site or originating on-Site and not in contact with the cover over the contaminated soil will collect only in areas that have not been filled with treated soils from the LTU that contain dioxins (and in areas that are otherwise not suspected to contain soil that could result in impacts to groundwater). This will eliminate the potential for groundwater contamination beneath the ponded areas.

It is also anticipated that the soil cover will be stabilized with native vegetation, which is unlikely to result in mobilization of dioxins. There are limited data on plant uptake of dioxins, but the majority of plants evaluated have shown the uptake from soil and translocation into edible parts of the plant to be very low, with the main pathway for contaminants into the plant being atmospheric deposition. Data on uptake of dioxins from soil have been identified for green vegetables, root vegetables, and tuber vegetables. The vegetation used to stabilize the soil covers will not include vegetables.

The forthcoming decision document will address protectiveness with respect to soil left on-Site with dioxin concentrations above cleanup levels, such as requirements for capping, storm water management, and any other pertinent engineering and institutional controls. Appropriate monitoring and maintenance actions, public access control, and other institutional controls will be needed to ensure that the integrity of the final cover and the site storm water conveyance system is not disturbed.

Remedy - Institutional Controls

18. Institutional controls have not be adequately formulated for the site; also, there are documented significant issues associated with the use of institutional controls at hazardous waste sites. [see comments (D64), (G3), (K3), (L1), and (N2) for very detailed lists of concerns regarding use of ICs.] There are legal issues associated with the use of institutional controls [see comment (K4) for details]. How do use of institutional controls relate to site redevelopment? (C2), (C6), (D11), (D27), (D32), (D33), (D36), (D56), (D64), (D68), (E4), (F15), (F22), (G2), (G3), (H2), (I16), (J11), (K1), (K2), (K3), (K4), (L1), (M16), (M23), (M38), (N1), (N2), (O4), (O8), (018), (O31), (Q6), (Q7)

DEQ Response: Institutional controls are generally established at the close of remedial action to ensure that they are appropriate to protect the remedy as implemented. Some institutional controls, such as deed restrictions on property owned by the Atlantic Richfield Company and the Controlled Groundwater Area, are already in place. As part of the remedial design process for the Montana Pole land treatment unit offload and closure, an Institutional Controls Implementation and Assurance Plan will be developed to describe the controls that will be necessary to protect the final remedy at the Site. By developing additional institutional controls as part of the closure design process, DEQ and EPA will be able to complete detailed discussions with BSB and other parties responsible for implementing, maintaining, and enforcing institutional controls. Other relevant stakeholders will be included in this process as appropriate.

Additional permanent institutional controls to be developed and implemented include deed restrictions and/or environmental covenants for all appropriate areas to prevent future on-Site residential use, and restrict land use where waste is left in place above levels that allow for unlimited use/unrestricted exposure. The institutional controls should also address protection of remedy components such as the Corrective Action Management Unit facility that is proposed for the on-Site management of treated soils impacted by dioxin. These efforts are currently in progress.

The institutional controls to be developed and implemented will take into consideration the current and future use of the Montana Pole property, and stakeholders as well as land owners will be included in this effort. At Montana Pole, it is anticipated that once the remedy is complete, the property will be transferred to BSB; therefore, BSB representatives will be heavily involved in and consulted during the development of institutional controls.

Remedy - Capping

19. The proposed minimalist/shallow soil cap is not protective; and in addition, there are many documented problems with the use of caps. [see comments (D63), (G2), and (K2) for very detailed lists of concerns regarding capping.] There are long-term maintenance issues and leaching through caps can occur; thus, it is questionable whether a cap can protect human health and the environment. Containment is also contrary to the Superfund mandate that treatment is to be preferred over leaving waste in place. The ROD calls for active treatment as the primary cleanup method, not containment (capping). The ROD should be amended to address treatment (or removal) of contaminated soils rather than containment; biological treatment of site contaminants has been shown to work.
(C2), (D10), (D27), (D30), (D34), (D41), (D44), (D46), (D47), (D54), (D56), (D59), (D62), (D63), (D68), (E3), (F4), (F13), (F15), (G2), (I5), (I7), (I8), (I10), (I14), (I15), (J9), (K1), (K2), (M2), (M5), (M13), (M31), (O2), (O7), (Q4), (R14)

DEQ Response: The remedy at the Montana Pole Site has included extensive active remediation, including excavation, biological treatment of soil at the land treatment unit, and the ongoing groundwater extraction and treatment. Active remediation has been, and continues to be, the primary cleanup method employed at the Site.

Excavation and treatment of soils over large parts of the site was effective at remediating pentachlorophenol and polycyclic aromatic hydrocarbons contamination in soils. Treatment was no tfully effective at remediating dioxin contamination. Incinerating soils was one option evaluated prior to the Record of Decision during the early 1990s that could have remediated dioxin. However, "land farming" treatment was selected over incineration partly in response to public opposition to incineration. Dioxin remains in treated soils at the site, and although the dioxin will eventually break down, that will take a considerable amount of time. It is anticipated that the forthcoming decision document will include placement of treated soils on-Site with appropriate engineering controls (such as capping and storm water management) and institutional controls, so that the dioxin is not released at concentrations which would present a hazard to people or the environment.

The Superfund Remedy Report, Fourteenth Edition (EPA 542-R-13-016, November 2013), states "Treatment, on-Site containment, and off-Site disposal of contaminated source media and groundwater were selected at nearly the same rate [for FY 2009 to 2011] as in the previous timeframe evaluated (FY 2005 to 2008). Overall, remedies include a mix of approaches, primarily treatment; on-Site containment; off-Site disposal; monitored natural attenuation (MNA) or recovery (MNR); and institutional controls (ICs)." The remedy at the Montana Pole Site includes a mix of active remediation and containment, plus engineering and institutional controls, consistent with most Superfund site remedies.

Comment F4 states "… an article entitled: "Treatment of Dioxin Contaminated Soils," Standberg, et al., published in November 2011 by the Swedish Environmental Research Institute provides compelling evidence of the efficacy of active biological treatment on wastes similar to those found at the Pole Plant and in a climate similar to Butte's climate." However, the cited article presents information only for biological treatment to remediate polycyclic aromatic hydrocarbons; there is no discussion regarding biological treatment of dioxins. As noted in Response #10, the EPA website Clu-In identifies that the structure of dioxins resists chemical or biological degradation.

20. The Record of Decision for MPTP promised that the dioxins, furans, PCPs and PAHs found at the site would be biologically treated and the site cleaned up. Biological treatment does work. Contrary to the promise of cleanup, the DEQ and EPA have reneged on this promise. MDEQ and EPA have abandoned treatment in favor of containment, leaving the threat in place.
(D27), (D41), (D44), (D45), (D47), (D56), (D68), (F3), (F4), (F6), (F15), (F22), (M2), (M3), (M6), (M15), (M23), (M33), (O7), (O8), (020), (021), (022), (031)

DEQ Response: See Response to Comment #19. Biological treatment has successfully remediated Site soils for pentachlorophenol and polycyclic aromatic hydrocarbons; however, biological treatment has not achieved the Record of Decision cleanup level for dioxin in soils. The Record of Decision selected remedy "uses treatment technologies and permanent solutions to the maximum extent practicable and will be cost effective" (Record of Decision p.38). As noted in the response to Comment #6, the Fourth Five-Year Review recommends that a decision document be prepared to address placing treated soil on-Site that contains dioxins above cleanup levels, before final design and implementation of the remaining land treatment unit offload and placement of cover. The decision document will address protectiveness with respect to soil left on site with dioxin concentrations above cleanup levels, such as requirements for capping, storm water management, and any other pertinent engineering and institutional controls.

Five Year Review

21. The Five Year Review needs to be more than a perfunctory process, the DEQ evaluated its own work in the process, and the process does not conform to EPA's Five Year Review Policies. There is mischaracterization of the purpose and scope of a Five Year Review. The public needs to be more involved in the Five Year Review process.
(C1), (C3), (C6), (C8), (C9), (E1), (E12), (J1), (J12), (R20)

DEQ Response: Standard practice in the Superfund program is for the EPA project manager for site remediation to conduct the Five-Year Review. Under the National Contingency Plan regulations, the lead agency (DEQ at this site) is required to conduct the Five-Year Review (Title 40 Code of Federal Regulations [CFR] § 300.430). This Five-Year Review was prepared by DEQ (with contractor assistance) in coordination with EPA Region 8. The Five-Year Review was also reviewed by the EPA Region 8 Branch Chief and EPA headquarters. Additionally, CERCLA law itself identifies the implementing agency as the entity which conducts five year reviews.

The project manager does not act in a vacuum when he or she conducts such a review; these additional reviews by individuals who have no routine connection to the Site provide for independent review. The "Comprehensive Five-Year Review Guidance" (OSWER 9355.7-03B-P, June 2000) indicates that the project manager is part of the review team conducting a Five-Year Review at any site. While EPA (and DEQ) can use contractor services or other agencies to provide assistance in conducting the Five-Year Reviews, EPA is ultimately responsible for making the determination whether the remedy is protective.

The public was involved in the Five-Year Review process through interviews and a public meeting.

22. The current Five Year Review of the MPTP Site remedy refuses to independently review the quality of the cleanup. Conclusions and decisions need to be independently verified/corroborated.
(D13), (D61), (E10), (I1), (I16), (J3), (J12), (O5)

DEQ Response: Please refer to Response #21 above.

23. The Five Year Review needs to evaluate if cleanup levels for dioxin in groundwater are adequate given the new lower standards. A comparison of dioxin levels in groundwater at MPTP with background levels of dioxin in groundwater at other urban areas would be helpful for the public to understand the magnitude of dioxin levels. Evaluation of long-term fate of dioxin in groundwater needs to be incorporated into the evaluation of dioxin cleanup levels to meet current water quality standards.
(D31), (D39)

    DEQ Response: See response to Comment #6 (and also the response to Comment #12 for a discussion of the lack of databases with background dioxin groundwater concentrations in urban areas).

24. Why does it appear that the recommendations given in the last Five Year Review of the MPTP Pant have been ignored; have they been ignored? Please provide a detailed discussion of which of the recommendations have been ignored, why they have been ignored, and what will be done to implement them including with a timeframe for implementation.
(Q3)

    DEQ Response: The Third Five-Year Review included the following five recommendations:

    1. *Modify the existing Controlled Groundwater Area established in October 2009 to address significant increases in groundwater withdrawals from existing infrastructure that are planned in the vicinity of the Site.*
    2. *Remove pentachlorophenol contaminated soil beneath power poles.*
    3. *Clarify the points of compliance for groundwater to reflect the current configuration of Silver Bow Creek, the current pentachlorophenol plume distribution, and the updated conceptual site model.*
    4. *Develop and implement permanent institutional controls to prevent future on-Site residential use and restrict land use where waste has been left in place above levels that allow for unlimited use/unrestricted exposure.*
    5. *Through the appropriate decision document, adopt the August 2010 DEQ-7 chronic value for cadmium as a cleanup standard. The revised chronic standard does not require a change to the selected remedy because it meets the modified chronic value for cadmium, as well as the standard identified in the Record of Decision.*

    Recommendations 1 and 2 have been implemented. Recommendations 3, 4, and 5 are partly complete or underway, as described below.

    - *Recommendation 3: A monitoring plan revision implemented in 2013 revised compliance points for current monitoring. DEQ will finalize compliance points once system equilibrium is established after the BSB wastewater treatment plant dewatering is completed.*
    - *Recommendation 4: Stakeholder discussions regarding developing and implementing permanent institutional controls to prevent future on-Site residential use and restrict land use where waste has been left in place above levels that allow for unlimited use/unrestricted exposure have occurred, but there has been no final resolution. DEQ prefers to finalize these institutional controls in conjunction with final design of the land treatment unit offload and protective cover. Once the design is finalized, a final determination of land use will be made so the institutional controls can be customized as needed.*

- *Recommendation 5: Final documentation of a changed Applicable or Relevant and Appropriate Requirement will be noted in the appropriate decision document regarding an updated standard for cadmium and benzo(a) pyrene (and potentially other parameters).*

Reuse of the Site

25. There is a rush to reuse the MPTP Site before it is safe; partly because this is a cash out site. Any talk of reuse of this land is premature until the threat to Butte's health and environment from the Plant is eliminated.
(B11), (C4), (D2), (D7), (D15), (D55), (F14), (H1), (M14), (O30), (R5)

DEQ Response: The Record of Decision defined the reasonably anticipated future use as recreational. The final remedial action for the site is planned to meet Record of Decision requirements and subordinate goals. Other future uses may be allowed, following an evaluation of that use and the exposure anticipated, as controlled by the local land use and permitting process as well as deed restrictions.

Floodplain Issues

26. The Five Year Review should provide maps of the 100-year floodplain and maps of locations where soils with dioxin levels exceeding cleanup levels have been backfilled. Soils containing dioxin should not be backfilled within the floodplain under the current ROD or any changes invoked with an ESD.
(D35), (Q2)

DEQ Response: The Fourth Five-Year Review includes a figure that depicts the Silver Bow Creek and Site floodplains, and as discussed in the response to Comment #17, the Fourth Five-Year Review notes the following: "Phase 6 [of the remedy] is currently in the planning state, and will consist of removal and disposal of the soil treatment facilities on the south side of the Site, final engineering controls (soil cover, storm water management), re-vegetation of all disturbed areas, and implementation of appropriate institutional controls to maintain protectiveness of the remedy. In conjunction with these efforts, modeling was performed to estimate the floodplains at the Site...the previous land treatment unit offloads were not placed within the illustrated floodplain. Design of the final land treatment unit offload will need to consider the modeled floodplain locations and potential storm water management approaches to insure the soils with dioxins are not within areas where flooding is expected. An update to storm water management planning and documentation is currently underway, and needs to consider locations of soils containing dioxins above Record of Decision cleanup standards (previous and planned)."

Air Quality

27. Agencies should summarize for the layperson and distribute to the public the review findings for air monitoring health risks.
(D58), (D73), (F18), (F26), (M19), (M28), (013), (O34)

DEQ Response: Although the Record of Decision does not require air monitoring, DEQ has conducted air monitoring around the land treatment unit in response to community concerns regarding odors and to ensure that contaminated materials were not "leaving the site" and causing a health concern. Air monitoring data indicated that the concentrations of volatile and semivolatile organic contaminants of concern that would be expected to be associated with air in the vicinity of the site (primarily pentachlorophenol) are below EPA Region 9 Regional Screening Levels (EPA, 2010). Not all compounds detected at concentrations greater than regional

screening levels (benzene and acetaldehyde) can be directly attributable to contaminated soils at the Site; these compounds are not listed as contaminants of concern in the Site Record of Decision. The primary contaminant associated with the Site is pentachlorophenol; this compound has not been detected in the air monitoring samples. The compounds detected in the air monitoring samples are not exclusive to those at the Site, which makes it difficult to determine the source or sources of these compounds.

28. Local residents have had to endure tremendous odor problems caused by the MDEQ's waste in place remedy.
(D28), (D70), (F23), (M25), (01O)

DEQ Response: Most of the Butte residents interviewed in 2016 identified that odor and dust associated with the land treatment unit operation had previously been a very significant issue in the community, but none of those interviewed identified odors or dust as an issue within the last 5 years. The lack of comments on the odors and dust issue corresponds to reduced activity at the land treatment unit over the last 5 years (i.e. discontinuation of tilling and less frequent application of irrigation water with the intention to reduce the volume of water stored in the land treatment unit retention pond). Those who discussed this issue during the interviews were notified that a final offload is being planned for the land treatment unit that could result in short-term odors or other impacts. Several of those interviewed indicated a need for timely notification of those potentially affected before such activities are initiated.

29. Why is the MPTP Site still out of compliance with emission standards for dioxin?
(D73), (F26), (M28), (O13)

DEQ Response: See response to Comment #6.

Tree-line Mortality

30. Agencies should summarize for the layperson and distribute to the public the review findings for soil sampled where the "wind break trees" died.
(D58), (F18), (M20), (O35)

MDEQ Response: Soil samples were collected in September 2011 to assess the cause of the tree mortality at the land treatment unit; pentachlorophenol was used as an indicator contaminant. Seven of the 10 soil samples analyzed reported pentachlorophenol concentrations to be less than detection limits. The three other samples reported pentachlorophenol concentrations of 0.27 to 0.29 milligrams per kilogram (mg/kg); which are 3 orders of magnitude below the Record of Decision cleanup standard of 34 mg/kg. DEQ does not believe Site contamination resulted in the tree mortality based on the following:

- *The analytical pentachlorophenol data for the 10 soil samples collected in the vicinity of the trees*
- *Lack of visible contamination or soil staining at the time the trees were planted, and*
- *Thriving revegetation on the north side of the Site (over offloaded soils from the land treatment unit).*

Parrott Tailings

31. Parrott Tailings waste and environmental justice issues raised
(F1), (G1), (H1), (H2), (H3), (J12), (R4)

DEQ Response: The Parrott Tailings is not associated with the Montana Pole cleanup.

Risk Assessment

32. Was a risk assessment performed for the Site? If necessary, a new risk assessments should be conducted; it may be necessary to revise or expand the previous risk assessment as part of your five-year review to ensure that any assumptions made at the time of the original risk assessment continue to be protective.
(C6), (C7), (Q1)

DEQ Response: Yes, a risk assessment (Final Baseline Risk Assessment for the Montana Pole NPL Site, CDM, 1993) was performed for the Montana Pole site during the conduct of the remedial investigation and feasibility study. In the Five-Year Review, further risk evaluation was performed as part of the assessment of the Record of Decision cleanup standards and will be referenced in the forthcoming decision document.

EMAIL A

From: John Ray [mailto:bodinman2003@yahoo.com]
Sent: Wednesday, April 06, 2016 5:59 AM
Subject: Community Involvement (or Lack Thereof) in Montana Pole Plant Five Year Review

Both MDEQ (Montana Department of Environmental Quality) and EPA policy mandate community involvement in environmental decision making. Not only is this agency policy, community involvement in government decision making is a fundamental tenet of democratic decision making. If the public cannot participate in agency decision making, how do we hold the non-elected agency personnel accountable to the public. If the agencies are not accountable to the public, we have authoritarian government.	A1

With that said, a critical Five Year Review of the Montana Pole Plant Superfund cleanup in Butte, Montana is currently occurring. Yet agency attempts to encourage community involvement is woefully lacking in this Five Year Review. (To be blunt, community involvement at Montana Pole hasn't been a stellar example of what community involvement should be.) A few hand picked by the agency folks have been interviewed and there was an ad in local newspapers inviting people, not to comment, but to go on line if they wanted "information" about the site. This information is really an "advertisement" that attempts to convince the public that the cleanup is going well, the remedy is protective, and soon the site will be available for use. My view, supported by the MDEQ's and EPA's own data, is that nothing could be more removed from the truth. But, the above is the extent of proposed community involvement by MDEQ and EPA. Again, if, which I sometimes doubt, MDEQ and by extension EPA are really committed to meaningful public involvement in agency decision making, the following minimum should be done in terms of community involvement.	A2

1. There needs to be announcements (at least two) in local newspapers of the Five Year Review *that solicit public comment and list the contacts to whom comments should be sent*.	A3

2. There needs to be a definite time period announced for the Review. If the currently secret dates for the Review are being approached, the time period needs to be extended.	A4

3. There needs to be at least one public meeting, the principal purpose of which is to take public comment, *before* the comment period is over. This meeting should be held at a site near the Pole Plant at a time convenient for residents to attend. The public meeting should be adequately publicized. The neighborhoods affected by the cleanup need to be notified directly.	A5

4. There needs to be outreach specifically directed toward the neighborhoods most affected by the Pole Plant cleanup.	A6

These four activities are a minimum of what needs to be done. So far, MDEQ and by extension, since this is a Superfund site, EPA have done virtually nothing to include the public. MDEQ seems particularly ossified in its approach to the Five Year Review. The impression given, if not the reality, is that this is a pro-forma exercise that needs to be done as quickly, secretly, and with as little controversy as possible. If is bad enough that Five Year Reviews entail the agencies evaluating their own work, but the Pole Plant Five Year Review doesn't even pretend to be interested in public comment. I ask MDEQ and EPA to implement the four suggestions that I made above and have meaningful community involvement in the Montana Pole Plant Five Year Review.	A7

EMAIL B

From: John Ray [mailto:bodinman2003@yahoo.com]
Sent: Sunday, April 10, 2016 5:38 PM
Subject: Re: Community Involvement (or Lack Thereof) in Montana Pole Plant Five Year Review

Based on my reading of your response, I fail to discern a true commitment to efficacious public involvement in Superfund decision making. MDEQ is obviously trying to get away with doing the absolute minimum when it comes to public involvement with the Five Year Review of Montana Pole Plant.	B1

Assuming that the comment period for the Five Year Review for Montana Pole Plant has not already passed, it is commendable that MDEQ is having a public meeting. Hopefully this meeting will not be a one-way flow of "information" from MDEQ about how well the cleanup is going and will actually take public comment and listen to the public. From your description of the meeting agenda, it appears though that the meeting will be more of a PR event that will attempt to sell the cleanup to residents.	B2

Your list of topics to be considered at the meeting is revealing for what it is not discussing. The meeting will not be discussing, from what I can tell, the following: 1. The dioxin cleanup levels for soils at Montana Pole are not being met and will not be met in the near future.	B3

2. Current dioxin discharge from the Montana Pole Plant into Silver Bow Creek does not meet water quality standards.	B4

3. The existing water quality standards set for Montana Pole Plant are very permissive and less restrictive/protective than national standards. So meeting these lax standards would not protect human health and the environment. But even these lax standards are not being met.	B5

4. The current ground water treatment system in place at Montana Pole Plant discharges dioxin into Silver Bow Creek at 100 times the lax water quality standards limit. 5. This current dioxin discharge at 100 times the permissive water quality standards will continue for decades.	B6

6. MDEQ has decided not to adhere to the cleanup standards set for Montana Pole but will waive them.	B7

7. The flow of storm water runoff through the Pole Plant that compromises the remedy. All we hear from MDEQ is that they are looking into the problem. When will the problem be fixed?	B8

The above issues should be discussed and answered at this meeting. The above list of unresolved issues reveals a cleanup that is not working to protect human health and the environment.	B9

You mention the usefulness of interviews which are useful provided those interviewed represent a true cross section of the affected community. The interviewees for the Montana Pole Plant were selected by MDEQ. We don't even know who they were in full. We don't know if they are representative of the whole community. (I was interviewed so this is not "sour grapes" about the interview process.) We have a hermetically sealed Five Year Review process for Montana Pole Plant. MDEQ is evaluating its own work. MDEQ decides who will be interviewed and provide citizen input. How can the public have any confidence in a process such as this one?	B10

MDEQ still seems to be rushing into future land use of the site and insisting that the cleanup is almost complete. How can the cleanup be considered complete given the issues that I raised above? How can the site be considered safe and no longer a threat to Butte or Silver Bow Creek given the issues that I have raised?	B11

I still recommend that MDEQ announce a full comment period and publicize the opportunity to comment to the whole community. If the comment period has ended, reopen it. I still urge MDEQ to place ads in the local newspaper that invite public comment. I still urge MDEQ to have specific outreach to the affected community. I urge MDEQ to fully address ALL of the outstanding issues regarding the Pole Plant.	B12

The Superfund decision-making process mandates public involvement and numerous institutional mechanisms are provided for public comment. The EPA has a policy mandate that holds that it is: "imperative that EPA pay close attention" to citizen input and that citizens need to be "involved in the decision-making process." (OSWER 9230.0-18- "Incorporating Citizen Concerns into Superfund Decision-making.") The Introduction of the EPA's Superfund Community Involvement Handbook (April 2002) notes that the EPA is committed to "early and meaningful community participation during Superfund cleanup." The agency goes on to say that community involvement and participation in decision-making is a "foundation" of the Superfund program. The Handbook talks about citizens "shaping" Superfund decisions. The Handbook further notes: "Superfund community involvement is not a public relations effort to sell the Agency or its plans to the community, nor is it just the communication of information. Community involvement is the vehicle EPA uses to get community concerns and interests to	B13

the decision-making table." EPA endorses the core values of the International Association for Public Participation that in part include "the promise that the public's contribution will influence the decision." Community concerns should be reflected in agency decisions. (OSWER 9230.0-99, "Early and Meaningful Community Involvement") In its description of the Superfund process in the January 2000 booklet This is Superfund, the statement is made that there is community involvement throughout the Superfund process. (p. 8) The above comments present a rather strong commitment on EPA's part to the efficacy of public participation. After all the Pole Plant is a federal Superfund site and should conform to the above requirements for public participation. The DEQ website makes a strong commitment to public participation: Public participation is essential to our processes and decisions. It is time for MDEQ to show this commitment in deeds not words.	

EMAIL C

From: John Ray [mailto:bodinman2003@yahoo.com]
Sent: Thursday, April 14, 2016 8:52 AM
Subject: COMPLAINT--Five Year Review of Montana Pole Plant Federal Superfund Site--Call for Redress

I read with some interest the notice in today's Montana Standard of the public meeting on the Pole Plant later this month and the invitation to citizens to submit their name if they want to be interviewed. What I found extremely objectionable was the characterization of public input as part of the Five Year Review as largely limited to such items as "reporting broken fences" and so forth. This is an unwarranted restriction of the role and scope of public participation in a Five Year Review and incorrectly characterizes the purpose of a Five Year Review as well as what Five Year Reviews cover. Five Year Reviews cover far more than broken fences. While this notice is somewhat better than the previous notices in the paper, it still provides misinformation to citizens. Five Year Reviews are much broader than your notice in today's paper indicates or suggests. The scope of issues the public is invited to address is much more comprehensive than MDEQ's restrictive listing in the paper. People should be encouraged to comment on the whole and complete range of protectiveness issues at the Pole Plant.	C1

People are concerned about: the failure to remove the threat of dioxin from the Pole Plant soil; water quality standards not being met; failure to have an effective, long term storm water runoff plan in place; reliance on a minimalist capping system that has failed when used in other parts of Butte; failure to adequately formulate or characterize the institutional controls that well be needed on site. People have more concerns than just broken fences. Your attempt to limit the public discussion is a disservice to the citizens you are supposed to be serving. It is a totally inaccurate portrayal of the Five Year Review process.	C2

I therefore wish to lodge a complaint with EPA and MDEQ. I ask that a new notice be placed in the paper, a notice that truly and accurately characterizes the role and scope of public participation in the Five Year Review of Montana Pole. It is bad enough that this Five Year Review is being conducted by the very people who are implementing the remedy, i.e. those doing the work are evaluating their own work. It is bad enough that the individuals previously selected for interviews were hand picked by the agency and, by and large, not representative of the community.	C3

The impression MDEQ gives is that, maybe because this is a cash out site, the agency really doesn't want a thorough review of what is going on at the Pole Plant. The agency wants to "get'er done" without, it seems, too much concern for getting er done right.	C4

Below, in order to substantiate the claims that I made above, I have provided extensive documentation from the EPA's policy statements on what Five Year Reviews should do. Since this is a federal Superfund site, MDEQ must conform to these requirements. But over and above conforming to the requirements, MDEQ should embrace full public participation in the Five Year Review process. Why hasn't this been the case?	C5

Five-Year Reviews—What they are supposed to do. Five-Year Reviews are not supposed to be perfunctory or cursory exercises. Let us consider the main guidances found in the EPA's *Comprehensive Five-Year Review Guidance*—EPA 540-R-01-007—OSWER No. 9355.7-03B-P, June 2001. (This is THE Guidance document covering Five-Year Reviews including the Five Year Review of Montana Pole Plant which is an EPA, i.e. federal Superfund site. (Unless otherwise noted, all page references refer to this document.) Even a cursory reading of the following will convincingly demonstrate that MDEQ's characterization of what a Five Year Review should do and consider is in error. A. Five-Year Reviews need to be conducted when waste is left in place B. The purpose of a Five-Year Review is: "to evaluate the implementation and performance of a remedy in order to determine if the remedy is or will be protective of human health and the environment. Evaluation of the remedy and the determination of protectiveness should be based on and sufficiently supported by data and observations." (Page1-1) See also: *CERCLA*, Section 121 (c) and 40 *CFR*, Section 300.430(f)(4)(ii). C. Community Involvement is a significant part of the Five-Year Review process. (See pages 3-2 and 3-3.) D. The Five Year Review envisions the necessity of supplemental data collection, sampling and evaluation activities. (Page 3-3) E. Neutral, objective parties "without bias or preconceived views or conclusions about the remedy and the site" should perform the Five-Year Review. (Page 3-5) F. The Five-Year Review should address certain topics which include: a. "Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?" (Page 3-7) b. "Has any other information come to light that could call into question the protectiveness of the remedy?" (Page 3-7) c. "A determination of whether (new) issues affect current or future protectiveness." (Page 3-7) d. "List of any recommendations, including follow-up actions to ensure protectiveness." (Page 3-7) G. The Five-Year Review process is supposed to identify whether or not "there are problems with the remedy that could ultimately lead to the remedy not being protective or suggest protectiveness is at risk." (Page 4-1) H. The Five-Year Review should consider whether "other actions (e.g. removals) are necessary to ensure that there are no exposure pathways that could result in unacceptable risks." (Page 4-1) I. The Five-Year Review should consider: "whether new human health or ecological exposure pathways or receptors have been identified." (Page 4-2) J. *Very importantly*, the Five-Year Review should consider whether "new contaminants or contaminants sources have been identified." (Page 4-2) K. The implementation status of institutional controls needs to be considered. (Page 4-3) This includes whether or not institutional controls are incomplete, inadequate or unworkable. (Page 4-10) L. If necessary, new risk assessments should be conducted. "In some cases, it may be necessary to revise or expand the previous risk assessment as part of your five-year	C6

review." (Page 4-7) M. The Priority Soils remedy uses site-specific cleanup levels. "If the remedy is intended to meet site specific. . . cleanup levels, you should check to see whether toxicity or other contaminant characteristics used to determine the original cleanup level have changed. If there have been changes in the understanding or in our knowledge of these physical/chemical characteristics, you may need to recalculate risk. . . ." (Page 4-7) It is clear that cleanup is not a frozen process but changes to meet new conditions. (Page 4-80) N. RAOs (Remedial Action Objectives) may be modified as a result of the Five-Year Review process. (Page 4-8) O. RAOs need to be evaluated as to whether or not they are "sufficiently comprehensive to cover new or changed conditions at a site." (Page 4-9) P. Five-Year Reviews need to consider whether or not risks have been sufficiently addressed at the site. (Page 4-9) Q. If needed, the agency should be open to conducting "additional studies or investigations" in order to optimize the remedy. (Page 4-12) R. Remedies need to be modified if they are not protective, based on incomplete or inadequate data and/or unworkable. (Pages 4-13 and 4-14)	

Another document of significance is: EPA, Five Year Reviews, Frequently Asked Question (FAOs) and Answers, OSWER 9355.7-21. In this document we find additional information as to what is involved in a Five-Year Review and that Five-Year Reviews are supposed to be a proactive process. 1. Remedy optimization opportunities typically identify modifications to the operating remedy which may improve remedy performance. . . . (Page 8) 2. In Question B of the Technical Assessment section of the five-year review report, the toxicity data evaluation done in the risk assessment should be reviewed to ensure that any assumptions made at the time of the original risk assessment continue to be protective. In addition to reviewing the toxicity information form [sic] the original risk assessment, Regions generally should evaluate new toxicity information for other chemicals identified at the site. New toxicity information my result in the determination that the additional contaminants sources poses a risk to human health or the environment. The review of both the original risk assessment and any new site contaminant information is intended to ensure that the implemented remedy continues to be protective both currently and in the future. (Page 9) 3. When conducting the five-year review, it is appropriate to evaluate whether any new information comes to light that could call into question the protectiveness of the remedy. (Page 10) 4. The goal of the recommendation, and associated follow-up actions, generally is to ensure both current protectiveness and long-term protectiveness of the implemented remedy. (Page 11)	C7

The overall question the Five Year Review of the Montana Pole Plant is supposed to answer is:	C8

Does the remedy protect human health and the environment? The Five Year Review is not supposed to concentrate on "broken fences."	

If the MDEQ is going to be true to the mandated requirements for conducting a Five-Year Review, it is clear that that review will need to be more than a perfunctory process. If the remedies for Montana Pole Plant are not meeting the above protectiveness requirements, which they are not, if new information has come to light, which has occurred, if the remedy is based on incomplete, inaccurate or inadequate characterization of the toxics of concern, which is true, if the remedy is not protective of human health and the environment, which it is not, it should be modified so as to be fully protective of human health and the environment. Remedy evaluations are supposed to fix remedy implementation problems that compromise the remedy now and in the future.	C9

Email D

From: John Ray [mailto:bodinman2003@yahoo.com]
Sent: Wednesday, April 27, 2016 5:35 AM
Subject: Montana Pole Plant Meeting--Citizens Need to be Heard on a Cleanup that has serious problems.

Tonight the Montana Department of Environmental Quality and the EPA are having a so called "open house" meeting on the Montana Pole Plant. It is my understanding that the arrangement will be several "stations" where citizens can get "information" about the site and about how well the remedy is working. The meeting will largely be a PR event from MDEQ and EPA. No time is set aside for citizen comment. Never mind that EPA community involvement policy as well as sound democratic decision making mandates that the public helps to mold and shape and impact decisions. The community outreach activities for this site have been marked by a lack of any real effort on the part of MDEQ or EPA to involve the public in any meaningful way in decisions affecting the Montana Pole Plant.	D1

My view is that, based on overwhelming scientific evidence, the site is not safe, the site is not clean and the remedy is not working. Yet, there has been a rush to finish off this site and turn it over for future land use. This is premature. I have attached a lengthy document which I feel details my contention that the "cleanup" of Montana Pole plant has not worked to protect human health and the environment. It is based on scientifically verifiable data, much of it from MDEQ and EPA.	D2

Since there will be no opportunity at tonight's meeting for public citizen comment, I intend to distribute this document to interested citizens.	D3

While I realize that after so long there is citizen fatigue regarding the Pole Plant and other Superfund sites in Butte, we cannot drop our vigilance now. Silver Bow Creek and Butte will never be "cleaned up" until, along with other Superfund sites in Butte, the issues I raise in the attached document are addressed and the Pole Plant fully remediated.	D4

These issues are not being sufficiently addressed now. The Montana Pole Plant—The Site is Not Clean; The Site is Not Safe; The Remedy is Not Working In several ways the Montana Pole Plant is one of Butte's most dangerous Superfund sites. As is the case with so many other Superfund sites in Butte, the community is saddled with a sub-par cleanup of the Montana Pole Plant.	D5

The Montana Department of Environmental Quality (MDEQ), as well as the EPA, seems	D6

impervious to citizen concerns and steadfastly clings to this failed remedy.	

As the following pages indicate, there are serious shortcomings in the Pole Plant cleanup. Any talk of reuse of this land is premature until the threat to Butte's health and environment from the Plant is eliminated. Any talk of restoring Silver Bow Creek is premature until the threat from the Pole Plant is removed. The data, as well as many of the inferences from the data, that are contained in the following pages come from the EPA's and MDEQ's own documents.	D7

1. Dioxin is present at the Montana Pole Plant. Hazardous furans, PCPs and PAHs are also present. 2. The cleanup of dioxin at the Montana Pole Plant is ineffective—dioxin will remain in the soils and dioxin will continue to pollute Silver Bow Creek.	D8

3. The present cleanup of the Montana Pole Plant is not meeting cleanup standards.	D9

4. The only protection afforded citizens from the deadly dioxin will be shallow caps over the contaminated soil which caps are not protective.	D10

5. Institutional controls to be used at the site have been poorly characterized and have not worked at other similar sites.	D11

6. The threat to the Pole Plant remedy from storm water runoff remains unaddressed.	D12

7. The current Five Year Review of the Montana Pole Plant remedy refuses to independently review the quality of the cleanup.	D13

8. MDEQ's attempts to involve the public in the Five Year Review have been abysmal. The impression is given that public input is superfluous and irrelevant.	D14

9. There is a rush to reuse the Pole Plant before it is safe. Because this is a cash out site, MDEQ wants to hand this toxic turkey off to Butte Silver Bow as quickly as possible.	D15

Dioxin and Montana Pole Plant—The Threat Remains—The Cleanup is Ineffective I wish to specifically address dioxin and the Montana Pole Plant. Contrary to the assertions of the Montana Department of Environmental Quality (MDEQ) and EPA, dioxin at the Montana Pole Plant still presents a significant, unremediated threat to human health and the environment. Until this problem is corrected, Silver Bow Creek cannot be fully restored and talk of future land use at the site is premature.	D16

There are no safe levels of exposure to dioxin. An EPA report in 2012 concluded that, after reviewing mounds of evidence, there are potentially serious health effects at ultra-low levels of exposure to dioxin. Other scientific studies have linked dioxins to cancer, disrupted	D17

hormones, reproductive damage such as reduced sperm counts, neurological effects in children and adults, immune system changes and skin disorders. (EPA, Environmental Health News) Studies have shown serious health effects at parts per trillion exposure to dioxin. No wonder dioxin is considered to be one of the most toxic substances known to human beings. The EPA lists the following as health risks associated with dioxin: Dioxins are highly toxic and can cause cancer, reproductive and developmental problems, damage to the immune system, and can interfere with hormones.	

It is my understanding that: 1. The dioxin cleanup levels for soils at Montana Pole are not being met and will not be met in the near future.	D18

2. Current dioxin discharge from the Montana Pole Plant into Silver Bow Creek does not meet water quality standards.	D19

3. The water quality standards set by the ROD for Montana Pole Plant are very permissive and less restrictive/protective than national standards. So meeting these lax standards does not protect human health and the environment. But even these lax standards are not being met.	D20

4. The current ground water treatment system in place at Montana Pole Plant discharges dioxin into Silver Bow Creek at 100 times the lax water quality standards. 5. This current discharge at 100 times the permissive water quality standards will continue for decades.	D21

6. MDEQ has decided not to adhere to the cleanup standards in the ROD for Montana Pole but will waive them.	D22

7. Given points 1-6 above, how than can MDEQ honestly claim that the site is remediated? 8. Given points 1-6 above, how can MDEQ legitimately claim that the Montana Pole Plant site does not pose a threat to human health?	D23

9. The public is largely unaware of points 1-6 above. Community involvement activities conducted by MDEQ have been intermittent and ineffective. Not only has the public had little role in impacting the decisions regarding Montana Pole Plant, MDEQ has been ineffective in simply informing the public as to what is taking place in regard to the Pole Plant cleanup.	D24

In the remainder of this message, I provide independent confirmation of my assertions from experts in the field. Often, too, the data I use is MDEQ's and EPA's own statements and data. MDEQ's cavalier dismissal of this information is shocking. Again, in light of this data, how can MDEQ and EPA say that the remedy is working to protect human health and the environment?	D25

We must remember that according to the World Health Organization: "Dioxins are highly toxic and can cause reproductive and developmental problems, damage the immune system, interfere with hormones and also cause cancer." Dioxin poses a serious threat to both human health and the environment. There are no safe levels of exposure to dioxin. (EPA) In fact, dioxin has been referred to as the "most toxic chemical known." (Hazardous Waste in America, Epstein, Brown and Pope) Lethal effects of dioxin can be seen at very low levels—a millionth of a gram can kill lab animals. Dioxin was the toxic found in Agent Orange and at New York's Love Canal. Dioxin causes serious cancerous and non-cancerous human health effects. (World Health Organization) Dioxin can produce multiple types of cancer. Non-cancerous health effects include type 2 diabetes, impaired immune system, ischemic heart disease, endometriosis, decreased fertility, inability to carry pregnancies to term, birth defects and learning disabilities. According to a statement made by the National Institute of Environmental Health Sciences, the "dangers of dioxin last for decades after initial exposure."	D26

The Record of Decision for Montana Pole promised that the dioxins, furans, PCPs and PAHs found at the site (all are serious health threats) would be biologically treated and the site cleaned up. Contrary to the promise of cleanup, the MDEQ and EPA have reneged on this promise. MDEQ and EPA have largely abandoned treatment in favor of containment, leaving the threat in place. Now, cleanup will consist of leaving all of these toxics on site and "managing them" through institutional controls. The EPA itself says that the toxicity of dioxin exists for an extended period of time. Containment is contrary to the Superfund mandate that treatment is to be preferred over leaving waste in place. The shoddy cleanup at the Pole Plant perpetuates a public health threat that should and could have been fixed.	D27

However, the current containment remedy is not working. Dioxin is still being released .The groundwater treatment system that was implemented at the Pole Plant site still allows for significant discharge of dioxin into Silver Bow Creek—100 times the current dioxin surface water standard. Such discharges will continue for decades to come. MDEQ's own discharge study said that MDEQ's planned cleanup approach would still allow dioxin to be discharged into Silver Bow Creek. MDEQ has ignored this problem and continues to implement a non-protective cleanup. Why was a sub-par cleanup approach selected? The threat to human health is particularly acute for those living near the Pole Plant. Local residents have had to endure not only a failed cleanup but tremendous odor problems caused by the MDEQ's waste in place remedy.	D28

The local EPA TAG group CTEC has called the problems associated with dioxin contamination to the attention of MDEQ and nothing has been done to address these issues.	D29

In comments submitted by CTEC to MDEQ on April 14, 2011 we find: Dioxin in Treated Soils Soil treatment at the site is not effective for reducing dioxin to meet the ROD cleanup level or EPA Regional Screening Levels for Chemical Contaminants at Superfund Sites. CTEC is concerned that the current program of backfilling dioxin containing soils with a 1 ft cap of	D30

clean soil will not be protective of human health given potential future land uses, and may still provide a pathway for groundwater impacts. The failure of treatment to meet ROD cleanup levels warrants detailed evaluation in the Five Year Review.	

Dioxin in Groundwater Water quality standards for dioxin have been lowered since the ROD. The 2006 Five Year Review noted the need to evaluate lower dioxin standards, but a description of this evaluation has not been provided to the public. The Five Year Review needs to evaluate if cleanup levels for dioxin in groundwater are adequate given the new lower standards.	D31

Extended CTEC Comments--Dioxin in Treated Soils Treatment has not been effective at reducing dioxin levels in soil to meet ROD requirements. Data provided in the Second Five-Year Review indicates that soil with a dioxin level over 4 times the ROD cleanup level and 48 times higher than EPA industrial Regional Screening Levels (RSLs) is being backfilled at the site. Cleanup levels derived in the ROD assumed future recreational land use. The Five Year Review should evaluate if dioxin in soil will be compliant with recreational use and if not, disclose what types of reuse or institutional controls will be necessary.	D32

The 2006 Five Year Review stated disposing of dioxin soils on top of clean fill extending at least one foot above the historical high groundwater mark and covered with at least one foot of clean fill is contemplated in the ROD. CTEC's review of the ROD does not find any contingency measures for backfilling soils which do not meet cleanup levels, including dioxin. A one foot cap of clean fill is insufficient for dioxin containing soils. Worms will actively bring dioxin contaminated soil to the surface if caps are not greater than the frost depth in Butte, which historically has been up to 5-6 ft. Backfilling soil with dioxin is a significant difference from the remedy proposed in the ROD, which alone warrants adequate evaluation and public comment and an Explanation of Significant Differences (ESD) given the significant nature of this remedy change. CTEC contends that the ROD should be amended to address treatment of dioxin containing soils because dioxin treatment is technically practical. Treatment of dioxin soils will prevent the need for additional institutional controls (ICs) which are inherently limited in protection due to cap failures, the need for perpetual maintenance, and limitations which ICs will place of future land reuse.	D33

CDM's (2001) study of leachability of dioxins and furans predicted groundwater concentrations under extreme worst-case conditions of 37 pg/L; 18.5 times higher than the current groundwater quality standard. CTEC is concerned that the backfilling of dioxin containing soil could present a long-term source of dioxin to alluvial groundwater, for which no permanent dioxin treatment is proposed.	D34

The ROD states waste should not be stored or disposed within the 100-yr floodplain. FEMA maps indicate the 100-yr floodplain includes a large portion of the site. The Five Year Review should provide maps of the 100-year floodplain and maps of locations where soils with dioxin levels exceeding cleanup levels have been backfilled. Soils containing dioxin should not be	D35

backfilled within the floodplain under the current ROD or any changes invoked with an ESD.	

Alternatives to backfilling and institutional control need to be considered for soils which do not meet dioxin cleanup levels. CTEC recommends dioxin treatments such as using white rot fungi be used to optimize the remedy for treatment of waste and future land re-use.	D36

Extended CTEC Comments--Dioxin in Groundwater The 2006 Five Year Review states (pp19) average August 2005 influent TCDD concentration in groundwater is 19.46 pg/L and plant effluent averaged 0.518 pg/L. The 2006 Five Year Review also indicates dioxin concentrations up to 43.45 pg/L at the leading periphery of the contaminant plume. These concentrations exceed both current groundwater standards and surface water standards (for effluent).	D37

The 2006 Five Year Review indicated that DEQ and EPA would evaluate modification of the cleanup standards for dioxins in groundwater and in discharge to surface water to the current standards, 2 pg/L and 0.05 pg/L respectively. To date, the public has only been provided with the statement that the new water quality standards were considered during summer 2007 but that the existing remedy was deemed appropriate (DEQ December 2009 update), which does not explain how the need to meet current water quality standards was evaluated or the rationale for not adopting the current standards. The Five Year Review needs to describe in detail the evaluation of these updated water quality ARARs.	D38

The dioxin concentration of 43.45 pg/L sampled at the leading periphery of the contaminant plume is 22 times the current groundwater standards and 869 times current surface water standards. An evaluation of groundwater impacts to surface water, springs and wetlands, once the groundwater capture and remediation system is no longer operated. A comparison of dioxin levels in groundwater at MPTP with background levels of dioxin in groundwater at other urban areas would be helpful for the public to understand the magnitude of dioxin levels. Evaluation of long-term fate of dioxin in groundwater needs to be incorporated into the evaluation of dioxin cleanup levels to meet current water quality standards.	D39

CTEC's review of the Butte Alluvial and Bedrock Controlled Ground Water Area (BABCGWA) Petition and Final Order indicates that the controlled groundwater area designation was focused on the widespread metals contamination from mining and not dioxin. The plume of groundwater contaminated with dioxin may have expanded. The BABCGWA does not consider dioxin in water quality testing of wells completed in contaminated aquifers. It needs to be determined whether the BABCGWA will adequately protect the public and environment from drinking PCP or Dioxin contaminated water.	D40

Please also note the following subsidiary information that relates to problem associated with the Montana Pole Plant cleanup: The biological degradation rate of these compounds is generally very slow when compared to other organic compounds. Because PCDDs and PCDFs have very low vapor pressures, they	D41

do not readily evaporate or volatilize to the atmosphere. The compounds adhere tightly to soil particles and do not migrate readily or leach into groundwater or surface water unless the contaminated soil particles themselves migrate via erosion processes (Freeman, 1989). (Emphasis supplied.) page 14 Soil-Plant Transfer of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans to Vegetables of the Cucumber Family (Cucurbitaceae) Anke. Huelster , Jochen F. Mueller , Horst. Marschner Environ. Sci. Technol., 1994, 28 (6), pp 1110–1115DOI: 10.1021/es00055a021Publication Date: June 1994 (Article: Indicates that dioxin is mobilized in soils as the result of plant activitiy. Given that there will only be a 12 inch cap over dioxin contaminated soils and the cap will have vegetative cover, the vegetative cover will absorb dioxin and bring it to the surface.) Sorption of 2,3,7,8-tetrachlorodibenzo-p-dioxin to soils from water/methanol mixtures Richard W. Walters , Annette. Guiseppi-Elie Environ. Sci. Technol., 1988, 22 (7), pp 819–825DOI: 10.1021/es00172a012 Publication Date: July 1988 Study by U.S. Dept of Agriculture indicated that dioxin is only immobile in soils devoid of other organic material. If any organic co-solvents as are present at the Pole Plant are in the soil, mobility will occur. SUBSTANTIAL MIGRATION OF DIOXINS IN AGROCHEMICAL FORMULATIONS, Grant, Sharon, Mortimer, Munro, Stevenson, Gavin, Malcolm, Don and Gaus, Caroline, The University of Queensland (National Research Centre for Environmental Toxicology (EnTox)), 39 However, the presence of co-contaminants can act as transport facilitators for otherwise low mobility organic compounds (LMOCs) These results highlight that the paradigm of LMOCs being non mobile in soils should be considered carefully together with application specific and environmental factors which may have the ability to considerably change the predicted environmental fate of these chemicals. (This article supports the above mentioned study by the U.S. Department of Agriculture that if, as we find at the Pole Plant, co-contaminates are present, dioxin does become mobile in soil. The point is that since the remedy for the Pole Plant was changed from one of active treatment to containment, co-contaminants that will make dioxin mobile in soil will be present.	

We must remember that according to the last Five Year Review of the Montana Pole Plant: The cleanup levels for dioxins in soils are not currently being met and are not anticipated to be met if the current remedy operates as intended. CDM's Technical Memorandum Vadose Zone Soils Dioxin/Furan Mobility Evaluation, September 27, 2001, evaluation concluded that dioxins and furans are not likely to be treated, biodegraded, or leached from soils during bioremediation. . . . MDEQ admits that cleanup levels are not being met and will not be met. Yet, MDEQ clings to a remedy, which by their own admission, is not working.	D42

The dioxin contamination problem is made worse because of storm water runoff through the Pole Plant. MDEQ admits that this is a problem but, so far, has done little to fix the problem.	D43

1. The Record of Decision for the Montana Pole Plant clearly calls for active treatment of the waste as the primary cleanup method. The ROD does not support keeping waste in place as the primary or major approach to cleanup. Somewhere along the way, the emphasis on active	D44

treatment was changed to an emphasis on containment under caps. That was pretty clear at the Tuesday night (October 29, 2013) Pole Plant meeting. Pages 6, 7, and 35 of the Pole Plant ROD clearly stipulate that active treatment will be the cleanup method. In the Record of Decision—Montana Pole Plant we find this quotation that exemplifies the position in the Record of Decision: All accessible contaminated soils and LNAPL will be excavated to the extent practicable and treated, preventing this material from continuing to contaminate groundwater. The selected remedy will also satisfy the preference for treatment as a principal element of the remedy. Page 35	

2. Active biological treatment does work on wastes such as we find at the Pole Plant and in our climate. For example, an article entitled: "Treatment of Dioxin Contaminate Soils," Standberg, et. al, published in November 2011 by the Swedish Environmental Research Institute provides compelling evidence of the efficacy of active biological treatment on wastes similar to those found at the Pole Plant and in a climate similar to Butte's climate. See also: Biodegradation of Dioxins and Furans by Rolf Wittich, July 15, 1998): Bioremediation of organic pollutants and heavy metals by use of microorganisms represents a safe, inexpensive, and environmentally-friendly concept in modern environmental engineering. During the last three decades intense efforts have been made by microbiologists and environmental engineers in the isolation and characterization of microorganisms capable of degradation, transformation and detoxification of recalcitrant chemical compounds of environmental concern: (polyhalogenated) dibenzo-p-dioxins, dibenzofurans, and diphenyl ethers. Special emphasis is placed on the potential of molecular biology techniques to improve presently available biocatalysts. (Biodgredation of Dioxins and Furans by Rolf Wittich, July 15, 1998)	D45

3. Dioxin is mobile in soils such as those at the Montana Pole Plant. The ROD itself says that it is possible for dioxin in soils to migrate. (Page 14) There are present in the Montana Pole Plant soils co-contaminants that can mobilize dioxin. In addition, the caps that are used will not prevent surface water and other contaminants from leaching down and mobilizing dioxin. Given the problems of caps with bio-irrigation, advection, desiccation, erosion, weathering, bio-intrusion and stabilization, the dioxin in the soil will be mobilized. Only in a pure lab setting does dioxin remain non-mobile. Certainly the Montana Pole Plant is not a pure lab setting. (See: Dioxin reservoirs in southern Viet Nam--A legacy of Agent Orange by Divernychuk, et al in Chemoshpere 47 (2002) 117-137. Similar findings are reported in the following:	D46

1. Soil-Plant Transfer of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans to Vegetables of the Cucumber Family (Cucurbitaceae) Anke. Huelster , Jochen F. Mueller , Horst. Marschner *Environ. Sci. Technol.*, 1994, 28 (6), pp 1110–1115DOI: 10.1021/es00055a021Publication Date: June 1994 (Article: Indicates that dioxin is mobilized in soils as the result of plant activity. Given that there will only be a 12 inch cap	D47

over dioxin contaminated soils and the cap will have vegetative cover, the vegetative cover will absorb dioxin and bring it to the surface.) 2. Sorption of 2,3,7,8-tetrachlorodibenzo-p-dioxin to soils from water/methanol mixtures Richard W. Walters , Annette. Guiseppi-Elie *Environ. Sci. Technol.*, 1988, 22 (7), pp 819–825DOI: 10.1021/es00172a012 Publication Date: July 1988 3. Study by U.S. Dept. of Agriculture indicated that dioxin is only immobile in soils devoid of other organic material. If any organic co-solvents, as are present at the Pole Plant, are in the soil, mobility will occur. 4. SUBSTANTIAL MIGRATION OF DIOXINS IN AGROCHEMICAL FORMULATIONS, Grant, Sharon, Mortimer, Munro, Stevenson, Gavin, Malcolm, Don and Gaus, Caroline, The University of Queensland (National Research Centre for Environmental Toxicology (EnTox)), 39 However, the presence of co-contaminants can act as transport facilitators for otherwise low mobility organic compounds (LMOCs) These results highlight that the paradigm of LMOCs being non mobile in soils should be considered carefully together with application specific and environmental factors which may have the ability to considerably change the predicted environmental fate of these chemicals. (This article supports the above mentioned study by the U.S. Department of Agriculture that if, as we find at the Pole Plant, co-contaminates are present, dioxin does become mobile in soil. The point is that since the remedy for the Pole Plant was changed from one of active treatment to containment, co-contaminants that will make dioxin mobile in soil will be present. 5. Assessment of Dioxin Contamination at Sawmill Sites: A Report to the Ministry for the Environment by Tonkin & Taylor Ltd and SPHERE, Prepared for the New Zealand Ministry for the Environment October 2008 (conclusions are similar to the one's I included in my earlier email to you today, i.e. that dioxin is mobile in both soil and water.	

Also, data presented by the MDEQ at the Tuesday, October 29 meeting indicated that dioxin is present in the recovery trenches at the Pole Plant. If dioxin isn't mobile in soil at the Pole Plant, how did the dioxin get in the recovery trenches?	D48

Another point that Ian made: MDEQ is in charge of the cleanup in Missoula of the White Pine Sash site. This site was a wood treatment facility similar to Montana Pole. The MDEQ acknowledges at this site that dioxin can be mobile in soils. Why not acknowledge the same at Montana Pole? Finally, the dioxin levels that we are now seeing in groundwater at the Montana Pole Plant were not supposed to have been reached until 200,000 years from now according to MDEQ. Why, if dioxin is not mobile, are we seeing dioxin now that we should not have seen for 200,000 years?	D49

Summary of my position:	D50

1. The bottom line is that the dioxins, Pcps, Pahs and furans found at the site are highly toxic and carcinogenic. Dioxin poses a serious threat to both human health and the environment. There are no safe levels of exposure to dioxin. (EPA) In fact, dioxin has been referred to as the "most toxic chemical known." (Hazardous Waste in America, Epstein, Brown and Pope) Lethal effects of dioxin can be seen at very low levels—a millionth of a gram can kill lab animals. Dioxin was the toxic found in Agent Orange and at New York's Love Canal. Dioxin causes serious cancerous and non-cancerous human health effects. (World Health Organization) Dioxin can produce multiple types of cancer. Non-cancerous health effects include type 2 diabetes, impaired immune system, ischemic heart disease, endometriosis, decreased fertility, inability to carry pregnancies to term, birth defects and learning disabilities. According to the National Institute of Environmental Health Sciences, the "dangers of dioxin last for decades after initial exposure." Just dealing with contaminant level statistics can mask the danger posed by these contaminants.	

2. These toxics will largely remain on site to pose a perpetual threat to human health and the environment. The site will never be cleaned up. 3. Even the data presented at the October 29th meeting shows that these toxics have been released. Perhaps these toxics have not been released in large quantities, perhaps they are not released all the time, but given the toxicity of the materials even relatively small releases are problematic. And given that the site will not be cleaned up, these releases will continue in perpetuity.	D51

4. Based on the discussion of the DEQ 7 standards, it is obvious that the cleanup levels in the original Record of Decision for the Pole Plant are not protective. The problem is that the current cleanup is not meeting, in a significant number of cases, the DEQ 7 standards. Yet, the presentation on October 29th continually referred to meeting the outdated, non-protective EPA standards in the Record of Decision. Probably, the old Record of Decision will never be reopened.	D52

5. The comparisons of the Pole Plant site to other sites presented at the October 29th meeting don't prove anything. Because, for example, the Pole Plant is comparable to other similar sites does not mean that the Butte cleanup is working to protect human health and the environment. We saw a gross misuse of comparisons.	D53

6. The extensive use of caps for the Pole Plant is very problematic. Butte's history with capping toxic waste has not been good. Caps have been very problematic. The dioxins and other contaminants at the Pole Plant will all be just left in place, covered with only 12 inches of topsoil caps. Previous capping on the Butte Hill, which uses more soil than the level at the Pole Plant, has not worked well. We have a situation where the most toxic substances in Butte (dioxins, PCPs and furans) are to be covered with the least amount of soil. Caps, as we have seen in Butte, already are susceptible to failure by means of bio-irrigation, advection, dessication, erosion, weathering, bio-intrusion and stabilization problems. Caps also have significant construction, repair and maintenance problems.	D54

7. Because the responsible parties for the cleanup cashed out, we better get it right now. The money for the cleanup is limited. My view is that a quality cleanup at Montana Pole has been sacrificed because of this cash out.	D55

In short: The Record of Decision for Montana Pole promised that the dioxins, furans, PCPs and PAHs found at the site (all are serious health threats) would be biologically treated and the site cleaned up. Contrary to the promise of cleanup, the MDEQ and EPA have reneged on this promise. MDEQ and EPA have largely abandoned treatment in favor of containment, leaving the threat in place. Now, cleanup will consist of leaving all of these toxics on site and "managing them" through institutional controls. The EPA itself says that the toxicity of dioxin exists for an extended period of time. Containment is contrary to the Superfund mandate that treatment is to be preferred over leaving waste in place. The shoddy cleanup at the Pole Plant perpetuates a public health threat that should and could have been fixed. However, the current containment remedy is not working. Dioxin is still being released .The groundwater treatment system that was implemented at the Pole Plant site still allows for significant discharge of dioxin into Silver Bow Creek—100 times the current dioxin surface water standard. Such discharges will continue for decades to come. MDEQ's own discharge study said that MDEQ's planned cleanup approach would still allow dioxin to be discharged into Silver Bow Creek. MDEQ has ignored this problem and continues to implement a non-protective cleanup. Why was a sub-par cleanup approach selected? The threat to human health is particularly acute for those living near the Pole Plant. So, while progress has been made, the rosy picture presented at the October 29th meeting does not give us a full picture of what is going on at the Pole Plant.	D56

In addition to the citations I provided in this document, I would also ask that you review Ian's submission of November 5, 2013 to the CTEC board giving his reactions to the conclusions presented at the October 29, 2013 meeting. The following is the email from Ian (Ian Magruder, Kirk Engineering) of March 27, 2013 which I include as a reference point. "CTEC members- I thought I would summarize for you the important points from the Montana Pole update at the meeting the other night. 1. The groundwater treatment system discharges dioxin into Silver Creek at 100 times the current very low surface water standard. This is expected to continue for decades under the current plan. It needs to be shown that this will not impact the health of aquatic life, fish, or people who eat them.	D57

2. The Five Year Review from 2011 included three action items that the agencies would summarize for the layperson and distribute to the public the review findings, air monitoring health risks, and that they sampled soil where the wind-break trees died. This was to be an important response to citizens' comments and still needs to happen."	D58

Therefore, the only protection from the dioxin in the soils at Montana Pole Plant will be the caps placed over the soil. However, storm water runoff, which continues to be an unremediated problem, compromises the integrity of the soil caps. After all there will only be a few inches of cap to protect the public.	D59

The so-called cleanup of the Montana Pole Plant has been in many important respects a failure. Currently, the Montana Pole Plant is undergoing another Five Year Review where the EPA and MDEQ will evaluate their own work. MDEQ has not even solicited public comment on the Five Year Review. In an ad in local newspapers, MDEQ said simply: "If you would like to learn more about the Montana Pole and Treating plant Superfund site, please visit the DEQ website." This ad did not encourage the public to comment.	D60

Any sound decision making system has a built in evaluation mechanism whereby, after implementation, decisions can be assessed as to effectiveness in meeting the goals of the decision. Superfund decisions undergo periodic, every five years, reviews that are supposed to assess whether or not the remedy selected by EPA is protecting human health and the environment. These reviews are called "Five-Year Reviews." Currently, the Montana Pole Plant is undergoing such as review. However, the review is being conducted by the very people that are also implementing the remedy—hardly a good recipe for an evaluation process. In fact, they have gone so far as to interview each other as part of the evaluation process. What is needed is for those evaluating the Montana Pole Plant remedy to not be the same people who are implementing the remedy. I make no accusations of wrongdoing. I am simply saying that evaluation and implementation should be separate. Even without realizing it, we may be biased in favor of our own work. There is also a question of public confidence in the outcome of the review. Would the public have more confidence in a review done by independent experts or in a review done by those who implement the remedy? An independent evaluation provides independent perspective, judgement and feedback. There is a tendency for people to praise their own work. How realistic is it for the public to expect that MDEQ will criticize its own work? We all have a tendency to be biased in our own favor.	D61

An independent review provides a level of certainty and corroboration missing from a purely internal review. An independent review maintains the integrity of the process. An independent review is transparent and fair. What I am asking is that the current Five Year Review of Montana Pole Plant be subjected to an independent peer review by qualified experts who are not part of the implementation process. MDEQ should not evaluate its own work. This is standard procedure in the scientific and academic community. Subjecting one's work to independent peer review is standard practice for the reasons mentioned above. The people doing the implementing of the remedy at Montana Pole are, I am sure, fine people. However, they should not be tasked with the impossible burden of evaluating their own work. Consider the benefits of an independent peer review: According to the U.S. Department of Energy a "peer review is a documented, critical review performed by peers [defined in the USNRC report as "a person having technical expertise in the subject matter to be reviewed (or a subset of the subject matter to be reviewed) to a degree at least equivalent to that needed for the original work"] who are independent of the work being reviewed. The peer's independence from the work being reviewed means that the peer, a) was not involved as a participant, supervisor, technical reviewer, or advisor in the work being reviewed, and b) to the extent practical, has sufficient freedom from funding considerations to assure the work is impartially reviewed. A peer review is an in-depth critique of assumptions, calculations, extrapolations, alternate interpretations, methodology, and acceptance criteria employed, and of conclusions drawn in the original work. Peer reviews confirm the *adequacy* of the work. What confidence can the public have in this Five Year Review?	

In short: 1. Dioxin and other major contaminants are present at the Montana Pole Plant. EPA and the Montana Department of Environmental Quality have said so. 2. The Montana Pole Plant was listed as a Superfund site because it was determined by EPA that these toxics posed a serious risk to human health and the environment. 3. Dioxin will remain on site at the Pole Plant, covered by a thin topsoil cover, after the cleanup is completed. Just read the statements to that effect from MDEQ. 4. These thin caps have proven to fail regularly in the rest of Butte. 5. Storm water runoff regularly flows through the Pole Plant and can wash toxics into Silver Bow Creek. 6. Given the thin cover and the fact that dioxin is left on site, how can MDEQ certify that that site is safe for further future use? 7. Before the site can be deemed remediated and before Silver Bow Creek can be restored, dioxin and other associated toxics at the Montana Pole site must be REMOVED and destroyed.	D62

After the so called cleanup is completed, deadly dioxin will remain in the soils at the Montana Pole Plant. The only protection that the public will have from this deadly dioxin will we a relatively shallow soil cap. Soil caps have not worked well in Butte. Please consider the following:	D63

Caps are not Permanently Protective of Human Health and the Environment. Problems with caps: 1. Metals can be remobilized through bio-irrigation. (Dueri, Sibylle, et. al., University of Laval, Quebec, "Modeling the Transport of Heavy Metals through a Capping-Layer: The case Study of the Flood Sediments Deposited in the Saguenay Fjord, Quebec.") 2. The long term efficacy of caps can be compromised by advection "related to consolidation, diffusion, chemical reactions, and the effect of . . . burrowing activity." (Ibid.) 3. Desiccation can cause cracking of the cap cover. (David Daniel, Professor of Civil Engineering, University of Texas, Geotechnical Practice for Waste Disposal) 4. The freeze-thaw cycle can produce changes in the structure and fabric of the cover and a way that increases hydraulic conductivity. (Ibid.) 5. Caps are difficult to construct correctly. (Ibid.) 6. Caps are difficult to maintain and repair. (Ibid.) 7. Erosion is a serious problem. (Jack Caldwell, U.S. Department of Energy, Principles and Practice of Waste Encapsulation.) 8. Biointrusion can compromise the effectiveness of the cap. (Ibid.) 9. Differential settlement of the cap can cause cracking. (Oweis and Khera, New Jersey Institute of Technology, Geotechnology of Waste Management.) 10. Caps require regular and often expensive repair. (Ibid.) 11. Stabilization of the cap is a problem. (Ibid.) 12. Caps present long-term subsidence and settlement issues. (Ibid.) 13. Because of their susceptibility to "weathering, cracking and subsidence" caps have limited long term utility. "Wind, rain, and generalized erosion over time can severely damage even a well-designed . . . cover." (U.S. Department of Energy, Office of Environmental Management, "Remediation Technology Descriptions: Containment.") See also: Merritt, Frederick (ed.) Standard Handbook for Civil Engineers, McGraw-Hill, New York. The extensive use of caps as a cleanup method for Montana Pole Plant would do nothing to reduce the toxicity and volume and mobility of contaminants. Caps do nothing to clean up a site. The extensive use of caps as a cleanup method for Montana Pole Plant would not provide a permanent remedy. The extensive use of caps as a cleanup method for Montana Pole Plant would violate the Superfund mandate for treatment over containment. In short, the extensive use of caps for the Montana Pole Plant would not be protective of human health and the environment.	

In addition to caps, the remedy for the Montana Pole Plant depends on institutional controls to keep the public from contacting the deadly contaminants at the Plant. The Public should be concerned about too great a Reliance on Institutional Controls. Institutional controls per se do nothing to reduce the mobility, toxicity, or volume of contaminants. Institutional controls do nothing to clean up a site. The institutional controls being considered in the EPA's RI/FS for Priority Soils would seriously limit productive land uses and greatly compromise the property rights of owners to use their land as they determine. The extensive reliance on institutional controls is also contrary to the Superfund mandate of preference for treatment over restricted land use. Institutional controls do nothing to treat a site. The EPA's own document "Rules of Thumb for Superfund Remedy Selection" states that	D64

the law mandates a clear preference for treatment over all other approaches. "EPA expects to use treatment to address the principal threats posed by a site. . . ." [40 CFR 300.430(a)(1)(iii)(A)]. The above document also notes: "Institutional controls. . .generally shall not substitute for more active measures. . . ." (pp. 12-13)

The EPA itself has found significant problems with institutional controls at its other sites. In an article entitled "EPA, Think Tank Studies Show Superfund Land-use Controls Flawed, December 10, 2001" which summarizes "Superfund Report via Inside EPA.com" by Resources for the Future, we find these conclusions, *reached by the EPA itself*, which due to their significance, I will quote at length:

"EPA and environmental think tank studies have shown that the federal and state governments' land-use restrictions at Superfund sites, known as institutional controls (IC), are seriously flawed, with an agency study showing the controls are not reliably implemented and the think tank report finding the controls are dramatically under-funded."

"During a November 27 land use control summit, sponsored by the International City/County Management Association (ICMA), EPA officials and the Environmental Law Institute (ELI), outlined numerous shortcomings they have found with EPA's IC monitoring and enforcement efforts nationwide. While EPA released the results of a study showing EPA has failed to ensure Superfund ICs are reliably implemented, and ELI study indicates that EPA's ICs are dramatically under-funded."

"Bruce Means, of EPA's Federal Facilities Restoration and Reuse Office, told attendees that preliminary studies show that half of the ICs implemented under Superfund records of decisions (ROD) were mischaracterized. During a study of RODs conducted during 1999 and 2000, the agency found that half of the ICs established under RODs were not implemented as the agency had planned."

"And Jay Pendergrass of ELI outlined the preliminary findings of ELI's study of state's IC programs, which showed that the programs are severely under-funded."
"In a draft version of the report, Pendergrass found that state environmental programs are underfunded and as a result the sites allocate very little time on IC implementation. The funding and staffing shortfall 'raises concerns about whether [ICs] are implemented as intended and [are] as protective as intended."

"An ICMA source agrees that EPA has serious problems with its IC program, saying that the agency has many RODs with vague or inconsistent references to such controls."
(pages 1-2)

The greater the cleanup of the Butte Priority Soils Operable Unit, the more the site can be used productively. The less cleanup of the BPSOU, the less the site can be used for residences and recreational uses. Given the EPA's admission that institutional controls have failed it in the past, it is amazing that the remedies listed in the RI/FS for Priority Soils call for such extensive use of institutional controls.

<u>Other Problems with Institutional Controls:</u>

a. There is a tendency not to implement institutional controls as time passes. Frequently institutional control mandates are not carried to completion.
b. The effectiveness of institutional controls usually depends upon the ability, personnel and resources of the local government to implement. Often local governments do not have the personnel or resources to devote to the implementation and monitoring of institutional controls. Given the national administration's proposed cutbacks in Superfund allocations, resources will be increasingly unavailable on the national level to monitor implementation and effectiveness of institutional controls. Certainly the financial capacity of Butte's local government to implement and monitor institutional controls is greatly limited. Nowhere does the EPA's comprehensively address the above issue.
c. "Institutional controls rely heavily on humans to implement, oversee, and administer them. It is human nature to ignore tasks that no one else seems to care about or where the purpose is not readily apparent. Residual hazardous substances are a classic example of a problem that is not readily apparent." ("Protecting Public Health at Superfund Sites: Can Institutional Controls Meet the Challenge?" Environmental Law Institute, p. 2)
d. Although EPA must review the remedy every five years, the frequency of this review process may be insufficient to detect the failure of institutional controls.
e. The use of education as part of the institutional controls strategy is a substantial part of the EPA's approach to implementing institutional controls. Research of previous remedies under Superfund indicates that education programs fail to materialize.
f. "In addition to the direct costs of implementing institutional controls, their use can impose substantial indirect costs on communities, property owners, prospective purchasers and developers by limiting the ways a site may be used. The burden of the restrictions on use of the site falls on the property owner and the community, with the owner reaping potentially lower profits from use of the property and the community receiving lower social benefits from the allowed uses than would have been possible if no restrictions existed." (ELI, *Ibid.)*
g. Because the sites where institutional controls will be implemented will not be cleaned up and will present a continuing potential threat to human health, these sites will be off limits to development in perpetuity. It is difficult to see how the use of institutional controls meshes with the goals of the EPA's Superfund Redevelopment Initiative.
h. It is impossible to determine future possible land uses for the site nor is it possible to predict unanticipated land uses. (See: "Linking Land Use and Superfund Cleanups: Uncharted Territory," by Probst, Hersh, Wernstedy and Mazurek, Summary of Findings, RFF, p. 1)
i. "Institutional controls have more problems than just risk miscalculation. Breeches in the site because of future construction, or even animals may cause the control to fail. The lack of a required contingency plan, would not account for new remedies, new information, or failed institutional controls negatively impacts the effectiveness of the treatment. Institutional memory loss was well is an important factor. This memory loss occurs when a party decides to breach the original institutional control without its own knowledge. In fact, in the ICMA (International City/County Management Association) study, the majority of respondents (63%) said that breaches in the institutional controls on a site were highly or somewhat likely. Following up on that question, 30% of the respondents reported that no formal inspection schedule was set up to evaluate the site as require by law." (Erwin Tam, Environmental Science and Economics, UC Berkeley, "Analysis of Institutional Controls at California Superfund Sites.")
j. "Concern has been expressed about the long-term viability of institutional controls as a

remediation tool. For example, they may be forgotten; enforcement agencies may not effectively review properties or land users' actions; or land users simply may take their chances. Decision makers should weigh the full costs of such options, including capital costs, costs of long-term sampling and analysis, and costs of replacing equipment, as well as concerns about potential long-term risks associated with contaminants left in place, against the cost options that would remove the contaminants completely. Many local governments do not yet have the capacity and resources necessary to meet the challenges of long-term stewardship." ("Understanding the Role of Institutional Controls at Brownfields Sites: Major Concepts and Issues.") k. Because institutional controls leave large amounts of contaminants in place, institutional controls will have to be perpetual. Who is to say what anticipated land uses come up for an institutionally controlled area? For example, fifty years after the record of decision for Butte Priority Soils is implemented, the contaminants will still be there threatening human health and the environment, but will the will be there to restrict land uses in order to prevent the release of contaminants. "Institutional controls 'work' only if they are complied with. And while this is true of any site remedy, institutional controls require monitoring and enforcement over long time periods." ("Linking Land Use and Superfund Cleanups: Unchartered Territory, Probst, et al., Resources for the Future Center for Risk Management.) Will the will to enforce institutional controls exist fifty to a hundred years in the future? l. Legal, social and political pressures limit the effectiveness of institutional controls. (*Ibid*.) m. The long-term effectiveness of institutional controls is unknown. "There has, however, been little investigation of what happens at sites on the National Priorities List (NPL) when land use plays a prominent role in the remedy selection process. There also has been little analysis of what institutions are involved in making land use decisions and maintaining land use restrictions over time. It is unclear what legal mechanisms are most effective, what institutions will be responsible for enforcing institutional controls, and who's going to pay for these additional responsibilities. We need to be able to answer these questions if land use-based remedies are to be protective over the long term." (*Ibid*.) "Planners of long-term disposal systems have long recognized the difficulty of maintaining institutional control over property. . . ." (Jack A. Caldwell and Charles C. Reith, *Principles and Practice of Waste Encapsulation*, 1993, p. 35)	

Summary Eternal vigilance is the price of liberty. Thomas Jefferson Wouldn't it be nice if citizens could trust government to do the right thing? Unfortunately, that doesn't always happen. Anytime power is given to a government institution, that institution can escape popular accountability. Even when government is supposedly acting to promote and protect public health and safety, citizens need to be on their guard. The public interest is best promoted and protected by a vigilant public.	D65

The Montana Pole Plant Superfund site in Butte usually flies below the public radar, except	D66

for those living near the site. Because surface water, groundwater, soils and sediments at the Pole Plant are contaminated with dioxins, the Pole Plant is, perhaps, the most dangerous of the Superfund sites in Butte. The Pole Plant cleanup by the Montana Department of Environmental Quality (MDEQ) leaves much to be desired.	

Dioxin poses a serious threat to both human health and the environment. There are no safe levels of exposure to dioxin. (EPA) In fact, dioxin has been referred to as the "most toxic chemical known." (Hazardous Waste in America, Epstein, Brown and Pope) Lethal effects of dioxin can be seen at very low levels—a millionth of a gram can kill lab animals. Dioxin was the toxic found in Agent Orange and at New York's Love Canal. Dioxin causes serious cancerous and non-cancerous human health effects. (World Health Organization) Dioxin can produce multiple types of cancer. Non-cancerous health effects include type 2 diabetes, impaired immune system, ischemic heart disease, endometriosis, decreased fertility, inability to carry pregnancies to term, birth defects and learning disabilities. According to the National Institute of Environmental Health Sciences, the "dangers of dioxin last for decades after initial exposure."	D67

The Record of Decision for Montana Pole promised that the dioxins, furans, PCPs and PAHs found at the site (all are serious health threats) would be biologically treated and the site cleaned up. Contrary to the promise of cleanup, the MDEQ and EPA have reneged on this promise. MDEQ and EPA have largely abandoned treatment in favor of containment, leaving the threat in place. Now, cleanup will consist of leaving all of these toxics on site and "managing them" through institutional controls. The EPA itself says that the toxicity of dioxin exists for an extended period of time. Containment is contrary to the Superfund mandate that treatment is to be preferred over leaving waste in place. The shoddy cleanup at the Pole Plant perpetuates a public health threat that should and could have been fixed.	D68

However, the current containment remedy is not working. Dioxin is still being released .The groundwater treatment system that was implemented at the Pole Plant site still allows for significant discharge of dioxin into Silver Bow Creek—100 times the current dioxin surface water standard. Such discharges will continue for decades to come. MDEQ's own discharge study said that MDEQ's planned cleanup approach would still allow dioxin to be discharged into Silver Bow Creek. MDEQ has ignored this problem and continues to implement a non-protective cleanup. Why was a sub-par cleanup approach selected? The threat to human health is particularly acute for those living near the Pole Plant.	D69

Local residents have had to endure not only a failed cleanup but tremendous odor problems caused by the MDEQ's waste in place remedy.	D70

Citizens have a right to know if and why government is not doing what it said it would do to protect human health and the environment. Agency decisions are binding.	D71

The Pole Plant cleanup, again contrary to what was promised regarding community involvement, has failed to provide the public with timely information about the problems	D72

with the cleanup. The lack of any coordinated or effective program for citizen involvement means that citizens are prevented from holding government accountable and influencing government cleanup activities. The lack of transparency by the MDEQ and EPA means that citizens are left to “hope” that government does the right thing.	

The public deserves answers to the following questions: (1) Why is the Pole Plant still out of compliance with emission standards for dioxin?	D73

And (2) Why hasn’t the Pole Plant been cleaned up? After all, the public’s safety is the highest law. (Roman law)	D74

EMAIL E

From: John Ray [mailto:bodinman2003@yahoo.com]
Sent: Monday, September 19, 2016 1:37 PM
Subject: MDEQ Requested Summary of Concerns--Montana Pole Plant Five Year Review

In a phone conversation with me, David Bowers of MDEQ has asked me to summarize the issues that I raised and submitted to MDEQ and EPA (this is a federal Superfund site) as part of the public comment period on the Five Year Review of the Montana Pole Plant. (It is my understanding that the Five Year Review is finished and work is being completed on responding to citizen comments.) I am happy to do so and provide MDEQ and EPA with a summary of my concerns. However, I still wish for all of my comments to be considered and to merit a comprehensive and detailed response as part of the Five Year Review process. This summary is in no way a substitute for my extended comments on the Montana Pole Plant. It is to these submitted comments that MDEQ and EPA should refer in order to see the documentation and substantiation, as well as the extended reasoning, that I have provided as warrant and justification for my concerns. Five Year Reviews are important events and should not be taken lightly or considered cursory. Public input is a vital part of the Five Year Review and should impact the review and receive a detailed response. Given the presence of deadly dioxin at the Montana Pole Plant is particularly important to evaluate whether or not the remedy as being implemented is protecting human health and the environment.	E1

Summary of Issues Raised in my Comments Regarding the Five Year Review of Montana Pole Plant 1. Dioxin—As currently implemented, the remedy fails to adequately remediate dioxin. a. Dioxin is present at the Montana Pole Plant b. Dioxin in soils is an unremediated threat to human health. c. Dioxin is leaching into Silver Bow Creek and presents an n ongoing threat to that Creek d. Soil and water cleanup standards for dioxin are not being met. e. Groundwater treatment is not working as intended.	E2

2. Caps-- As currently implemented, the remedy fails to adequately deal with problems associated with capping at the site. a. Questions as to the protectiveness of the proposed caps. b. Questions regarding the long term maintenance of the caps. c. Questions regarding the design of the caps.	E3

3. Institutional Controls-- As currently implemented, the remedy fails to adequately deal with problems associated with institutional controls. a. Problematic as to implementation. b. Problematic as to maintenance. c. Legally problematic	E4

4. Issues related to failure to adhere to and implement the requirements for the Record of Decision for the Montana Pole Plant	E5

5. Failure to meet cleanup targets articulated in the Record of Decision for Montana Pole Plant.	E6

6. Failure to adhere to cleanup standards for the Montana Pole Plant	E7

6. Excessively lax and permissive water quality cleanup standards for Montana Pole Plant.	E8

8. Failure to deal in an adequate manner with storm water runoff through the Montana Pole Plant.	E9

9. Failure to provide an independent review of the efficacy of the implementation of the Montana Pole Plant remedy.	E10

10. Failure to meaningfully involve the general public in the Five Year Review of the Montana Pole Plant.	E11

11. Mischaracterization of the purpose and scope of a Five Year Review.	E12

12. Failure of the remedy as currently being implemented to provide a permanent, comprehensive cleanup that reduces the toxicity and mobility of contaminants.	E13

This is a summary of my concerns. As I said, a detailed explanation along with data is provided in the text of my public comments that were submitted to MDEQ and EPA. These concerns need to be fully addressed in the Five Year Review of the site.	E14

EMAIL F

From: John Ray [mailto:bodinman2003@yahoo.com]
Sent: Tuesday, January 26, 2016 8:42 AM
Subject: Let us not forget the Montana Pole Plant

While attention has recently been focused on the removal of the Parrot Tailings, storm water runoff, the Berkeley Pit, etc., we must not forget the Montana Pole Plant, which I think is a ticking time bomb in Butte. This issue of the Montana Pole Plant cleanup is current because the plan seems to be to relocate the county shops at the Pole Plant under the assumption that it is cleaned up. Nothing could be further from the truth. Silver Bow Creek will never be completely restored unless we deal with and destroy the Montana Pole Plant's deadly dioxin.	F1

Deadly dioxin remains on site as a perpetual threat to Butte and Silver Bow Creek. The inability of EPA and Butte Silver Bow to control storm water runoff means that this runoff perpetually runs through and over the dioxin at the Pole Plant causing dioxin, one of the most potent carcinogens known to human beings, to be discharged into Silver Bow Creek. The dioxin should be removed and destroyed not left to fester in perpetuity.	F2

Consider: 1. The Record of Decision for the Montana Pole Plant clearly calls for active treatment of the waste as the primary cleanup method. The ROD does not support keeping waste in place as the primary or major approach to cleanup. Somewhere along the way, the emphasis on active treatment was changed to an emphasis on containment under caps. That was pretty clear at the Tuesday night (October 29, 2013) Pole Plant meeting. Pages 6, 7, and 35 of the Pole Plant ROD clearly stipulate that active treatment will be the cleanup method. In the Record of Decision—Montana Pole Plant we find this quotation that exemplifies the position in the Record of Decision: All accessible contaminated soils and LNAPL will be excavated to the extent practicable and treated, preventing this material from continuing to contaminate groundwater. The selected remedy will also satisfy the preference for treatment as a principal element of the remedy. Page 35	F3

2. Active biological treatment does work on wastes such as we find at the Pole Plant and in our climate. For example, an article entitled: "Treatment of Dioxin Contaminate Soils," Standberg, et. al, published in November 2011 by the Swedish Environmental Research Institute provides compelling evidence of the efficacy of active biological treatment on wastes similar to those found at the Pole Plant and in a climate similar to Butte's climate. See also: Biodegradation of Dioxins and Furans by Rolf Wittich, July 15, 1998): Bioremediation of organic pollutants and heavy metals by use of microorganisms represents a safe, inexpensive, and environmentally-friendly concept in modern environmental engineering. During the last three decades intense efforts have been made by microbiologists	F4

and environmental engineers in the isolation and characterization of microorganisms capable of degradation, transformation and detoxification of recalcitrant chemical compounds of environmental concern: (polyhalogenated) dibenzo-p-dioxins, dibenzofurans, and diphenyl ethers. Special emphasis is placed on the potential of molecular biology techniques to improve presently available biocatalysts. (Biodgredation of Dioxins and Furans by Rolf Wittich, July 15, 1998)	

3. Dioxin is mobile in soils such as those at the Montana Pole Plant. The ROD itself says that it is possible for dioxin in soils to migrate. (Page 14) There are present in the Montana Pole Plant soils co-contaminants that can mobilize dioxin.	F5

In addition, the caps that are used will not prevent surface water and other contaminants from leaching down and mobilizing dioxin. Given the problems of caps with bio-irrigation, advection, desiccation, erosion, weathering, bio-intrusion and stabilization, the dioxin in the soil will be mobilized. Only in a pure lab setting does dioxin remain non-mobile. Certainly the Montana Pole Plant is not a pure lab setting. (See: Dioxin reservoirs in southern Viet Nam--A legacy of Agent Orange by Divernychuk, et al in Chemoshpere 47 (2002) 117-137. Similar findings are reported in the following: 1. Soil-Plant Transfer of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans to Vegetables of the Cucumber Family (Cucurbitaceae) Anke. Huelster , Jochen F. Mueller , Horst. Marschner Environ. Sci. Technol., 1994, 28 (6), pp 1110–1115DOI: 10.1021/es00055a021Publication Date: June 1994 (Article: Indicates that dioxin is mobilized in soils as the result of plant activity. Given that there will only be a 12 inch cap over dioxin contaminated soils and the cap will have vegetative cover, the vegetative cover will absorb dioxin and bring it to the surface.) 2. Sorption of 2,3,7,8-tetrachlorodibenzo-p-dioxin to soils from water/methanol mixtures Richard W. Walters , Annette. Guiseppi-Elie Environ. Sci. Technol., 1988, 22 (7), pp 819–825DOI: 10.1021/es00172a012 Publication Date: July 1988 3. Study by U.S. Dept. of Agriculture indicated that dioxin is only immobile in soils devoid of other organic material. If any organic co-solvents, as are present at the Pole Plant, are in the soil, mobility will occur. 4. SUBSTANTIAL MIGRATION OF DIOXINS IN AGROCHEMICAL FORMULATIONS, Grant, Sharon, Mortimer, Munro, Stevenson, Gavin, Malcolm, Don and Gaus, Caroline, The University of Queensland (National Research Centre for Environmental Toxicology (EnTox)), 39 However, the presence of co-contaminants can act as transport facilitators for otherwise low mobility organic compounds (LMOCs) These results highlight that the paradigm of LMOCs being non mobile in soils should be considered carefully together with application specific and environmental factors which may have the ability to considerably change the predicted environmental fate of these chemicals. (This article supports the above mentioned study by the U.S. Department of Agriculture that if, as we find at the Pole Plant, co-contaminates are present, dioxin does become mobile in soil.	F6

The point is that since the remedy for the Pole Plant was changed from one of active treatment to containment, co-contaminants that will make dioxin mobile in soil will be present. 5. Assessment of Dioxin Contamination at Sawmill Sites: A Report to the Ministry for the Environment by Tonkin & Taylor Ltd and SPHERE, Prepared for the New Zealand Ministry for the Environment October 2008 (conclusions are similar to the one's I included in my earlier email to you today, i.e. that dioxin is mobile in both soil and water.	

Also, data presented by the MDEQ at the Tuesday, October 29 meeting indicated that dioxin is present in the recovery trenches at the Pole Plant. If dioxin isn't mobile in soil at the Pole Plant, how did the dioxin get in the recovery trenches? Another point that Ian made: MDEQ is in charge of the cleanup in Missoula of the White Pine Sash site. This site was a wood treatment facility similar to Montana Pole. The MDEQ acknowledges at this site that dioxin can be mobile in soils. Why not acknowledge the same at Montana Pole? Finally, the dioxin levels that we are now seeing in groundwater at the Montana Pole Plant were not supposed to have been reached until 200,000 years from now according to MDEQ. Why, if dioxin is not mobile, are we seeing dioxin now that we should not have seen for 200,000 years?	F7

Summary of my position: 1. The bottom line is that the dioxins, Pcps, Pahs and furans found at the site are highly toxic and carcinogenic. Dioxin poses a serious threat to both human health and the environment. There are no safe levels of exposure to dioxin. (EPA) In fact, dioxin has been referred to as the “most toxic chemical known.” (Hazardous Waste in America, Epstein, Brown and Pope) Lethal effects of dioxin can be seen at very low levels—a millionth of a gram can kill lab animals. Dioxin was the toxic found in Agent Orange and at New York’s Love Canal. Dioxin causes serious cancerous and non-cancerous human health effects. (World Health Organization) Dioxin can produce multiple types of cancer. Non-cancerous health effects include type 2 diabetes, impaired immune system, ischemic heart disease, endometriosis, decreased fertility, inability to carry pregnancies to term, birth defects and learning disabilities. According to the National Institute of Environmental Health Sciences, the “dangers of dioxin last for decades after initial exposure.” Just dealing with contaminant level statistics can mask the danger posed by these contaminants.	F8

2. These toxics will largely remain on site to pose a perpetual threat to human health and the environment. The site will never be cleaned up.	F9

3. Even the data presented at the October 29th meeting shows that these toxics have been released. Perhaps these toxics have not been released in large quantities, perhaps they are not released all the time, but given the toxicity of the materials even relatively small releases are problematic. And given that the site will not be cleaned up, these releases will continue in perpetuity.	F10

4. Based on the discussion of the DEQ 7 standards, it is obvious that the cleanup levels in the original Record of Decision for the Pole Plant are not protective. The problem is that the current cleanup is not meeting, in a significant number of cases, the DEQ 7 standards. Yet, the presentation on October 29th continually referred to meeting the outdated, non-protective EPA standards in the Record of Decision. Probably, the old Record of Decision will never be reopened.	F11

5. The comparisons of the Pole Plant site to other sites presented at the October 29th meeting don't prove anything. Because, for example, the Pole Plant is comparable to other similar sites does not mean that the Butte cleanup is working to protect human health and the environment. We saw a gross misuse of comparisons.	F12

6. The extensive use of caps for the Pole Plant is very problematic. Butte's history with capping toxic waste has not been good. Caps have been very problematic. The dioxins and other contaminants at the Pole Plant will all be just left in place, covered with only 12 inches of topsoil caps. Previous capping on the Butte Hill, which uses more soil than the level at the Pole Plant, has not worked well. We have a situation where the most toxic substances in Butte (dioxins, PCPs and furans) are to be covered with the least amount of soil. Caps, as we have seen in Butte, already are susceptible to failure by means of bio-irrigation, advection, dessication, erosion, weathering, bio-intrusion and stabilization problems. Caps also have significant construction, repair and maintenance problems.	F13

7. Because the responsible parties for the cleanup cashed out, we better get it right now. The money for the cleanup is limited. My view is that a quality cleanup at Montana Pole has been sacrificed because of this cash out.	F14

In short: The Record of Decision for Montana Pole promised that the dioxins, furans, PCPs and PAHs found at the site (all are serious health threats) would be biologically treated and the site cleaned up. Contrary to the promise of cleanup, the MDEQ and EPA have reneged on this promise. MDEQ and EPA have largely abandoned treatment in favor of containment, leaving the threat in place. Now, cleanup will consist of leaving all of these toxics on site and “managing them” through institutional controls. The EPA itself says that the toxicity of dioxin exists for an extended period of time. Containment is contrary to the Superfund mandate that treatment is to be preferred over leaving waste in place. The shoddy cleanup at the Pole Plant perpetuates a public health threat that should and could have been fixed.	F15

However, the current containment remedy is not working. Dioxin is still being released .The groundwater treatment system that was implemented at the Pole Plant site still allows for significant discharge of dioxin into Silver Bow Creek—100 times the current dioxin surface water standard. Such discharges will continue for decades to come. MDEQ’s own discharge	F16

study said that MDEQ's planned cleanup approach would still allow dioxin to be discharged into Silver Bow Creek. MDEQ has ignored this problem and continues to implement a non-protective cleanup. Why was a sub-par cleanup approach selected? The threat to human health is particularly acute for those living near the Pole Plant.	

So, while progress has been made, the rosy picture presented at the October 29th meeting does not give us a full picture of what is going on at the Pole Plant. In addition to the citations I provided in this document, I would also ask that you review Ian's submission of November 5, 2013 to the CTEC board giving his reactions to the conclusions presented at the October 29, 2013 meeting. (Ian Magruder is an engineering consultant to CTEC.) The following is the email from Ian of March 27, 2013 which I include as a reference point. From: Ian Magruder <ian_magruder@kirkenr.com> Sent: Wednesday, March 27, 2013 9:18 AM Subject: MT Pole CTEC members- I thought I would summarize for you the important points from the Montana Pole update at the meeting the other night. 1. The groundwater treatment system discharges dioxin into Silver Creek at 100 times the current very low surface water standard. This is expected to continue for decades under the current plan. It needs to be shown that this will not impact the health of aquatic life, fish, or people who eat them.	F17

2. The Five Year Review from 2011 included three action items that the agencies would summarize for the layperson and distribute to the public the review findings, air monitoring health risks, and that they sampled soil where the wind-break trees died. This was to be an important response to citizens comments and still needs to happen.	F18

In summary: Eternal vigilance is the price of liberty. Thomas Jefferson Wouldn't it be nice if citizens could trust government to do the right thing. Unfortunately, that doesn't always happen. Anytime power is given to a government institution, that institution can escape popular accountability. Even when government is supposedly acting to promote and protect public health and safety, citizens need to be on their guard. The public interest is best promoted and protected by a vigilant public.	F19

The Montana Pole Plant Superfund site in Butte usually flies below the public radar, except for those living near the site. Because surface water, groundwater, soils and sediments at the Pole Plant are contaminated with dioxins, the Pole Plant is, perhaps, the most dangerous of the Superfund sites in Butte. The Pole Plant cleanup by the Montana Department of	F20

Environmental Quality (MDEQ) leaves much to be desired.	

Dioxin poses a serious threat to both human health and the environment. There are no safe levels of exposure to dioxin. (EPA) In fact, dioxin has been referred to as the "most toxic chemical known." (Hazardous Waste in America, Epstein, Brown and Pope) Lethal effects of dioxin can be seen at very low levels—a millionth of a gram can kill lab animals. Dioxin was the toxic found in Agent Orange and at New York's Love Canal. Dioxin causes serious cancerous and non-cancerous human health effects. (World Health Organization) Dioxin can produce multiple types of cancer. Non-cancerous health effects include type 2 diabetes, impaired immune system, ischemic heart disease, endometriosis, decreased fertility, inability to carry pregnancies to term, birth defects and learning disabilities. According to the National Institute of Environmental Health Sciences, the "dangers of dioxin last for decades after initial exposure."	F21

The Record of Decision for Montana Pole promised that the dioxins, furans, PCPs and PAHs found at the site (all are serious health threats) would be biologically treated and the site cleaned up. Contrary to the promise of cleanup, the MDEQ and EPA have reneged on this promise. MDEQ and EPA have largely abandoned treatment in favor of containment, leaving the threat in place. Now, cleanup will consist of leaving all of these toxics on site and "managing them" through institutional controls. The EPA itself says that the toxicity of dioxin exists for an extended period of time. Containment is contrary to the Superfund mandate that treatment is to be preferred over leaving waste in place. The shoddy cleanup at the Pole Plant perpetuates a public health threat that should and could have been fixed.	F22

However, the current containment remedy is not working. Dioxin is still being released .The groundwater treatment system that was implemented at the Pole Plant site still allows for significant discharge of dioxin into Silver Bow Creek—100 times the current dioxin surface water standard. Such discharges will continue for decades to come. MDEQ's own discharge study said that MDEQ's planned cleanup approach would still allow dioxin to be discharged into Silver Bow Creek. MDEQ has ignored this problem and continues to implement a non-protective cleanup. Why was a sub-par cleanup approach selected? The threat to human health is particularly acute for those living near the Pole Plant. Local residents have had to endure not only a failed cleanup but tremendous odor problems caused by the MDEQ's waste in place remedy.	F23

Citizens have a right to know if and why government is not doing what it said it would do to protect human health and the environment. Agency decisions are binding.	F24

The Pole Plant cleanup, again contrary to what was promised regarding community involvement, has failed to provide the public with timely information about the problems with the cleanup. The lack of any coordinated or effective program for citizen involvement means that citizens are prevented from holding government accountable and influencing government cleanup activities. The lack of transparency by the MDEQ and EPA means that citizens are left to "hope" that government does the right thing.	F25

The public deserves answers to the following questions: (1) Why is the Pole Plant still out of compliance with emission standards for dioxin? And (2) Why hasn't the Pole Plant been cleaned up? After all, the public's safety is the highest law. (Roman law)	F26

EMAIL G

From: John Ray [mailto:bodinman2003@yahoo.com]
Sent: Wednesday, January 27, 2016 6:04 AM
Subject: Montana Pole Plant--The "Forgotten" Superfund Site in Butte

Yesterday, I sent a relatively brief statement on the Montana Pole Plant "cleanup." I have attached a follow up document for your consideration that more fully documents and justifies my concerns. As I have indicated, I think that the Montana Pole Plant has, in a sense, "slipped through the cracks." The assumption is somewhat blithely made that all is well, the site is almost cleaned up, and is almost ready to be put to constructive uses such as the site for the county shops. Local government has certainly bought into this cheery picture. In some sense, I think that this attempt to rush to say the Montana Pole Plant is remediated is motivated by the desire to get Superfund behind us and remove the Superfund stigma from Butte. WE all want Butte cleaned up. But the reality must match the words and in the case of the Pole Plant, as in the case of the Parrot Tailings, storm water runoff, the Berkeley Pit, etc., this has not happened yet. This joyful and rosy picture is mistaken. The site has not been and will not be remediated or cleaned up as long as deadly dioxin remains on site. The site has not be "cleaned up" as long as storm water runoff regularly flows through the site and carries off this dioxin down to Silver Bow Creek. The "cleanup" of the Montana Pole Plant is another example of the sub-par Superfund cleanups with which Butte has been saddled. Citizens and local government need to take a stand and demand a real "cleanup" of the Montana Pole Plant. MDEQ needs to re-evaluate its approach to the Montana Pole Plant. EPA needs to step in and mandate the removal and destruction of the dioxin on the site.	G1

Attachment: Dioxin Caps—Concerns/Questions about the Area of Restricted Use at Montana Pole Plant Dioxin contaminated soils will be left on-site at Montana Pole. Given that there are no safe levels of dioxin exposure, given that dioxins attack numerous human organs, given that dioxins persist over time because of their chemical stability and tendency to accumulate in the body's fatty tissue (The WHO estimates that the half-life in the body of dioxin is estimated to be 7 to 11 years.), given the fact that people are already exposed to dioxin and their toxic burden should not be increased and given the highly toxic nature of the dioxins (that cause problems of the reproductive and developmental systems, damage to the immune system and are a potent carcinogen) that will remain in the area of restricted use at the Montana Pole Plant, my concern is that the capping that will be done will be adequate to protect public health and the environment. To that end, I have the following questions/concerns: 1. What design, construction and operation requirements will have to be met for the caps? 2. Will protection such as that provided by an active sorbent such as coke or activated carbon be provided? (With clay and AC treatments, bioaccumulation and leakage of dioxins was 67-91% lower than at the uncapped reference fields. For example, without activated carbon, cap	G2

efficiencies drop by 46%. The use of AC decreased both the bioavailability of dioxins present below the cap and the bioaccumulation and leakage of dioxins entering the cap after placement. “Field Experiment on Thin-Layer Capping in Ormefjorden and Eidangerfjorden, Telemark: Functional Response and Bioavailability of Dioxins, 2009-2011,” Schanning, M.T. and I Allan. Norwegian Institute for Water Research, REPORT SNOP 6285-2012, 92 pp, 2012)
3. Could zeolite be used as the cap?
4. Will the soil be treated with cationic surfactants prior to capping?
5. How will the proposed capping of the restricted area at Montana Pole Plant be congruent with the provisions of 40 CFR 300.430?
6. How will the proposed capping of the restricted area at Montana Pole Plant be congruent with the provisions of 55 FR 8703, March 9, 1990?
7. How will the proposed capping of the restricted area at Montana Pole Plant be congruent with the provisions of 63 FR at 28621m May 26, 1998?
8. How will RCRA LDRs apply to the proposed capping of the restricted area?
9. How will the proposed capping of the restricted area at Montana Pole Plant be congruent with the provisions of 40 CFR Part 268?
10. How will the proposed capping of the restricted area at Montana Pole Plant be congruent with the provisions of 40 CFR 264?
11. What treatment will be provided after the sites is capped?
12. What institutional controls will be mandated?
13. How will stormwater runoff over the restricted area be controlled?
14. What specific in-situ treatment modalities will be used?
15. To what extent will caps used be impermeable?
16. What will be done regarding the power and sewage lines that run under the plant?

Using capping as the Primary Method of Protection for Dioxin Contaminated Soils at the Pole Plant is very Problematic
Caps are not Permanently Protective of Human Health and the Environment.
1. Dioxin can be remobilized through bio-irrigation. (Dueri, Sibylle, et. al., University of Laval, Quebec, “Modeling the Transport of Heavy Metals through a Capping-Layer: The case Study of the Flood Sediments Deposited in the Saguenay Fjord, Quebec.”)
2. The long term efficacy of caps can be compromised by advection “related to consolidation, diffusion, chemical reactions, and the effect of . . . burrowing activity.” (Ibid.)
3. Desiccation can cause cracking of the cap cover. (David Daniel, Professor of Civil Engineering, University of Texas, Geotechnical Practice for Waste Disposal)
4. The freeze-thaw cycle can produce changes in the structure and fabric of the cover and a way that increases hydraulic conductivity. (Ibid.)
5. Caps are difficult to construct correctly. (Ibid.)
6. Caps are difficult to maintain and repair. (Ibid.)
7. Erosion is a serious problem. (Jack Caldwell, U.S. Department of Energy, Principles and Practice of Waste Encapsulation.)
8. Biointrusion can compromise the effectiveness of the cap. (Ibid.)
9. Differential settlement of the cap can cause cracking. (Oweis and Khera, New Jersey Institute of Technology, Geotechnology of Waste Management.)
10. Caps require regular and often expensive repair. (Ibid.)
11. Stabilization of the cap is a problem. (Ibid.)
12. Caps present long-term subsidence and settlement issues. (Ibid.)
13. Because of their susceptibility to “weathering, cracking and subsidence” caps have limited

long term utility. “Wind, rain, and generalized erosion over time can severely damage even a well-designed . . . cover.” (U.S. Department of Energy, Office of Environmental Management, “Remediation Technology Descriptions: Containment.”) See also: Merritt, Frederick (ed.) Standard Handbook for Civil Engineers, McGraw-Hill, New York.
The extensive use of caps as a cleanup method for dioxin contaminated soils at the Montana Pole Plant would do nothing to reduce the toxicity and volume and mobility of dioxin. Caps do nothing to clean up a site. The extensive use of caps as a cleanup method for dioxin contaminated soils at Montana Pole Plant would not provide a permanent remedy. Research clearly indicates that caps may actually make dioxin more bioavailable. The extensive use of caps as a cleanup method for dioxin contaminated soils at Montana Pole would violate the Superfund mandate for treatment over containment. In short, the extensive use of caps for the dioxin contaminated soil would not be protective of human health and the environment.
Problematic Nature of Phytostabilization.
(The dioxin contaminated soil caps will use plants for stabilization and to maintain the integrity of the caps. Plant cover will be a major part of the remediation picture advocated for dioxin contaminated soils. The quality of the vegetation on the caps will directly determine the protective efficacy of the caps. So far vegetative cover for caps in Butte has not done well.)

These following comments are meant to show the very problematic nature of phytostabilization, as advocated for the remediation of dioxin contaminated soils at Montana Pole Plant.
1. At a site in Dearing, Kansas that contained contaminants similar to those found at the Montana Pole Plant, only 50% of the plants survived after three years. Of course, those that died recontaminated. A site in Whitewood Creek, South Dakota had only a five percent survival rate with contaminants similar to those founding at the Montana Pole Plant area. (Schnoor, J. l. “Phytoremediation,” Technology Overview Report, Ground Water Remediation Technologies Analysis Center, Series E, Vol, 1), October 1997.) Existing caps on the Butte Hill have had similar problems with dying vegetation, most lasting only a season.
2. There is great concern over the permanence of phytostabilized dioxin. (“Clean Tailing Reclamation: Tailing Reprocessing for Sulfide Removal and Vegetation Establishment,” S.R. Jennings and J. Krueger.)
3. Phytosabilization techniques do not adequately take into account plant geochemistry. Failure to do so may actually produce a situation where plants increase the leaching of dioxin. Schwab, A.P., et. al. Kansas State University, “Fate and Transport of Heavy Metals and Radionuclides in Soil: The Impacts of Vegetation.” The Great Plains/Rocky Mountain Hazardous substance Research Center.)
4. The long-term effectiveness of phytostabilization has not been established in the field. Some field studies show “that some plant species with good greenhouse development, but lower enzymatic activities recorded in their rhizosphere area, were not stable in time and perished after 1 year in the field.” (Petrisor, Ioana, et. al, University of Southern California, “Global Enzymatic Activities—Potential Tools in Assessment of Phytostabilization Strategies.” See also: Brown, Kathryn, “The Green Clean,” BioScience, Volume 45, No. 9, October 1995)
5. Droughts or floods can destroy plants. (See: Brown, Ibid.)
6. Regulatory Issues: “As of now phytoremediation is too new to be approved by regulatory agencies. Can it clean up the site below action levels? On what scale? Does it create any toxic intermediate or products? Is it cost effect as alternative methods? Does the public accept the technology?” (Zynda, Todd, Michigan State University, “Phytoremediation,” Hazardous

Substances Research Center. Michigan State University) The use of phytostabilization should be minimal compared to removal of contaminated waste to a safe repository. The Montana Pole Plant Cleanup Relies too Heavily on Institutional Controls that are an Inherently Flawed Approach to Superfund Cleanups.	

Superfund's goal is to clean up hazardous waste sites that pose a threat to human health and the environment. Superfund cleanups should provide a permanent remedy that, in part, reduces the toxicity, mobility, and volume of contaminants. Because Superfund has a strong preference for treatment, the use of institutional controls should normally not be a substitute for "more active measures (e.g. treatment and/or containment of source materials) as the sole remedy. . . ." (40 CFR 300.430(a)(1)(iii)(D). OSWER Directive 9355.0-69, EPA 540-R-97-013 makes essentially this same point that the use of institutional controls should be a remedy of last resort. To the extent that contamination at a site is really cleaned up, the necessity for institutional controls is minimized. To the extent that institutional controls are used at a site to put waste off-limits, the extent of contamination cleanup is minimized. It is important to remember that the impetus for Superfund in the first place was a failure of institutional controls to prevent the contamination problems and resultant health effects at Love Canal where the institutional controls were not followed. Risk is a function of both toxicity of the materials on site and the degree of exposure to the hazardous waste. (Effects of Future Land Use Assumptions on Environmental Restoration Decision Making, DOE, Office of Environmental Policy and Assistance, RCRA/CERCLA Information Brief, DOE/EH-413/9810, July 1998, p.1) Institutional controls depend on limiting exposure to toxic materials and do nothing to lessen the toxicity of these materials. After institutional controls are implemented, the toxic materials that originally triggered the Superfund cleanup are still on site to threaten human health and the environment. MDEQ's solution to the problem of dioxin contaminated soils at Montana Pole Plant should be concerned about treating dioxin and, if treatment of the waste is technically impossible, removing the hazardous waste to a repository where the waste will no longer threaten human health and the environment. "Our obligation is to free subsequent generations of the responsibility for care taking our hazardous residues, not to saddle them with housekeeping chores which, if neglected, will result in the re-pollution of the environment that we worked so hard to clean." (Jack A. Caldwell and Charles C. Reith, Principles and Practice of Waste Encapsulation. Boca Raton: Lewis Publishing Co., 1993, p. 35.) Dioxin that is institutionally controlled is still a permanent threat to human health and the environment. The cleaner a site is after remediation, the greater the potential land uses for that site. The more contamination left after remediation, the less the potential land uses are for the site. "Citizens have pushed for the highest cleanup standards, arguing that an unrestricted use would allow a wider range of future development at the site." (Wernstedt, et. al., Basing Superfund Cleanups on Future Land Uses: Promising Remedy or Dubious Nostrum?, Resources for the Future, Discussion Paper 98-03, October 1997, p. 17) The institutional controls being supported for Montana Pole Plant by MDEQ would seriously limit productive land uses. The extensive reliance on institutional controls is also contrary to the Superfund	G3

mandate of preference for treatment and cleanup over institutional controls that restrict land use in perpetuity. If the goal is to encourage productive land uses after Superfund cleanup, a clean site affords the most encouragement. If the goal is to protect human health and the environment, dioxin must be treated and/or removed.

The thesis of my comments regarding institutional controls is that the use of institutional controls for the Montana Pole Pant site should be minimal. Instead of extensive use of institutional controls to deal with the dioxin contaminants, dioxin at the Montana Pole Plant should, to the greatest technically feasible extent, be removed to a safe repository and treated there using appropriate innovative technologies.

Consider the following detailed argument about the inadequacy of institutional controls.
Institutional Controls are not Effective
A. The EPA itself has found significant problems with the effectiveness of institutional controls. For example, in an article entitled "EPA, Think Tank Studies Show Superfund Land-use Controls Flawed, December 10, 2001" which summarizes "Superfund Report via Inside EPA.com" by Resources for the Future, we find the following conclusions:
1. Institutional Controls are not reliably implemented. The EPA study found that over half of the institutional controls implemented under EPA issued records of decision are mischaracterized and that half of the institutional controls were not implemented according to EPA plans.
2. Institutional Controls are dramatically underfunded.
3. Monitoring of institutional controls is poor. Another study of California Superfund sites entitled: "Analysis of Institutional Controls at California Superfund Sites" by Erwin Tam of the University of California—Berkley found that 30% of the sites had no inspection schedule as required by law and in 63% of the cases it was felt that compromise of the institutionally controlled site was likely.
4. Enforcement of institutional controls is poor.
5. ROD's tend to have "vague or inconsistent references" to institutional controls.
In a study done by English, et. al. of the University of Tennessee entitled Institutional Controls at Superfund Sites, (July 1997. Hereinafter cited as Institutional Controls at Superfund Sites.), which was funded in part by EPA; the EPA's remedial project managers admit the above listed problems (1-5) with institutional controls. The report concludes: "Perhaps most importantly, the results of this study point to a fairly strong sense of unease on the part of some RPMs with the efficacy of institutional controls. This finding is consistent with discussions in the literature on the efficacy of institutional controls." (p.67) No wonder noted engineers Jack A Caldwell and Charles C. Reith stated in their book Principles and Practice of Waste Encapsulation, that "Planners of long-term disposal systems have long recognized the difficulty of maintaining institutional control over property. . . ." (p. 35)
B. "To the extent that responsibility for selecting and maintaining the long-term effectiveness of the remedy will become contingent on the intent and actions of a more diffuse set of institutions—local government, private property laws, current and future property owners, land recordation offices, the courts—the ultimate effectiveness of a remedy to protect human health and the environment will become increasingly difficult to assess." (Hersh, et. al., Linking Land Use and Superfund Cleanups: Uncharted Territory, Center for Risk Management, 1997, p.49. Hereinafter cited as: Linking Land Use.) If institutional controls become the prime remedy for the dioxin contaminated soil at the Montana Pole Plant, the community will have to live with these controls, effective or not, in perpetuity.

C. The success of institutional controls will depend on changing the way people behave which is very difficult.
Managing human behavior is an extraordinarily difficult task. None of the institutional controls in use, or under consideration for future use, is foolproof. None can reduce to zero the risk of human or environmental exposure to hazardous substances left in place at a site. Nor is there a universal, all-purpose institutional control appropriate for all sites. (Environmental Law Institute, Protecting Public Health at Superfund Sites: Can Institutional Controls Meet the Challenge, 1999, p. 13. Hereinafter cited as Protecting Public Health.)
The risk of human exposure is considerably less if the toxics are treated to make them non-toxic or if they are removed to a repository where the public cannot come in contact with them.
D. The relationship between land use and toxic exposure is not well understood and can have a great deal of variation.

Institutional Controls have Inherent Limitations

A. Institutional controls do nothing to reduce the toxicity or volume of contaminants.
Institutional controls, per se, are not that effective in reducing mobility of toxics off-site. To be protective of human health and the environment, institutional controls would have to last as long as the toxics last. "Substances such as lead, mercury, arsenic, and cadmium will not degrade at all and will remain potentially hazardous unless removed or treated. In order to effectively protect against exposure to such long-lived risks, institutional controls would need to last essentially for as long as humans are expected to live on the planet." (Protecting Public Health, p. 13.) No institutional control has this needed level of permanence. If institutional controls are used instead of removal and/or treatment, these controls will have to work in perpetuity. Remember, toxic heavy metals such as those found at the BPSOU do not lose their toxicity over time. Yet, institutional controls are predicated on the designated land use of a sight existing in perpetuity—a flawed assumption. Land use changes are the most frequent changes in a locality.

B. Institutional controls also increase the likelihood that people will unknowingly be exposed to hazardous materials. Leaving contamination on site will always pose a threat of exposure if the institutional control fails. Predicting the long-term efficacy of an institutional control system is very problematic.

C. As we saw with regard to lead exposure, very often, as time passes, it is determined that the contamination in place is more dangerous to human health and/or the environment than originally thought. In such a situation, the in-place institutional controls may not be sufficiently protective of human health and the environment. "Questions then arise about who should be responsible for additional controls or remediation, and about whether residual contaminants should be allowed only if their risks and methods of containment are well understood." (Institutional Controls at Superfund Sites, p. 36.) It is critical that we get the most protective remedy the first time around.

D. Since the implementation of institutional controls depends on people, human error or neglect is a constant problem. After a remedy is selected, the degree of interest in the implementation of the remedy does not match the degree of interest shown during the remedy selection process. "Residual hazardous substances are a classic example of a problem

that is not readily apparent, and the tasks associated with implementing institutional controls are unlikely to be the focus of widespread public attention in many cases. Thus, decision makers should plan for a relatively high probability that the person charged with the responsibility to implement an institutional control will fail to do so because that task is not a high priority for that person or because it is a task without a specific deadline and can therefore be postponed indefinitely." (Protecting Public Health, p. 103) The efficacy of an institutional control depends on human judgment and "the judgment of any individual may be questionable in a specific situation and a poor judgment about implementing institutional controls could cause people to be exposed to hazardous substances." (Protecting Public Health, p. 105)

The Meaning and Understanding of Institutional Controls is Problematic.

A. What are the institutions that will be charged with controlling the toxics? How will these institutions coordinate their activities? Who will devise these institutional controls? Who will have enforcement responsibility? How will these controls be enforced?
What is meant by controls? To what extent will the nature of these controls be the result of political processes rather than good protective environmental and scientific technology? Who will monitor the institutional controls? How often will the controls be monitored? How will they be monitored? All of these questions must be satisfactorily answered before the public can have any confidence in the protectiveness of the controls. Yet, in far too many cases where EPA has extensively utilized institutional controls, these questions have never been answered. Nor is there any consensus as to how they should be answered.

B. "When we admit societal values, power, political leverage, and notions of rights and duties into the picture, it becomes difficult to see 'controls' as anything but contested, and hence problematic. For institutional controls are not stagnant features of a remedy but are made and unmade in the course of experience by regulatory statutes, by the acuity of government oversight, by negotiations at planning board meetings, by the attitudes of bankers, developers, and others involved in real estate, by the limitations of scientific understanding of the health risks posed by toxic chemicals, by the vast and evolving corpus of real property law, by public trust in government or the lack thereof, and, in a broader sense by the constellation of rights and responsibilities that inform a societal ethic." (Linking Land Use, p. 52. See also: T. Beatley, Ethical Land Use: Principles of Policy and Planning (Baltimore, MD: Johns Hopkins Press, 1994 and R. Platt, Land Use and Society: Geography, Law and Public Policy (Washington, D.C.: Island Press, 1996)
Even if there were some agreement on the nature and role of institutional controls, that agreement would be fleeting.

Legal Issues Limit the Effectiveness of Institutional Controls

A. Another problem complicating the use of institutional controls are the courts. The courts can potentially play a significant role on land use decisions and land use decisions can be very litigious.

> "Although the courts try not to make substantive zoning decisions, judicial attacks on local land use regulations are well documented in case law and in the planning literature and constitute yet another source of uncertainty to the effective working of institutional controls at Superfund sites. In

view of the wide variation in the decisions of state and appellate courts concerning the limits of police power to regulate land use and the need for Constitutional protection for the individual, it is easy to envisage the possibility that an owner of a site that is encumbered with a use restriction may challenge and successfully invalidate an institutional control, such as a zoning restriction, on the grounds that the restriction will cause a severe burden and, as such, constitutes a taking of private property by the government." (Linking Land Use, p. 64)

B. The NCP does not clearly specify the legal authority for institutional controls. Because there are no detailed statutory specifications of institutional controls, institutional controls are often left to the end of the remedy selection process where public input is minimal. Leaving them to the end is problematic in that: "If you leave institutional controls to the last and you can't get them implemented, then you're stuck. You're at a dead end rather than the destination of the record of decision (ROD)." (Claudia Kerbawy, op.cit., p. 53)

C. On a practical level, it is unclear who should monitor and enforce the institutional controls. RODs usually have little specificity regarding the implementation and monitoring of institutional controls. Often the specification of the nature and types of institutional controls is very general. Questions abound regarding what kind of monitoring will be performed, who will perform the monitoring, how and what type of enforcement will occur, what will be the frequency of the monitoring, and who is responsible for maintaining the protectiveness of the institutional control arrangements. The technical remedy is determined first and then institutional controls are developed to protect the remedy. Yet, it is often difficult to get acceptance by property owners or PRPs after the ROD is issued

D. Given that issues related to institutional land use/property control are not based in federal law but are based in state property laws or the local police power, federal control of institutional controls on the local level is very limited. CERCLA provides EPA with oversight authority over institutional controls that are part of the ROD remedy but CERCLA provides no mechanisms to enforce that control. Every five years, EPA can amend a remedy when contaminants are left in place, but during that five-year period the supervision of institutional controls is with the local government. Much to compromise a remedy can happen in five years. Moreover, there are serious proposals in Congress to remove the five-year review process. Hence, federal supervision of institutional controls is very problematic and could disappear altogether.

E. It is very problematic whether an institutional control on a current owner of a particular property would bind subsequent owners of that property. "Can third parties (for example, community groups or the local government) enforce a restriction at a site if the property owner fails to comply with the control and the holder of the easement, for example, (EPA, a PRP, the state government, or a local government if signatory to the agreement) fails to act properly? (Linking Land Use, p. 57) In Environmental Regulation of Real Property, N. Robinson comments that institutional control covenants are very complicated and that "they often defeat the attempts of parties to write covenants which will be enforceable against successors." (pp. 6-16) For example, the form of future property ownership must be similar to the existing type of property ownership for an institutional control restriction to continue in force. Once a property is sold to a new owner, monitoring of what the new owner does on

the property is diffuse if it exists at all.

What happens in a commercial venture if the purchaser of the property goes bankrupt? Who is responsible for the institutional control restrictions on the property? Who will enforce these restrictions? State laws regulating the use property are Byzantine.

> "The common law tradition of different types of ownership could limit long-term effectiveness of (institutional controls') reliability if they fail to bind third parties to the agreements worked out in the consent decree, and the question of authority—who holds an easement and on what legal basis can the government or some other entity challenge noncompliance with the easement or deed restriction—is, again, open to interpretation. These issues suggest that proprietary controls, negotiated between PRP/site owners and government (federal, state, local) may be insufficient by themselves to effectively ensure the long-term safety of the public from residual contamination. Their reliability hinges on how carefully they are devised, the authority and willingness of the party holding the rights to use them, and the willingness of a property owner to comply." (Linking Land Use, p. 58)

F. Multiple owners or multiple use of a site also compromise the ability of government to police institutional controls.
G. The "touch and concern" doctrine can limit the efficacy of real covenants in the institutional control process. "Equitable servitudes" also are limited in their effectiveness by the "touch and concern" requirement.
H. Liability under institutional controls is problematic.
"When institutional controls are created, it is important to determine who will be liable in the event they fail. Even if the EPA has entered into a consent decree
at the time of the initial site remediation releasing PRPs from liability for residual contamination, questions remain about liability if the institutional controls are violated. For example: If the current property owners allow development that violates use restrictions, are they liable, are the original PRPs liable, or both?
If people are harmed by such a violation, would they be able to sue the current property owners, the original PRPs or both?" (Institutional Controls at Superfund Sites, p. 34)
I. Another difficulty is that land use controls are "vulnerable to changing legal interpretations about the nature of property rights." (Wernstedt, et. al., Basing Superfund Cleanups on Future Land Uses: Promising Remedy of Dubious Nostrum?, Resources for the Future, Discussion Paper 98-03, October 1997, p. 16) For example, if the courts expand the scope of takings decisions to increase the extent to which government regulations are viewed as a "taking" then the efficacy of institutional controls will be diminished.

Summary of the Problems with Institutional Controls

1. Institutional controls do not meet the Superfund mandate of really cleaning up a site. To clean up means to make free of contamination.
2. Institutional controls are not permanent remedies. Rather, institutional controls permanently leave pollutants in place.
3. Institutional controls do nothing to reduce the toxicity of the hazardous materials. Lead, arsenic, mercury, and cadmium don't naturally attenuate over time, but keep their toxicity

indefinitely. 4. Institutional controls are designed, implemented and monitored poorly. 5. Institutional controls have inherent enforcement problems. 6. Institutional controls have severe legal problems that work against effective reduction of the threats to human health and the environment posed by toxic materials. 7. Institutional controls are ineffective. 8. Institutional controls for a Superfund site are usually the result of a defective process that limits public participation and which leads to a haphazard development of institutional controls for a particular site. 9. Institutional controls are poorly understood and poorly defined. Institutional Controls Problems Summary The use of institutional controls at the Montana Pole Plant site should not be a substitute for real, permanent cleanup. Institutional controls do nothing to clean up a site. Because institutional controls rely on the flawed premise that the way to prevent human exposure to toxic substances is to remove humans from the toxic substance by attempting to change human behavior patterns rather than by removing the substance from the humans which would allow citizens to pursue their activities without being threatened by toxics, the extensive use of institutional controls is bound to fail. Institutional controls also have significant design, development, implementation, monitoring and enforcement problems. Institutional controls are not effective. Legal problems abound with institutional controls. Institutional controls are not a permanent solution to the toxics problem. To the maximum extent possible, the contaminants found Montana Pole Plant site should either be treated on site or, if on-site treatment is not possible, be removed from the area to a safe repository where they can be treated.	

EMAIL H

From: John Ray [mailto:bodinman2003@yahoo.com]
Sent: Thursday, January 28, 2016 5:35 AM
Subject: Additional Comment--Butte Area One Draft Restoration Plan Amendment: Parrot Tailings Waste Removal--LEGAL (case and statutory) PROBLEMS AND ENVIRONMENTAL JUSTICE ISSUES WARRANT REMOVAL UNDER REMEDIATION

I would like to submit the attached document as additional comment on Butte Area One Draft Restoration Plan Amendment: Parrot Tailings Waste Removal. I have looked at CERCLA law, both statutory and case law, and come to the following conclusions: 1. Removal of the tailings associated with the Parrot Tailings should be done under remediation not restoration. The case made in the Draft is a remediation case not a restoration case. 2. It is questionable whether or not using restoration dollars to remove the tailings associated with the Parrot Tailings is legally permissible. 3. Environmental justice demands removal all of the tailings associated with the Parrot Tailings, i.e. Diggings East, etc.. Leaving tailings in place along Silver Bow Creek means the Creek will never by fully restored. Leaving tailings in place will mean that low income citizens in the Butte Priority Soils area will continue to have to endure a disparate toxics burden in violation of EPA's environmental justice mandate as well as equal protection of the laws. I have copied folks other than the NRDP folks because this issue is at the heart of answering the question of whether or not we will fully restore Silver Bow Creek. What ought to be done is for EPA to step up, admit it made a mistake, reopen the ROD for Butte Priority Soils and provide for removal of the Parrot Tailings and associated tailings under remediation not restoration. EPA also ought to start vigorously enforcing storm water runoff controls in Butte as well as constructing the necessary infrastructure such as catch basins, etc. Until storm water runoff is controlled, Silver Bow Creek will never be really restored. The lack of real cleanup at the Montana Pole Plant needs to be investigated. How can we say that Silver Bow Creek is restored if we do not adequately address the issue of dioxin remaining on site as a perpetual threat at the Pole Plant? How can we say that Silver Bow Creek is restored when the issue of storm water runoff through the Pole Plant washing dioxin into Silver Bow Creek is not being addressed? In the rush to move the county shops, we are neglecting the fact that the Pole Plant is not really being cleaned up.	H1

Attachment: Comments—Butte Area One: Draft Restoration Plan Amendment—Parrot Tailings Waste Removal The removal of the Parrot Tailings should occur under the rubric of Superfund remediation NOT restoration. The Draft Amendment proposes removal using restoration dollars. This is a fundamental flaw in that this is not a restoration activity but a remediation activity and	H2

should be funded with remediation dollars not restoration dollars. The ROD for Priority Soils should be reopened and changed to provide for removal of the Parrot and associated tailings (Diggings East, etc.)

Remediation means preventing, stopping or reversing environmental harm. Restoration means returning something to its original state, a make whole remedy to the extent possible; or providing an equivalent resource. It is clear that the current EPA remedy for the Parrot and associated tailings is not working to protect us from environmental harm. Numerous independent, scientifically based studies by experts outside of the EPA convincingly prove that the remedy is not working to protect the environment. The environmental threat from the Parrott and associated tailings (Diggings East, etc.) remains. Only the EPA believes in the continued efficacy of its current cleanup approach for the Parrot and associated tailings.
As I said, the ROD for BPSOU should be reopened and removal of the Parrot and associated tailings should occur under remedy not restoration. Restoration should not be made to do the work that should be done under remediation. By paying with restoration dollars what should be accomplished by remediation dollars, will occasion significant opportunity costs. Money that could have been spent on needed restoration projects will have to be spent doing the job of remediation. Because the Butte Area One: Draft Restoration Plan Amendment calls for spending restoration dollars for doing what should be done under remediation, the approach is fatally flawed. The whole premise is wrong.

In reading Butte Area One Draft Restoration Plan Amendment: Parrot Tailings Waste Removal, December 31, 2015, it is clear to me that the justification for NRDP removing the Parrot Tailings is not a restoration justification but a remediation justification. The plan does not talk about restoring a damaged resource or coming up with an equivalent resource but clearly speaks of preventing further harm to Butte's aquatic resources and cleaning up Butte's aquatic resources. NRDP, in its own document, wants to remove the Parrot Tailings because leaving these tailings in place poses a threat to the environment—a clear remediation justification. According to the contentions of the NRDP's own document removal should be done under remediation. For example, Section 1, Introduction, clearly articulates a remediation purpose for the removal. It speaks of addressing "contamination associated with the Parrot Tailings." Most of the summary actions listed are clearly remediation not restoration activities. Section 3.3 of the Plan Amendment clearly states a remediation objective. Actually pages 1-24 of the Plan Amendment document articulate a remediation not a restoration activity. The goal of the Parrot Tailings removal as articulated under the Plan Amendment document is to remove a threat to the environment caused by mine wastes left behind from past mining activity in Butte. This is the exact same goal that Superfund remediation has articulated for numerous areas in Butte. This IS a remediation not a restoration activity.

Having restoration dollars pay for removal of the Parrot Tailings would also set a bad precedent. If restoration dollars can be used in this instance to remediate a threat to the environment, the difference between restoration and remediation would collapse and become meaningless.

The EPA makes a clear distinction between remediation and restoration: CERCLA directs two types of activities – cleanup and natural resource damage assessment and restoration – at sites contaminated by hazardous substances. EPA is the lead agency, in cooperation with

individual states and tribal governments, to investigate and clean up hazardous waste sites, as part of its response authority. EPA's goal is to prevent further contamination and cleanup sites to levels protective of human health and the environment [CERCLA §104; Executive Order 12580 §2(g) (January 23, 1987)]. Natural Resource Trustees have delegated authority to perform NRDAs and recover costs beyond cleanup to restore or replace natural resources to the conditions that would have existed without the hazardous substance release [CERCLA §107(f)(1); 40 CFR §300.615(c)(3), (4)].

I would make the further argument that it may well be legally impermissible, given the above distinction between restoration and remediation, to use restoration dollars to do the work of remediation. It is clear that the restoration work, i.e. removal of the Parrot Tailings, contemplated under NRDP is in reality remediation and should, therefore, be paid for under the rubric of remediation. To use restoration dollars to pay for remediation could well be a violation of CERCLA. I would ask that this legal issue be addressed.

Why is EPA so reticent to admit that it made a mistake and that the ROD for Priority Soils is flawed when it comes to the Parrot Tailings? Is EPA afraid of ARCO? Has bureaucratic lethargy set in? Has EPA been captured by ARCO? Admittedly, information when the ROD was issued for Priority Soils was incomplete. Much new information has been generated which information clearly shows that the data underlying the ROD remedy was flawed, incomplete and inadequate. The new data clearly warrants a reopening of the ROD and the removal of the Tailings under remediation.

EPA Montana is displaying the same obdurate and ossified approach to Butte that it is has shown in Colorado and Michigan. Why should Butte have to settle for an incomplete, inadequate, ineffective and insufficient cleanup? The EPA is happy to spend restoration dollars on removal. That gets them off the hook and they don't have to do the right thing by Butte. Why can't EPA boldly reopen the ROD and do what should be done—remove the Parrot and associated tailing under remediation not restoration.

Consider the Purpose of Superfund Remediation

> The object of our profession is to destroy hazardous waste, whenever possible, and to permanently dispose that which cannot be destroyed. Our obligation is to free subsequent generations of the responsibility for caretaking our hazardous residues, not to saddle them with housekeeping chores which, if neglected, will result in the re-pollution of the environment that we worked so hard to clean. (Jack A Caldwell and Charles C. Reith, Principles and Practice of Waste Encapsulation.)

Superfund's purpose is to clean up hazardous waste sites that pose a threat to human health and the environment. Remedies under Superfund should provide a permanent cleanup remedy not temporary containment. Simply, cleanup is the "act of cleaning up" and the term clean means "pure, free from dirt, contamination, impurities." According to the EPA, Superfund's mission is to "make sites safe, make sites clean, and bring new technology to bear on the problem."
If one carefully examines the major laws and regulations pertaining to Superfund, one finds

that they all emphasize the following: 1. Cleanup as the primary goal of any Superfund activity. 2. The reduction of toxicity, volume and mobility of hazardous substances, pollutants, and contaminants at a site. For example, the NCP mandates that the overriding goal of the Superfund remedy selection process is: "to select remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated waste." [40 CFR 300.430(a)(1)(i)] Treatment is the preferred approach to dealing with contaminants. 3. Permanent cleanup remedies. Section 121(b) of CERCLA mandates that: "Treatment which 'permanently and significantly reduces' the hazardous substances involved is to be 'preferred' over other remedies and EPA must select remedies that utilize 'permanent solutions'. . . ." (Quoted in Environmental Law Handbook, Arbuckle, et. al, 10th Edition, p. 88) During the Senate debate on SARA, Senator George Mitchell (D-Maine) argued that permanent treatment means that EPA cleanup plans must result in the permanent and major reduction in the toxicity, volume, and mobility of hazardous substances, pollutants, and contaminants at a site and that this reduction must be to the "lowest level achievable." Senator Mitchell stated: "In addition to the quantitative reduction implied, significant reduction in this context means the minimization of volume, toxicity and mobility of such substances to the lowest levels achievable with available technologies." (132 Congressional Record, S. 14914 (daily edition. October 3, 1986) It is clear that the legislative intent was permanent, real cleanups of Superfund sites. 4. Cost is not the major factor in selecting a cleanup remedy under Superfund. Cost is secondary to protecting human health and the environment. Under Superfund, human health and the environment must be protected from potential threats regardless of cost. During Senate debate on SARA, Senator John H. Chafee (R-RI) noted: "the extent to which a particular technology or solution is feasible or practicable is not a function of cost. A determination that a particular solution is not practicable because it is too expensive would be unlawful." (132 Congressional Record, S. 14925 (daily edition, October 3, 1986) The way in which cost is supposed to figure into Superfund decisions is that a determination is first made as to what is the level of protection for human health and the environment which the remedy should achieve and then selecting the most cost effective means of achieving that level of protection. Cost as a balancing criterion does not mean selecting the cheapest remedy. It is clear that the law mandates that the EPA designs a remedy which will be permanently protective of human health and the environment and then finds the most cost effective method of implementing that remedy. "The EPA is never justified in selecting a short-term, impermanent remedy (like landfilling or capping) simply because it is cheaper than a permanent alternative. The law could hardly be clearer." (Environmental Research Foundation, "More Lessons from Superfund.") 5. The use of institutional controls is not a substitute for cleanup of a site. "Institutional controls. . . generally shall not substitute for more active measures (e.g. treatment and/or containment of source material) as the sole remedy. . . . (40 CFR 300.430(a)(1)(iii)(D). See: OSWER Directive 9355.0-69, EPA 540-R-97-013-"Rules of Thumb for Superfund Remedy Selection."	

Superfund was designed not only to deal with actual harms to human health and the environment but also with threatened harms and potential threats. CERCLA specifically deals	H3

not only with release of hazardous substances but also with the “threat of” release “into the environment of a hazardous substance or pollutant or contaminant. CERCLA defines each of these terms quite broadly.” (*Environmental Law Handbook*, p. 76.) Also, Superfund places an emphasis on treatment rather than containment for hazardous waste. [EPA, “Rules of Thumb for Superfund Remedy Selection,” 40 CFR 300.430 (a)(1).

Considering the above would clearly lead to the conclusion that the proposed removal should be part of remediation not restoration. NRDP is not in the remediation business. NRDP is not in the business of doing what should be done under remediation. Also consider that the proposed lime treatment rubric does not work. Only removal works: Lime Treatment does not Work.

The use of lime abatement will be ineffective as a treatment technology for the Parrot and associated tailings.. A study conducted by Bethel Inc. showed that treatment of heavy metals with lime still allowed the release of 20% of the heavy metals into the environment. (Shimoda, Masao 1994. “Fixation Mechanisms of Toxic Heavy Metals with Cements. Proceedings of 15h U.S./Japan Experts Meeting,” U.S. Army Corps of Engineers.) Lime treatment also increases the volume of contaminated material 50 to 100%. (“In-Situ Remediation Technologies for Contaminated Sites,” Environment Canada, 11/19/02) The EPA itself in “Wastewater Technology Fact Sheet: Chemical Precipitation (Office of Water, EPA 832-F-00-018) lists numerous disadvantages of lime addition.

Please consider the following from the EPA which clearly shows what is covered as a proper expenditure of restoration dollars. It is clear, considering the justification for the proposed removal of the Parrott Tailings under restoration that a mistake has been made. This is not a restoration activity as defined below but a remediation activity. After reading this material it should be clearer that the proposed removal of the Parrott Tailings does not fall under the rubric of restoration.

CERCLA	**OPA**	
Definition of Damages	**§101(6) -** Defines "damages" as "injury or loss of natural resources," as set forth in Sections 107(a)(4)(C) and 111(b).	**§1001(5) -** Defines damages as those specified in Section 1002(b)(2), including "the cost of assessing these damages." **§1002(b)(2)** - Outlines six categories of damages for which a responsible party is liable under Section 1002(a). These are: natural resources; real or personal property; subsistence use; revenues; profits and earning capacity; and public services. Damages to natural resources are defined as "injury to, destruction of, loss of, or loss of use of, natural resources, including the reasonable costs of assessing the damage." These damages are recoverable by Federal, State, Indian Tribe, and foreign government Trustees.

		Damages to real or personal property are defined as "injury to, or economic losses resulting from destruction of, real or personal property." These damages are recoverable by the person who owns or leases that property. Damages to loss of subsistence use of natural resources "shall be recoverable by any claimant who so uses natural resources which have been injured, destroyed, or lost, without regard to the ownership or management of the resources." Damages for revenues are "equal to the net loss of taxes, royalties, rents, fees, or net profit shares due to the injury, destruction, or loss of real property, personal property, or natural resources. These damages are recoverable by the Federal government, a State, or a political subdivision of a State. Damages for profits and earning capacity are "equal to the loss of profits or impairment of earning capacity due to injury, destruction, or loss of real property, personal property, or natural resources." These damages are recoverable by any claimant. Damages for public services are the "net costs of providing increased or additional public services during or after removal activities." These damages are recoverable by a State or political subdivision of a State.	
Definition of Natural Resources	**§101(16) -** Defines "natural resources" as "land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States ... any State or local government, any foreign government, [or] any Indian [T]ribe."	**§1001(20)** - Defines natural resources as "land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States ... any State or local government or Indian [T]ribe, or any foreign government." Federal natural	

	Any member of an Indian Tribe can be a Trustee if the resources are subject to a trust restriction on alienation.	resources include the "resources of the exclusive economic zone."

Trustee Roles and Responsibilities	**CERCLA**	**OPA**
Requirement of Trustee Notification	**§104(b)(2)-Requirement of Trustee Notification-** Directs the President to notify the appropriate Federal and State Natural Resource Trustees of "potential damages to natural resources resulting from releases under investigation ... and ... to coordinate the assessments, investigations, and planning" with such Trustees.	**§1011- Consultation on Removal Actions**- Requires the President to consult with the affected Trustees, designated under Section 1006, on the appropriate removal action to be taken in connection with any discharge of oil.
Designation of Trustees	**§107(f)(1)** - Requires the President, or authorized representative of any State, to act on behalf of the public as Trustee to recover damages. **§107(f)(2)(A)** - Requires the President to designate in the National Contingency Plan (NCP) the Federal officials who shall act on behalf of the public as Trustees for natural resources. [This designation can be found at 40 CFR Part 300, Subpart G.] **§107(f)(2)(B)** - Requires the State Governor to designate State officials who may act on behalf of the public as Trustees for natural resources. The Governor shall notify the President of these designations.	**§1006(b)**- States that the President or the authorized representative of any State, Indian Tribe, or foreign government, shall act on behalf of the public, Indian Tribe, or foreign country as Trustee of natural resources "to present a claim for and to recover damages to the natural resources." Requires that the following parties designate Trustees: the President designate Federal Trustees to act on behalf of the public; the Governor of each State designate State and local officials to act on behalf of the public (and notify the President of such designation); the governing body of any Indian Tribe designate Tribal officials to act on behalf of the Tribe or its members (and notify the President of such designation); and the head of any foreign government designate the Trustee to act on behalf of that government as Trustee (and notify the President of such designation
Responsibilities of Trustees	**§107(f)(2)(A)**- Requires Federal Trustees to "assess damages for injury to, destruction of, or loss of natural resources ... under their trusteeship." Federal Trustees may assess damages	**§1006(c)(1)-(5)**- Sets up the functions of Federal, State, Indian Tribe, and foreign Trustees. All Trustees shall perform the

	for State natural resources "upon request of and reimbursement from a State and at the Federal officials' discretion." **§107(f)(2)(B)-** - Requires State Trustees to "assess damages for injury to, destruction of, or loss of natural resources ... under their trusteeship." **§111(i)Restoration of Natural Resources** - Prohibits Superfund monies to be used for "the restoration, rehabilitation, or replacement or acquisition of the equivalent of any natural resources until a plan for the use of such funds has been developed and adopted" by the affected Trustee, and "after adequate public notice and opportunity for hearing and consideration of all public comment." There is one exception to this requirement: in situations that require action to avoid an irreversible loss of natural resources or to prevent or reduce any continuing danger to natural resources, funds may used without the Section 111(i) plan. Affected Trustees are: (1) Federal agencies; (2) the Governor or Governors of any State having sustained damages to natural resources within its borders, belonging to, managed by or appertaining to such State, and (3) the governing body of any Indian Tribe having sustained damage to natural resources belonging to, managed by, controlled by, or appertaining to such Tribe, or belonging to a member of such Tribe if such resources are subject to a trust restriction on alienation. Superfund monies cannot be used to pay for natural resource	following duties: assess NRD; and develop and implement plans for "the restoration, rehabilitation, replacement, or acquisition of the equivalent, of the natural resources under their trusteeship." These plans shall be developed and implemented only after adequate public notice, an opportunity for a hearing, and consideration of all public comment. The Federal government may, "upon request of and reimbursement from a State or Indian [T]ribe ... assess damages for the natural resources under the State's or Tribe's trusteeship."	

	claims.	
Coordination Between Federal Government and Trustees for NRD	**§122(j)(1)**- Directs the President to "notify the Federal [N]atural [R]esource [T]rustees of the negotiations" and to "encourage the participation of such [T]rustee in the negotiations" when involved in negotiations concerning a release that may have resulted in damages to natural resources under the trusteeship of the United States.	**§1011**-Requires the President to consult with the affected Trustees, designated under Section 1006, on the appropriate removal action to be taken in connection with any discharge of oil.
Regulations Pertaining to NRDAs	**§301(c)**- Directs the President to promulgate regulations pertaining to NRD assessment. The regulations shall specify (1) "standard procedures for simplified assessments requiring minimal field observation" and (2) "alternative protocols for conducting assessments in individual cases." The regulations are to be reviewed and revised as appropriate every two years. The "simplified assessments" shall include methods of establishing measures of damages based on units of discharge or release or units of affected areas. The assessments for individual cases shall include methods of determining "the type and extent of short- and long-term injury, destruction, or loss." The regulations are to provide the "best available procedures to determine such damages, both direct and indirect injury, destruction, or loss and shall take into consideration factors including, but not limited to, replacement value, use value, and ability of the ecosystem or resource to recover."	**§1006(e)(1)**- Directs the President, acting through the Under Secretary of Commerce for Oceans and Atmosphere, to promulgate regulations for the assessment of NRD from discharge of oil no later than two years after the date of enactment of OPA.
Liability for NRD and Judicial Review	**CERCLA**	**OPA**
Liability for NRD	**§107(a)(4)(C)**- Defines the scope of natural resource liability as "damages	**§1002(a)**- Specifies that "each responsible party for a vessel or a

	for, injury to, destruction of, or loss of natural resources, including the reasonable costs of assessing such injury, destruction or loss resulting from" a release of hazardous substances or a threatened release that causes the incurrence of response costs. **§107(f)(1)**- States that, if NRD is proved under Section 107(a)(4)(C), liability shall be to the following parties: the United States Government, any State, or an Indian Tribe. For liability to extend to a State, the natural resources must be "within the State or belonging to, managed by, controlled by, or appertaining to such State." For liability to extend to an Indian Tribe, the natural resources must be "belonging to, managed by, controlled by, or appertaining to such [T]ribe, or belong to a member of such [T]ribe if such resources are subject to a trust restriction on alienation."	facility from which oil is discharged, or which poses a substantial threat of a discharge of oil.is liable for . . . damages specified in Section 1002(b)(2) that result from such an incident." The discharge or threat of discharge of oil must be into or upon navigable waters, adjoining shorelines, or the exclusive economic zone. **§1006(a)**- Specifies that responsible parties shall be liable to the United States Government, States, Indian Tribes, or foreign government bodies for damages to natural resources "belonging to, managed by, controlled by, or appertaining to" each entity.	
Limitation on Natural Resource Liability	**§107(f)(1)**- States the following conditions for not finding a party liable for NRD: (1) if the party has demonstrated that the NRD was specifically identified as an irreversible and irretrievable commitment of natural resources in an environmental impact statement or comparable analysis; (2) the decision to grant the permit or license authorizes the commitment of natural resources; and (3) the facility or project was operating within the terms of the permit or license. [In the case of Indian Tribes, the issuance of the permit or license must not be inconsistent with the fiduciary duty of the United States.]	**§1004**- Provides liability limits for responsible parties and any removal costs incurred by, or on behalf of, the responsible party. The limits do not apply if the incident was proximately caused by gross negligence or willful misconduct of, or the violation of any applicable Federal safety, construction, or operating regulation by, the responsible party. In addition, the limits do not apply if the responsible party fails or refuses to report the incident as required by law or to provide all reasonable cooperation and assistance requested by responsible officials in connection with removal activities.	

Use of Recovered Funds	**§107(f)(1)**- Stipulates that sums recovered by Federal and State Trustees for NRD shall be retained by the Trustee "only to restore, replace, or acquire the equivalent of" the subject natural resources. When the United States Government is the Trustee, the award can be used "without further appropriation."	**§1006(f)**- Specifies that sums recovered by Trustees "shall be retained ... in a revolving trust account, without further appropriation, for use only to reimburse or pay costs incurred" by the Trustee under Section 1006(c) with respect to the damaged natural resources. Any amounts in excess of those required for reimbursement and costs shall be deposited in this fund.	
Measurement of Damages	**§107(f)(1)**- States that measurement of NRD shall "not be limited by the sums which can be used to restore or replace" the subject natural resources.	**§1006(d)(1)-(2)**- Specifies that the measure of NRD is the following: (1) "the cost of restoring, rehabilitating, replacing, or acquiring the equivalent of, the damaged natural resources"; (2) "the diminution in value of those natural resources pending restoration"; and (3) "the reasonable cost of assessing those damages." These costs shall be determined using the plans discussed under Section 1006(c).	
Prohibition of Double Recovery	**§107(f)(1)**- Prohibits double recovery for NRD, including recovering the costs of assessment, restoration, rehabilitation, or acquisition for the same release and same natural resource.	**§1006(d)(3)**- Prohibits double recovery for NRD for the same incident and natural resource.	
Limitation on Retroactivity	**§107(f)(1)**- Prohibits NRD recovery, where the damages and the release of hazardous substances occurred wholly before the date of enactment of CERCLA (*i.e.*, December 11, 1980).	----------	
Rebuttable Presumption and Judicial Review	**§107(f)(2)(C)**- Requires that a determination or assessment of NRD made by a Trustee in accordance with regulations promulgated under CERCLA Section 301 shall have "the force and effect of a rebuttable presumption" in any administrative or judicial proceeding.	**§1006(e)(2)**- Requires that any determination and assessment of damages made in accordance with the regulations promulgated under Section 1006(e)(1) shall have "the force and effect of a rebuttable presumption" in any administrative or judicial proceeding.	
Period in Which NRD Action May be Brought	**§113(g)(1)**- States a number of conditions for bringing an NRD action: No action may be commenced for	**§1017(f)(1)**- An action for NRD shall be barred unless the action is brought within three years after: (1) "the date on which the loss and the connection	

	NRD unless the action is commenced within three years after the later of: the date of discovery of the loss; or the date on which regulations pertaining to NRD assessment are promulgated under Section 301(c). An action for recovery of NRD must be commenced within three years after completion of a remedial action (excluding operation and maintenance). This condition is applicable for NPL sites, Federal facilities, and any vessel or facility where a CERCLA remedial action is scheduled. Actions may also not be brought (1) prior to 60 days after the Federal or State Trustee provides to the President and the potentially responsible party a notice of intent to file suit or (2) before the selection of the remedial action if the President is diligently proceeding with the remedial investigation and feasibility study (RI/FS). This limitation does not apply to actions filed on or before October 17, 1986. Sections 113(g)(3)-(4) provide exceptions for the Section 113(g)(1) limitation period on actions involving contribution and subrogation. Section 113(g)(3) provides that no action for contribution of NRD may be commenced more than three years after: (1) the date of judgment for recovery of NRD; or (2) the date of an administrative or court order for a *de minimis* or cost recovery settlement. Section 113(g)(4) requires that, when a party is subrogated to a claim because that party has paid the claim, an action for recovery of those monies must be made within three years of the payment. [Section 126(d)	of the loss with the discharge in question are reasonably discoverable with the exercise of due care" or (2) in the case of NRD under Section 1002(b)(2)(A), the date of completion of the NRD assessment authorized in Section 1006(e). Section 1017(f)(3)-(4) provides exceptions for the Section 1017(f)(1) limitation period in actions involving contribution and subrogation. Section 1017(f)(3) provides that no action for contribution of NRD may be commenced more than three years after: (1) the date of judgment for recovery of NRD; or (2) the date of a judicially approved settlement for NRD. Section 1017(f)(4) requires that, when a party is subrogated to a claim because that party has paid the claim, an action for recovery of those monies must be made within three years of the payment.	

	describes the period in which an NRD action may be brought for Tribal claims.] **§126(d)**- Provides that for Tribal Trustees, the deadline for filing NRD claims is the later of: (1) expiration of the otherwise applicable period of limitations; or (2) two years after the United States, acting in its capacity as Trustee for the Tribe, gives written notice to the Tribe that it will not present a claim on behalf of the Tribe or fails to present a claim within the time limitations specified elsewhere in the statute.		
Covenant Not To Sue	**§122(j)(2)**- States that covenants not to sue for NRD under Federal trusteeship may be entered into "only if the Federal [N]atural [R]esource [T]rustee has agreed in writing to such covenant." The Federal Trustee may agree to a covenant not to sue if the potentially responsible party agrees to undertake appropriate actions to protect and restore the injured natural resources.	----------	
Court Review of Non-Discretionary Duty	----------	**§1006(g)**- States that any person may have a Federal court review of actions by any Federal official where there is "alleged to be a failure of that official to perform a duty under Section 1006 that is not discretionary with that official." The court may award costs of litigation to any prevailing party.	
Trust Fund Payment for NRD	**CERCLA**	**OPA**	
Use of Trust Fund for NRD	**§111(a)(3)**- Authorizes the Hazardous Substance Superfund (Superfund) to pay claims for NRD. [Superfund monies cannot be used to pay for natural resource claims.] **§111(b)**- Authorizes the Superfund to pay "any claim for injury to, or	**§1012(a)(2)**- The Oil Spill Liability Trust Fund (Oil Spill Fund) is available for the payment of costs incurred by certain Trustees in "assessing natural resource damages and for developing and implementing plans for the restoration, rehabilitation, replacement, or acquisition of the equivalent of damaged resources"	

	destruction or loss of, natural resources, including the cost of damage assessment." [Superfund monies cannot be used to pay for natural resource claims.] The President can assert a natural resource claim for 1) natural resources over which the United States has sovereign rights, or 2) natural resources within the territory of the fishery conservation zone of the United States to the extent they are managed by the United States. States may assert claims for natural resources "within the State or belonging to, managed by, controlled by, or appertaining to such State." Indian Tribes, or the United States acting on behalf of Indian Tribes, can file claims for natural resources "belonging to, managed by, controlled by, or appertaining to such [T]ribe, or belong to a member of such [T]ribe if such resources are subject to a trust restriction on alienation."	that are determined by the President to be consistent with the NCP. Only Federal, State, and Indian Tribe Trustees can receive payment of NRD costs from the Oil Spill Fund.	
Limitation on Use of Trust Fund for NRD	----------	**§1012(h)(2)**- No claim may be presented to the Oil Spill Fund for recovery of NRD unless: (1) "the claim is presented within 3 years after the date on which the injury and its connection with the discharge in question were reasonably discoverable with the exercise of due care" or (2) for NRD as defined by Section 1002(b)(2)(A), the date of completion of the natural resource damage assessment stipulated in Section 1006(e). **§1012(i)**- Prohibits the President from paying NRD from the Oil Spill Fund when an earlier claim for the same damages was paid by the Oil Spill Fund.	

		§1012(j)- Requires that Oil Spill Fund monies be paid for the restoration, rehabilitation, replacement, or acquisition of natural resources only in accordance with a Section 1006(c) plan. However, such a plan is not required in situations "requiring action to avoid irreversible loss of natural resources or to prevent or reduce any continuing danger to natural resources or similar need for emergency action."	

Environmental Justice demands removing all of the Tailings associated with the Parrot Tailings complex under remediation not restoration.

I would also maintain that there is an environmental justice issue here. The Butte Priority Soils area has a disparately high number of low-income citizens compared to the rest of Butte, the rest of the state of Montana and the nation as a whole. Clearly, the citizens of the Butte Priority Soils area would qualify as an environmental justice area. These citizens have had to endure a disparate, negative toxics burden. Leaving the Parrot and associated tailings in place would perpetuate this disparate, negative toxics burden. NRDP is conducted under the auspices of a federal Superfund program and so the EPA's mandate to promote environmental justice in all of its activities would apply. Even though the state of Montana does not have a specific environmental justice mandate, the equal protection of the laws would apply and would mandate, that since the residents of uptown Butte have had to endure a disparate toxics burden compared to the rest of Butte, Montana and United States and since the only sure way to remove this disparate, negative toxics burden is to remove the tailings, the tailings should be removed. I have already made the argument that they should be removed under remediation not restoration. Also, I have made the argument in a separate submittal that leaving waste in place perpetuates a threat in place and since this toxic threat is disparately born by the low income citizens who disproportionately live in uptown (BPSOU) Butte, ALL of the tailings associated with the Parrot Tailings, i.e. Diggings East, etc., should be removed.

EMAIL I

From: John Ray [mailto:bodinman2003@yahoo.com]
Sent: Monday, February 01, 2016 5:28 AM
Subject: Congratulations to Council of Commissioners for their Pro-Active Approach to Montana Pole Plant--Let's Get it Right before moving the County Shops

The Butte Council of Commissioners is to be commended for taking a pro-active role regarding relocation of the county shops to the Montana Pole Plant. Hard questions need to be asked and answered before the Montana Pole Plant can be deemed to be safe. I would ask the commissioners to be particularly critical of what MDEQ says. How likely is it that MDEQ will admit that we have a problematic Montana Pole remedy when they have been invested in this remedy for years? The Council needs independent corroboration.	I1

The comments by NRDP's Cunneen Padraig at a recent Council of Commissioners meeting, while sincere, were questionable. He stated that from NRDP's perspective the site was safe. I for one would like to know what was the basis for his conclusion. Is NRDP in a position to factually assert that the Montana Pole Plant is safe? Is NRDP involved in the remediation of the Pole Plant? I respect Mr. Padraig but I for one would like to know the basis of his conclusions. In fact, data should be demanded from MDEQ to prove their assertion that the site is safe. I suppose ideally MDEQ, EPA, CTEC, and other interested parties should be asked to address the Council of Commissioners in order to provide information about the Pole Plant site cleanup. I know that the Pole Plant site has all along been the preferred site to relocate the county shops. I just question how safe it would be to do so. I would urge the Council to err on the side of caution. Common sense would indicate that there are problems in terms of Mr. Padraig's assurances that the site is safe.	I2

In short: 1. Dioxin and other major contaminants are present at the Montana Pole Plant. EPA and the Montana Department of Environmental Quality have said so.	I3

2. The Montana Pole Plant was listed as a Superfund site because it was determined by EPA that these toxics posed a serious risk to human health and the environment.	I4

3. Dioxin will remain on site at the Pole Plant, covered by a thin topsoil cover, after the cleanup is completed. Just read the statements to that effect from MDEQ. 4. These thin caps have proven to fail regularly in the rest of Butte.	I5

5. Storm water runoff regularly flows through the Pole Plant and can wash toxics into Silver	I6

Bow Creek.	

6. Given the thin cover and the fact that dioxin is left on site, how can MDEQ certify that that site is safe for further future use?	I7

7. Before the site can be deemed remediated and before Silver Bow Creek can be restored, dioxin and other associated toxics at the Montana Pole site must be REMOVED and destroyed.	I8

Consider the following, undisputed, facts: The Pole Plant was listed as a Superfund site because it was contaminated with pentachlorophenol and dioxin. If the Penta and dioxins at the Plant were not a threat to human health and environment, why list the site in the first place? When listing the site, MDEQ and EPA went to great lengths to substantiate the significant threat posed by the contaminants at the Pole Plant. These toxics remain at the Pole Plant. According to the Montana Department of Environmental Quality's web site on the Montana Pole Plant, we find: Contamination consists of wood-treating products including pentachlorophenol (PCP), related chlorinated phenols, polynuclear aromatic hydrocarbons (PAH), dioxins/furans, and petroleum compounds that spread into surrounding soils, groundwater, and the adjacent Silver Bow Creek. Another section of the web site states: There are three different types of contaminants in the oil wood-treating fluid that are being cleaned up at the MPTP Site: pentachlorophenol (PCP), dioxins and furans, and polycyclic aromatic hydrocarbons (PAH). So we know dioxins are present. Pentachlorophenol has a wide range of dioxins in it and is a significant source of dioxin contamination nationally.	I9

MDEQ further states: the volume of contaminated soil that remains on the LTU is estimated at 53,000 cubic yards, assuming the sand layer is approximately 6 inches thick. After PCP and PAH data indicate that the soil meets site-specific cleanup goals, the soils will be used as backfill at the site. Dioxins are also being actively treated, but are being degraded at a much slower rate. For this reason, the treated soils will be covered and controls will be put in place to ensure that these areas are not disturbed. Of course, putting the county shops on site will "disturb" the caps. Also, we are talking about a lot of contaminated soil that will be left on site.	I10

Also now as I said, according to the MDEQ website, dioxins remain on site. The proposed remedy is to cover these dioxin contaminated soils with some topsoil. It is also worthy to note the MDEQ admits that storm water runoff flows through the Pole Plant, over the proposed cap and into Silver Bow Creek. The storm water runoff can easily erode the caps. MDEQ has admitted storm water runoff through the Pole Plant is a problem. Yet, to my knowledge, little has been done to curb storm water runoff through the Pole Plant.	I11

Butte's own CTEC (Citizens Technical Environmental Committee) notes: The ground water and soils at the Montana Pole site are contaminated with PCPs, dioxins, furans (flammable liquids	I12

from wood oils), volatile organic compounds (VOCs) and metals. The sludge also is contaminated with PCPs, dioxins and furans. PCP has been detected in Silver Bow Creek. Accidentally swallowing or having direct contact with ground water, surface water, soil or sludge can be hazardous to human health.	

There are no safe levels of exposure to dioxin. An EPA report in 2012 concluded that, after reviewing mounds of evidence, there are potentially serious health effects at ultra-low levels of exposure to dioxin. Other scientific studies have linked dioxins to cancer, disrupted hormones, reproductive damage such as reduced sperm counts, neurological effects in children and adults, immune system changes and skin disorders. (EPA, Environmental Health News) Studies have shown serious health effects at parts per trillion exposure to dioxin. No wonder dioxin is considered to be one of the most toxic substances known to human beings. The EPA lists the following as health risks associated with dioxin. Dioxins are highly toxic and can cause cancer, reproductive and developmental problems, damage to the immune system, and can interfere with hormones.	I13

The proposed capping of the dioxin on site will not be protective. Caps have the following serious shortcomings which we have seen frequently demonstrated in Butte. Caps are not Permanently Protective of Human Health and the Environment. Problems with caps: 1. Toxics can be remobilized through bio-irrigation. (Dueri, Sibylle, et. al., University of Laval, Quebec, "Modeling the Transport of Heavy Metals through a Capping-Layer: The case Study of the Flood Sediments Deposited in the Saguenay Fjord, Quebec.") 2. The long term efficacy of caps can be compromised by advection "related to consolidation, diffusion, chemical reactions, and the effect of . . . burrowing activity." (Ibid.) 3. Desiccation can cause cracking of the cap cover. (David Daniel, Professor of Civil Engineering, University of Texas, Geotechnical Practice for Waste Disposal) 4. The freeze-thaw cycle can produce changes in the structure and fabric of the cover and a way that increases hydraulic conductivity. (Ibid.) 5. Caps are difficult to construct correctly. (Ibid.) 6. Caps are difficult to maintain and repair. (Ibid.) 7. Erosion is a serious problem. (Jack Caldwell, U.S. Department of Energy, Principles and Practice of Waste Encapsulation.) 8. Biointrusion can compromise the effectiveness of the cap. (Ibid.) 9. Differential settlement of the cap can cause cracking. (Oweis and Khera, New Jersey Institute of Technology, Geotechnology of Waste Management.) 10. Caps require regular and often expensive repair. (Ibid.) 11. Stabilization of the cap is a problem. (Ibid.) 12. Caps present long-term subsidence and settlement issues. (Ibid.) 13. Because of their susceptibility to "weathering, cracking and subsidence" caps have limited long term utility. "Wind, rain, and generalized erosion over time can severely damage even a well-designed . . . cover." (U.S. Department of Energy, Office of Environmental Management, "Remediation Technology Descriptions: Containment.") See also: Merritt, Frederick (ed.) Standard Handbook for Civil Engineers, McGraw-Hill, New York.	I14

The extensive use of caps as a cleanup method for the Montana Pole Plant would do nothing to reduce the toxicity and volume and mobility of contaminants. Caps do nothing to clean up a site. The extensive use of caps as a cleanup method for the Montana Pole Plant would not provide a permanent remedy. The extensive use of caps as a cleanup method for the Montana Pole Plant would violate the Superfund mandate for treatment over containment. In short, the extensive use of caps for the Montana Pole Plant would not be protective of human health and the environment.	I15

In an earlier email to you, I listed all of the problems with institutional controls at the site. "An ounce of protection is worth a pound of cure." We have seen the truth of this old adage in regard to the toxic waste problem in Butte and we certainly see it in regard to the Montana Pole Plant. Before constructing the county shops on site, or before allowing any human use of the site, we need to be absolutely certain, with verification from independent sources, (not just MDEQ) that the site is safe. So far that verification is lacking. Before Silver Bow Creek can be fully restored, the toxics on site at Montana Pole must be removed and destroyed. Again, I applaud the Council of Commissioners for their critical stance. The Council is protecting public health.	I16

EMAIL J

From: John Ray [mailto:bodinman2003@yahoo.com]
Sent: Thursday, March 03, 2016 9:57 AM
Subject: Brief Summary Comments and Observations--Five Year Review of Montana Pole Plant

Montana Pole Plant I have sent numerous emails this morning regarding the Five Year Review for Montana Pole Plant. Five Year Reviews are supposed to evaluate whether or not the remedy is working to protect human health and the environment. Unfortunately, EPA Montana, which has overall responsibility for the Pole Plant, and MDEQ don't seem to take Five Year Reviews seriously. They are perfunctory activities that the agencies grudgingly undertake simply to comply with Superfund law. EPA, for example, called the current Five Year Review of Butte area Superfund sites a "cursory" review.	J1

MDEQ is not having, at the moment, an open public participation dimension to the review with no established public comment period and an invitation to the public to simply get "information" about what is transpiring at the site. No public meetings are scheduled? There is no public comment period? No outreach to effected areas is being conducted? What happened to the EPA mandate for effective public involvement that shapes decisions?	J2

The Five Year Review is being conducted by the very people who are responsible for implementing the remedy--those responsible for the work evaluate their own work. There is no independent evaluation of the efficacy of the Pole Plant remedy. How can the public have any confidence in the results of this Five Year Review?	J3

There are serious problems regarding the Pole Plant that have never been addressed by MDEQ. There is abundant documentation to support the existence of these unresolved problems. Current treatment methods at the Montana Pole Plant, by MDEQ's own admission, have not been effective in lessening dioxin in the soils nor in groundwater. PCP/dioxin contamination north of Silver Bow Creek has been ignored, as has the expansion of the groundwater contaminant plume.	J4

EPA and MDEQ have dismissed this failure to meet their own treatment goals and intend to continue using the same old failed treatment method. For some unknown reason, the EPA has not applied its own dioxin standards for groundwater at the Montana Pole Plant site.	J5

The continuing presence of significant levels of dioxin, PCBs and furans is an immediate threat to the health of resident's near the Pole Plant and a continuing threat to groundwater and surface water.	J6

Dioxin is a very potent carcinogen with no really safe levels of exposure.	J7

EPA and MDEQ have failed to use more effective treatment approaches, such as fungi, that could be more efficacious in really cleaning up the site.	J8

The dioxins and other contaminants at the Pole Plant will all be just left in place, covered with only 12 inches of topsoil caps. Previous capping on the Butte Hill, which uses more soil than the level at Montana Pole, has not worked well. We have a situation where the most toxic substances in Butte (dioxins, PCPs and furans) are to be covered with the least amount of soil. Caps, as we have seen in Butte already, are susceptible to failure by means of: bio-irrigation, advection, desiccation, erosion, weathering, bio-intrusion and stabilization problems. Caps also have significant construction, repair and maintenance problems. Yet, caps are all the EPA offers Butte residents.	J9

MDEQ is not serious about addressing storm water runoff through the Pole Plant. All I hear is that we are looking into it and will do something. MDEQ and EPA have been looking into this for years and have yet to fix the problem of storm water runoff through the Pole Plant site. This is a significant problem in that the storm water runoff picks up the toxics and transports them to Silver Bow Creek. The Creek will never be restored until storm water runoff is addressed. Yet, little, other than talk, has been done.	J10

Institutional control problems have yet to be addressed. Yet, institutional controls will be a major part of the Pole Plant remedy.	J11

I have called the Montana Pole Plant site the forgotten sight in Butte compared to the Pit, the Parrot Tailings, contaminated soils, etc. However, in many respects the Pole Plant is the most dangerous site. We deserve an independent, comprehensive and serious Five Year Review of the efficacy of the current remedy at the Montana Pole Plant. Will we get one this time?	J12

EMAIL K

From: John Ray [mailto:bodinman2003@yahoo.com]
Sent: Thursday, March 03, 2016 12:19 PM
Subject: Fw: Additional Commentary--Montana Pole Plant--Problems with Capping Dioxin and other contaminants of concern and Institutional Controls on site.

I have attached additional comments that I would like to be considered as part of the Five Year Review of the Montana Pole Plant. It contains a more extensive critique of the problems associated with capping the toxics of concern on site as well as the use of institutional controls on site. It also contains legal issues, so I have copied EPA attorneys.	K1

Dioxin Caps—Concerns/Questions about the Area of Restricted Use at Montana Pole Plant Submitted by: Dr. John W. Ray Dioxin contaminated soils will be left on-site at Montana Pole. Given that there are no safe levels of dioxin exposure, given that dioxins attack numerous human organs, given that dioxins persist over time because of their chemical stability and tendency to accumulate in the body's fatty tissue (The WHO estimates that the half-life in the body of dioxin is estimated to be 7 to 11 years.), given the fact that people are already exposed to dioxin and their toxic burden should not be increased and given the highly toxic nature of the dioxins (that cause problems of the reproductive and developmental systems, damage to the immune system and are a potent carcinogen) that will remain in the area of restricted use at the Montana Pole Plant, my concern is that the capping that will be done will be adequate to protect public health and the environment. To that end, I have the following questions/concerns: 1. What design, construction and operation requirements will have to be met for the caps? 2. Will protection such as that provided by an active sorbent such as coke or activated carbon be provided? (With clay and AC treatments, bioaccumulation and leakage of dioxins was 67-91% lower than at the uncapped reference fields. For example, without activated carbon, cap efficiencies drop by 46%. The use of AC decreased both the bioavailability of dioxins present below the cap and the bioaccumulation and leakage of dioxins entering the cap after placement. "Field Experiment on Thin-Layer Capping in Ormefjorden and Eidangerfjorden, Telemark: Functional Response and Bioavailability of Dioxins, 2009-2011," Schanning, M.T. and I Allan. Norwegian Institute for Water Research, REPORT SNOP 6285-2012, 92 pp, 2012) 3. Could zeolite be used as the cap? 4. Will the soil be treated with cationic surfactants prior to capping? 5. How will the proposed capping of the restricted area at Montana Pole Plant be congruent with the provisions of 40 CFR 300.430? 6. How will the proposed capping of the restricted area at Montana Pole Plant be congruent with the provisions of 55 FR 8703, March 9, 1990? 7. How will the proposed capping of the restricted area at Montana Pole Plant be congruent with the provisions of 63 FR at 28621m May 26, 1998? 8. How will RCRA LDRs apply to the proposed capping of the restricted area? 9. How will the proposed capping of the restricted area at Montana Pole Plant be congruent with the provisions of 40 CFR Part 268? 10. How will the proposed capping of the restricted area at Montana Pole Plant be congruent	K2

with the provisions of 40 CFR 264?
11. What treatment will be provided after the sites is capped?
12. What institutional controls will be mandated?
13. How will stormwater runoff over the restricted area be controlled?
14. What specific in-situ treatment modalities will be used?
15. To what extent will caps used be impermeable?
16. What will be done regarding the power and sewage lines that run under the plant?

Using capping as the Primary Method of Protection for Dioxin Contaminated Soils at the Pole Plant is very Problematic

Caps are not Permanently Protective of Human Health and the Environment.
1. Dioxin can be remobilized through bio-irrigation. (Dueri, Sibylle, et. al., University of Laval, Quebec, "Modeling the Transport of Heavy Metals through a Capping-Layer: The case Study of the Flood Sediments Deposited in the Saguenay Fjord, Quebec.")
2. The long term efficacy of caps can be compromised by advection "related to consolidation, diffusion, chemical reactions, and the effect of . . . burrowing activity." (Ibid.)
3. Desiccation can cause cracking of the cap cover. (David Daniel, Professor of Civil Engineering, University of Texas, Geotechnical Practice for Waste Disposal)
4. The freeze-thaw cycle can produce changes in the structure and fabric of the cover and a way that increases hydraulic conductivity. (Ibid.)
5. Caps are difficult to construct correctly. (Ibid.)
6. Caps are difficult to maintain and repair. (Ibid.)
7. Erosion is a serious problem. (Jack Caldwell, U.S. Department of Energy, Principles and Practice of Waste Encapsulation.)
8. Biointrusion can compromise the effectiveness of the cap. (Ibid.)
9. Differential settlement of the cap can cause cracking. (Oweis and Khera, New Jersey Institute of Technology, Geotechnology of Waste Management.)
10. Caps require regular and often expensive repair. (Ibid.)
11. Stabilization of the cap is a problem. (Ibid.)
12. Caps present long-term subsidence and settlement issues. (Ibid.)
13. Because of their susceptibility to "weathering, cracking and subsidence" caps have limited long term utility. "Wind, rain, and generalized erosion over time can severely damage even a well-designed . . . cover." (U.S. Department of Energy, Office of Environmental Management, "Remediation Technology Descriptions: Containment.") See also: Merritt, Frederick (ed.) Standard Handbook for Civil Engineers, McGraw-Hill, New York.
The extensive use of caps as a cleanup method for dioxin contaminated soils at the Montana Pole Plant would do nothing to reduce the toxicity and volume and mobility of dioxin. Caps do nothing to clean up a site. The extensive use of caps as a cleanup method for dioxin contaminated soils at Montana Pole Plant would not provide a permanent remedy. Research clearly indicates that caps may actually make dioxin more bioavailable. The extensive use of caps as a cleanup method for dioxin contaminated soils at Montana Pole would violate the Superfund mandate for treatment over containment. In short, the extensive use of caps for the dioxin contaminated soil would not be protective of human health and the environment.
Problematic Nature of Phytostabilization.
(The dioxin contaminated soil caps will use plants for stabilization and to maintain the integrity of the caps. Plant cover will be a major part of the remediation picture advocated for dioxin contaminated soils. The quality of the vegetation on the caps will directly determine

the protective efficacy of the caps. So far vegetative cover for caps in Butte has not done well.) These following comments are meant to show the very problematic nature of phytostabilization, as advocated for the remediation of dioxin contaminated soils at Montana Pole Plant. 1. At a site in Dearing, Kansas that contained contaminants similar to those found at the Montana Pole Plant, only 50% of the plants survived after three years. Of course, those that died recontaminated. A site in Whitewood Creek, South Dakota had only a five percent survival rate with contaminants similar to those founding at the Montana Pole Plant area. (Schnoor, J. l. "Phytoremediation," Technology Overview Report, Ground Water Remediation Technologies Analysis Center, Series E, Vol, 1), October 1997.) Existing caps on the Butte Hill have had similar problems with dying vegetation, most lasting only a season. 2. There is great concern over the permanence of phytostabilized dioxin. ("Clean Tailing Reclamation: Tailing Reprocessing for Sulfide Removal and Vegetation Establishment," S.R. Jennings and J. Krueger.) 3. Phytosabilization techniques do not adequately take into account plant geochemistry. Failure to do so may actually produce a situation where plants increase the leaching of dioxin. Schwab, A.P., et. al. Kansas State University, "Fate and Transport of Heavy Metals and Radionuclides in Soil: The Impacts of Vegetation." The Great Plains/Rocky Mountain Hazardous substance Research Center.) 4. The long-term effectiveness of phytostabilization has not been established in the field. Some field studies show "that some plant species with good greenhouse development, but lower enzymatic activities recorded in their rhizosphere area, were not stable in time and perished after 1 year in the field." (Petrisor, Ioana, et. al, University of Southern California, "Global Enzymatic Activities—Potential Tools in Assessment of Phytostabilization Strategies." See also: Brown, Kathryn, "The Green Clean," BioScience, Volume 45, No. 9, October 1995) 5. Droughts or floods can destroy plants. (See: Brown, Ibid.) 6. Regulatory Issues: "As of now phytoremediation is too new to be approved by regulatory agencies. Can it clean up the site below action levels? On what scale? Does it create any toxic intermediate or products? Is it cost effect as alternative methods? Does the public accept the technology?" (Zynda, Todd, Michigan State University, "Phytoremediation," Hazardous Substances Research Center. Michigan State University) The use of phytostabilization should be minimal compared to removal of contaminated waste to a safe repository.	

The Montana Pole Plant Cleanup Relies too Heavily on Institutional Controls that are an Inherently Flawed Approach to Superfund Cleanups. Superfund's goal is to clean up hazardous waste sites that pose a threat to human health and the environment. Superfund cleanups should provide a permanent remedy that, in part, reduces the toxicity, mobility, and volume of contaminants. Because Superfund has a strong preference for treatment, the use of institutional controls should normally not be a substitute for "more active measures (e.g. treatment and/or containment of source materials) as the sole remedy. . . ." (40 CFR 300.430(a)(1)(iii)(D). OSWER Directive 9355.0-69, EPA 540-R-97-013 makes essentially this same point that the use of institutional controls should be a remedy of	K3

last resort.

To the extent that contamination at a site is really cleaned up, the necessity for institutional controls is minimized. To the extent that institutional controls are used at a site to put waste off-limits, the extent of contamination cleanup is minimized. It is important to remember that the impetus for Superfund in the first place was a failure of institutional controls to prevent the contamination problems and resultant health effects at Love Canal where the institutional controls were not followed. Risk is a function of both toxicity of the materials on site and the degree of exposure to the hazardous waste. (Effects of Future Land Use Assumptions on Environmental Restoration Decision Making, DOE, Office of Environmental Policy and Assistance, RCRA/CERCLA Information Brief, DOE/EH-413/9810, July 1998, p.1) Institutional controls depend on limiting exposure to toxic materials and do nothing to lessen the toxicity of these materials. After institutional controls are implemented, the toxic materials that originally triggered the Superfund cleanup are still on site to threaten human health and the environment.

MDEQ's solution to the problem of dioxin contaminated soils at Montana Pole Plant should be concerned about treating dioxin and, if treatment of the waste is technically impossible, removing the hazardous waste to a repository where the waste will no longer threaten human health and the environment. "Our obligation is to free subsequent generations of the responsibility for care taking our hazardous residues, not to saddle them with housekeeping chores which, if neglected, will result in the re-pollution of the environment that we worked so hard to clean." (Jack A. Caldwell and Charles C. Reith, Principles and Practice of Waste Encapsulation. Boca Raton: Lewis Publishing Co., 1993, p. 35.) Dioxin that is institutionally controlled is still a permanent threat to human health and the environment.

The cleaner a site is after remediation, the greater the potential land uses for that site. The more contamination left after remediation, the less the potential land uses are for the site. "Citizens have pushed for the highest cleanup standards, arguing that an unrestricted use would allow a wider range of future development at the site." (Wernstedt, et. al., Basing Superfund Cleanups on Future Land Uses: Promising Remedy or Dubious Nostrum?, Resources for the Future, Discussion Paper 98-03, October 1997, p. 17) The institutional controls being supported for Montana Pole Plant by MDEQ would seriously limit productive land uses. The extensive reliance on institutional controls is also contrary to the Superfund mandate of preference for treatment and cleanup over institutional controls that restrict land use in perpetuity. If the goal is to encourage productive land uses after Superfund cleanup, a clean site affords the most encouragement. If the goal is to protect human health and the environment, dioxin must be treated and/or removed.

The thesis of my comments regarding institutional controls is that the use of institutional controls for the Montana Pole Pant site should be minimal. Instead of extensive use of institutional controls to deal with the dioxin contaminants, dioxin at the Montana Pole Plant should, to the greatest technically feasible extent, be removed to a safe repository and treated there using appropriate innovative technologies.

Consider the following detailed argument about the inadequacy of institutional controls.

Institutional Controls are not Effective

A. The EPA itself has found significant problems with the effectiveness of institutional controls. For example, in an article entitled "EPA, Think Tank Studies Show Superfund Land-use Controls Flawed, December 10, 2001" which summarizes "Superfund Report via Inside EPA.com" by Resources for the Future, we find the following conclusions:

1. Institutional Controls are not reliably implemented. The EPA study found that over half of the institutional controls implemented under EPA issued records of decision are mischaracterized and that half of the institutional controls were not implemented according to EPA plans.
2. Institutional Controls are dramatically underfunded.
3. Monitoring of institutional controls is poor. Another study of California Superfund sites entitled: "Analysis of Institutional Controls at California Superfund Sites" by Erwin Tam of the University of California—Berkley found that 30% of the sites had no inspection schedule as required by law and in 63% of the cases it was felt that compromise of the institutionally controlled site was likely.
4. Enforcement of institutional controls is poor.
5. ROD's tend to have "vague or inconsistent references" to institutional controls.

In a study done by English, et. al. of the University of Tennessee entitled Institutional Controls at Superfund Sites, (July 1997. Hereinafter cited as Institutional Controls at Superfund Sites.), which was funded in part by EPA; the EPA's remedial project managers admit the above listed problems (1-5) with institutional controls. The report concludes: "Perhaps most importantly, the results of this study point to a fairly strong sense of unease on the part of some RPMs with the efficacy of institutional controls. This finding is consistent with discussions in the literature on the efficacy of institutional controls." (p.67) No wonder noted engineers Jack A Caldwell and Charles C. Reith stated in their book Principles and Practice of Waste Encapsulation, that "Planners of long-term disposal systems have long recognized the difficulty of maintaining institutional control over property. . . ." (p. 35)

B. "To the extent that responsibility for selecting and maintaining the long-term effectiveness of the remedy will become contingent on the intent and actions of a more diffuse set of institutions—local government, private property laws, current and future property owners, land recordation offices, the courts—the ultimate effectiveness of a remedy to protect human health and the environment will become increasingly difficult to assess." (Hersh, et. al., Linking Land Use and Superfund Cleanups: Uncharted Territory, Center for Risk Management, 1997, p.49. Hereinafter cited as: Linking Land Use.) If institutional controls become the prime remedy for the dioxin contaminated soil at the Montana Pole Plant, the community will have to live with these controls, effective or not, in perpetuity.

C. The success of institutional controls will depend on changing the way people behave which is very difficult.
Managing human behavior is an extraordinarily difficult task. None of the institutional controls in use, or under consideration for future use, is foolproof. None can reduce to zero the risk of human or environmental exposure to hazardous substances left in place at a site. Nor is there a universal, all-purpose institutional control appropriate for all sites. (Environmental Law Institute, Protecting Public Health at Superfund Sites: Can Institutional Controls Meet the Challenge, 1999, p. 13. Hereinafter cited as Protecting Public Health.)

The risk of human exposure is considerably less if the toxics are treated to make them non-toxic or if they are removed to a repository where the public cannot come in contact with them.

D. The relationship between land use and toxic exposure is not well understood and can have a great deal of variation.

Institutional Controls have Inherent Limitations

A. Institutional controls do nothing to reduce the toxicity or volume of contaminants. Institutional controls, per se, are not that effective in reducing mobility of toxics off-site. To be protective of human health and the environment, institutional controls would have to last as long as the toxics last. "Substances such as lead, mercury, arsenic, and cadmium will not degrade at all and will remain potentially hazardous unless removed or treated. In order to effectively protect against exposure to such long-lived risks, institutional controls would need to last essentially for as long as humans are expected to live on the planet." (Protecting Public Health, p. 13.) No institutional control has this needed level of permanence. If institutional controls are used instead of removal and/or treatment, these controls will have to work in perpetuity. Remember, toxic heavy metals such as those found at the BPSOU do not lose their toxicity over time. Yet, institutional controls are predicated on the designated land use of a sight existing in perpetuity—a flawed assumption. Land use changes are the most frequent changes in a locality.

B. Institutional controls also increase the likelihood that people will unknowingly be exposed to hazardous materials. Leaving contamination on site will always pose a threat of exposure if the institutional control fails. Predicting the long-term efficacy of an institutional control system is very problematic.

C. As we saw with regard to lead exposure, very often, as time passes, it is determined that the contamination in place is more dangerous to human health and/or the environment than originally thought. In such a situation, the in-place institutional controls may not be sufficiently protective of human health and the environment. "Questions then arise about who should be responsible for additional controls or remediation, and about whether residual contaminants should be allowed only if their risks and methods of containment are well understood." (Institutional Controls at Superfund Sites, p. 36.) It is critical that we get the most protective remedy the first time around.

D. Since the implementation of institutional controls depends on people, human error or neglect is a constant problem. After a remedy is selected, the degree of interest in the implementation of the remedy does not match the degree of interest shown during the remedy selection process. "Residual hazardous substances are a classic example of a problem that is not readily apparent, and the tasks associated with implementing institutional controls are unlikely to be the focus of widespread public attention in many cases. Thus, decision makers should plan for a relatively high probability that the person charged with the responsibility to implement an institutional control will fail to do so because that task is not a high priority for that person or because it is a task without a specific deadline and can therefore be postponed indefinitely." (Protecting Public Health, p. 103) The efficacy of an institutional control depends on human judgment and "the judgment of any individual may

be questionable in a specific situation and a poor judgment about implementing institutional controls could cause people to be exposed to hazardous substances." (Protecting Public Health, p. 105) The Meaning and Understanding of Institutional Controls is Problematic. A. What are the institutions that will be charged with controlling the toxics? How will these institutions coordinate their activities? Who will devise these institutional controls? Who will have enforcement responsibility? How will these controls be enforced? What is meant by controls? To what extent will the nature of these controls be the result of political processes rather than good protective environmental and scientific technology? Who will monitor the institutional controls? How often will the controls be monitored? How will they be monitored? All of these questions must be satisfactorily answered before the public can have any confidence in the protectiveness of the controls. Yet, in far too many cases where EPA has extensively utilized institutional controls, these questions have never been answered. Nor is there any consensus as to how they should be answered. B. "When we admit societal values, power, political leverage, and notions of rights and duties into the picture, it becomes difficult to see 'controls' as anything but contested, and hence problematic. For institutional controls are not stagnant features of a remedy but are made and unmade in the course of experience by regulatory statutes, by the acuity of government oversight, by negotiations at planning board meetings, by the attitudes of bankers, developers, and others involved in real estate, by the limitations of scientific understanding of the health risks posed by toxic chemicals, by the vast and evolving corpus of real property law, by public trust in government or the lack thereof, and, in a broader sense by the constellation of rights and responsibilities that inform a societal ethic." (Linking Land Use, p. 52. See also: T. Beatley, Ethical Land Use: Principles of Policy and Planning (Baltimore, MD: Johns Hopkins Press, 1994 and R. Platt, Land Use and Society: Geography, Law and Public Policy (Washington, D.C.: Island Press, 1996) Even if there were some agreement on the nature and role of institutional controls, that agreement would be fleeting.	

Legal Issues Limit the Effectiveness of Institutional Controls A. Another problem complicating the use of institutional controls are the courts. The courts can potentially play a significant role on land use decisions and land use decisions can be very litigious. "Although the courts try not to make substantive zoning decisions, judicial attacks on local land use regulations are well documented in case law and in the planning literature and constitute yet another source of uncertainty to the effective working of institutional controls at Superfund sites. In view of the wide variation in the decisions of state and appellate courts concerning the limits of police power to regulate land use and the need for Constitutional protection for the individual, it is easy to envisage the possibility that an owner of a site that is encumbered with a use restriction may challenge and successfully invalidate an institutional control, such as a	K4

zoning restriction, on the grounds that the restriction will cause a severe burden and, as such, constitutes a taking of private property by the government." (Linking Land Use, p. 64)

B. The NCP does not clearly specify the legal authority for institutional controls. Because there are no detailed statutory specifications of institutional controls, institutional controls are often left to the end of the remedy selection process where public input is minimal. Leaving them to the end is problematic in that: "If you leave institutional controls to the last and you can't get them implemented, then you're stuck. You're at a dead end rather than the destination of the record of decision (ROD)." (Claudia Kerbawy, op.cit., p. 53)

C. On a practical level, it is unclear who should monitor and enforce the institutional controls. RODs usually have little specificity regarding the implementation and monitoring of institutional controls. Often the specification of the nature and types of institutional controls is very general. Questions abound regarding what kind of monitoring will be performed, who will perform the monitoring, how and what type of enforcement will occur, what will be the frequency of the monitoring, and who is responsible for maintaining the protectiveness of the institutional control arrangements. The technical remedy is determined first and then institutional controls are developed to protect the remedy. Yet, it is often difficult to get acceptance by property owners or PRPs after the ROD is issued

D. Given that issues related to institutional land use/property control are not based in federal law but are based in state property laws or the local police power, federal control of institutional controls on the local level is very limited. CERCLA provides EPA with oversight authority over institutional controls that are part of the ROD remedy but CERCLA provides no mechanisms to enforce that control. Every five years, EPA can amend a remedy when contaminants are left in place, but during that five-year period the supervision of institutional controls is with the local government. Much to compromise a remedy can happen in five years. Moreover, there are serious proposals in Congress to remove the five-year review process. Hence, federal supervision of institutional controls is very problematic and could disappear altogether.

E. It is very problematic whether an institutional control on a current owner of a particular property would bind subsequent owners of that property. "Can third parties (for example, community groups or the local government) enforce a restriction at a site if the property owner fails to comply with the control and the holder of the easement, for example, (EPA, a PRP, the state government, or a local government if signatory to the agreement) fails to act properly? (Linking Land Use, p. 57) In Environmental Regulation of Real Property, N. Robinson comments that institutional control covenants are very complicated and that "they often defeat the attempts of parties to write covenants which will be enforceable against successors." (pp. 6-16) For example, the form of future property ownership must be similar to the existing type of property ownership for an institutional control restriction to continue in force. Once a property is sold to a new owner, monitoring of what the new owner does on the property is diffuse if it exists at all.
What happens in a commercial venture if the purchaser of the property goes bankrupt? Who is responsible for the institutional control restrictions on the property? Who will enforce these restrictions? State laws regulating the use property are Byzantine.

> "The common law tradition of different types of ownership could limit long-term effectiveness of (institutional controls') reliability if they fail to bind third parties to the agreements worked out in the consent decree, and the question of authority—who holds an easement and on what legal basis can the government or some other entity challenge noncompliance with the easement or deed restriction—is, again, open to interpretation. These issues suggest that proprietary controls, negotiated between PRP/site owners and government (federal, state, local) may be insufficient by themselves to effectively ensure the long-term safety of the public from residual contamination. Their reliability hinges on how carefully they are devised, the authority and willingness of the party holding the rights to use them, and the willingness of a property owner to comply." (Linking Land Use, p. 58)

F. Multiple owners or multiple use of a site also compromise the ability of government to police institutional controls.

G. The "touch and concern" doctrine can limit the efficacy of real covenants in the institutional control process. "Equitable servitudes" also are limited in their effectiveness by the "touch and concern" requirement.

H. Liability under institutional controls is problematic.
"When institutional controls are created, it is important to determine who will be liable in the event they fail. Even if the EPA has entered into a consent decree at the time of the initial site remediation releasing PRPs from liability for residual contamination, questions remain about liability if the institutional controls are violated. For example: If the current property owners allow development that violates use restrictions, are they liable, are the original PRPs liable, or both? If people are harmed by such a violation, would they be able to sue the current property owners, the original PRPs or both?" (Institutional Controls at Superfund Sites, p. 34)

I. Another difficulty is that land use controls are "vulnerable to changing legal interpretations about the nature of property rights." (Wernstedt, et. al., Basing Superfund Cleanups on Future Land Uses: Promising Remedy of Dubious Nostrum?, Resources for the Future, Discussion Paper 98-03, October 1997, p. 16) For example, if the courts expand the scope of takings decisions to increase the extent to which government regulations are viewed as a "taking" then the efficacy of institutional controls will be diminished.

Summary of the Problems with Institutional Controls

1. Institutional controls do not meet the Superfund mandate of really cleaning up a site. To clean up means to make free of contamination.
2. Institutional controls are not permanent remedies. Rather, institutional controls permanently leave pollutants in place.
3. Institutional controls do nothing to reduce the toxicity of the hazardous materials. Lead, arsenic, mercury, and cadmium don't naturally attenuate over time, but keep their toxicity indefinitely.
4. Institutional controls are designed, implemented and monitored poorly.
5. Institutional controls have inherent enforcement problems.
6. Institutional controls have severe legal problems that work against effective reduction of

the threats to human health and the environment posed by toxic materials. 7. Institutional controls are ineffective. 8. Institutional controls for a Superfund site are usually the result of a defective process that limits public participation and which leads to a haphazard development of institutional controls for a particular site. 9. Institutional controls are poorly understood and poorly defined. Institutional Controls Problems Summary The use of institutional controls at the Montana Pole Plant site should not be a substitute for real, permanent cleanup. Institutional controls do nothing to clean up a site. Because institutional controls rely on the flawed premise that the way to prevent human exposure to toxic substances is to remove humans from the toxic substance by attempting to change human behavior patterns rather than by removing the substance from the humans which would allow citizens to pursue their activities without being threatened by toxics, the extensive use of institutional controls is bound to fail. Institutional controls also have significant design, development, implementation, monitoring and enforcement problems. Institutional controls are not effective. Legal problems abound with institutional controls. Institutional controls are not a permanent solution to the toxics problem. To the maximum extent possible, the contaminants found Montana Pole Plant site should either be treated on site or, if on-site treatment is not possible, be removed from the area to a safe repository where they can be treated.	

EMAIL L

From: John Ray [mailto:bodinman2003@yahoo.com]
Sent: Thursday, March 03, 2016 6:37 AM
Subject: Additional Input Five Year Review Montana Pole Plant

Five Year Review Issue Institutional Controls will be a major part of the remedy for the Montana Pole Plant. There are major problems/issues regarding the use of institutional controls that must be addressed during the Five Year Review. Please consider the following as additional public input. The Public should be concerned about too great a Reliance on Institutional Controls at the Montana Pole Plant. Institutional controls per se do nothing to reduce the mobility, toxicity, or volume of contaminants. Institutional controls do nothing to clean up a site. The institutional controls being considered in the EPA's RI/FS for Priority Soils would seriously limit productive land uses and greatly compromise the property rights of owners to use their land as they determine. The extensive reliance on institutional controls is also contrary to the Superfund mandate of preference for treatment over restricted land use. Institutional controls do nothing to treat a site. The EPA's own document "Rules of Thumb for Superfund Remedy Selection" states that the law mandates a clear preference for treatment over all other approaches. "EPA expects to use treatment to address the principal threats posed by a site. . . ." [40 CFR 300.430(a)(1)(iii)(A)]. The above document also notes: "Institutional controls. . .generally shall not substitute for more active measures. . . ." (pp. 12-13) The EPA itself has found significant problems with institutional controls at its other sites. In an article entitled "EPA, Think Tank Studies Show Superfund Land-use Controls Flawed, December 10, 2001" which summarizes "Superfund Report via Inside EPA.com" by Resources for the Future, we find these conclusions, reached by the EPA itself, which due to their significance, I will quote at length: "EPA and environmental think tank studies have shown that the federal and state governments' land-use restrictions at Superfund sites, known as institutional controls (IC), are seriously flawed, with an agency study showing the controls are not reliably implemented and the think tank report finding the controls are dramatically under-funded." "During a November 27 land use control summit, sponsored by the International City/County Management Association (ICMA), EPA officials and the Environmental Law Institute (ELI), outlined numerous shortcomings they have found with EPA's IC monitoring and enforcement efforts nationwide. While EPA released the results of a study showing EPA has failed to ensure Superfund ICs are reliably implemented, and ELI study indicates that EPA's ICs are dramatically under-funded." "Bruce Means, of EPA's Federal Facilities Restoration and Reuse Office, told attendees that preliminary studies show that half of the ICs implemented under Superfund records of decisions (ROD) were mischaracterized. During a study of RODs conducted during 1999 and 2000, the agency found that half of the ICs established under RODs were not implemented as the agency had planned." "And Jay Pendergrass of ELI outlined the preliminary findings of ELI's study of state's IC programs, which showed that the programs are severely under-funded."	L1

"In a draft version of the report, Pendergrass found that state environmental programs are underfunded and as a result the sites allocate very little time on IC implementation. The funding and staffing shortfall 'raises concerns about whether [ICs] are implemented as intended and [are] as protective as intended." "An ICMA source agrees that EPA has serious problems with its IC program, saying that the agency has many RODs with vague or inconsistent references to such controls." (pages 1-2) The greater the cleanup of the Butte Priority Soils Operable Unit, the more the site can be used productively. The less cleanup of the BPSOU, the less the site can be used for residences and recreational uses. Given the EPA's admission that institutional controls have failed it in the past, it is amazing that the remedies listed in the RI/FS for Priority Soils call for such extensive use of institutional controls. Other Problems with Institutional Controls: a. There is a tendency not to implement institutional controls as time passes. Frequently institutional control mandates are not carried to completion. b. The effectiveness of institutional controls usually depends upon the ability, personnel and resources of the local government to implement. Often local governments do not have the personnel or resources to devote to the implementation and monitoring of institutional controls. Given the national administration's proposed cutbacks in Superfund allocations, resources will be increasingly unavailable on the national level to monitor implementation and effectiveness of institutional controls. Certainly the financial capacity of Butte's local government to implement and monitor institutional controls is greatly limited. Nowhere does the EPA's comprehensively address the above issue. c. "Institutional controls rely heavily on humans to implement, oversee, and administer them. It is human nature to ignore tasks that no one else seems to care about or where the purpose is not readily apparent. Residual hazardous substances are a classic example of a problem that is not readily apparent." ("Protecting Public Health at Superfund Sites: Can Institutional Controls Meet the Challenge?" Environmental Law Institute, p. 2) d. Although EPA must review the remedy every five years, the frequency of this review process may be insufficient to detect the failure of institutional controls. e. The use of education as part of the institutional controls strategy is a substantial part of the EPA's approach to implementing institutional controls. Research of previous remedies under Superfund indicates that education programs fail to materialize. f. "In addition to the direct costs of implementing institutional controls, their use can impose substantial indirect costs on communities, property owners, prospective purchasers and developers by limiting the ways a site may be used. The burden of the restrictions on use of the site falls on the property owner and the community, with the owner reaping potentially lower profits from use of the property and the community receiving lower social benefits from the allowed uses than would have been possible if no restrictions existed." (ELI, Ibid.) g. Because the sites where institutional controls will be implemented will not be cleaned up and will present a continuing potential threat to human health, these sites will be off limits to development in perpetuity. It is difficult to see how the use of institutional controls meshes with the goals of the EPA's Superfund Redevelopment Initiative. h. It is impossible to determine future possible land uses for the site nor is it possible to predict unanticipated land uses. (See: "Linking Land Use and Superfund Cleanups: Uncharted Territory," by Probst, Hersh, Wernstedy and Mazurek, Summary of Findings, RFF, p. 1) i. "Institutional controls have more problems than just risk miscalculation. Breeches in the site because of future construction, or even animals may cause the control to fail. The lack of a required contingency plan, would not account for new remedies, new information, or failed	

institutional controls negatively impacts the effectiveness of the treatment. Institutional memory loss was well is an important factor. This memory loss occurs when a party decides to breach the original institutional control without its own knowledge. In fact, in the ICMA (International City/County Management Association) study, the majority of respondents (63%) said that breaches in the institutional controls on a site were highly or somewhat likely. Following up on that question, 30% of the respondents reported that no formal inspection schedule was set up to evaluate the site as require by law." (Erwin Tam, Environmental Science and Economics, UC Berkeley, "Analysis of Institutional Controls at California Superfund Sites.") j. "Concern has been expressed about the long-term viability of institutional controls as a remediation tool. For example, they may be forgotten; enforcement agencies may not effectively review properties or land users' actions; or land users simply may take their chances. Decision makers should weigh the full costs of such options, including capital costs, costs of long-term sampling and analysis, and costs of replacing equipment, as well as concerns about potential long-term risks associated with contaminants left in place, against the cost options that would remove the contaminants completely. Many local governments do not yet have the capacity and resources necessary to meet the challenges of long-term stewardship." ("Understanding the Role of Institutional Controls at Brownfields Sites: Major Concepts and Issues.") k. Because institutional controls leave large amounts of contaminants in place, institutional controls will have to be perpetual. Who is to say what anticipated land uses come up for an institutionally controlled area? For example, fifty years after the record of decision for Butte Priority Soils is implemented, the contaminants will still be there threatening human health and the environment, but will the will be there to restrict land uses in order to prevent the release of contaminants. "Institutional controls 'work' only if they are complied with. And while this is true of any site remedy, institutional controls require monitoring and enforcement over long time periods." ("Linking Land Use and Superfund Cleanups: Unchartered Territory, Probst, et al., Resources for the Future Center for Risk Management.) Will the will to enforce institutional controls exist fifty to a hundred years in the future? l. Legal, social and political pressures limit the effectiveness of institutional controls. (Ibid.) m. The long-term effectiveness of institutional controls is unknown. "There has, however, been little investigation of what happens at sites on the National Priorities List (NPL) when land use plays a prominent role in the remedy selection process. There also has been little analysis of what institutions are involved in making land use decisions and maintaining land use restrictions over time. It is unclear what legal mechanisms are most effective, what institutions will be responsible for enforcing institutional controls, and who's going to pay for these additional responsibilities. We need to be able to answer these questions if land use-based remedies are to be protective over the long term." (Ibid.) "Planners of long-term disposal systems have long recognized the difficulty of maintaining institutional control over property. . . ." (Jack A. Caldwell and Charles C. Reith, Principles and Practice of Waste Encapsulation, 1993, p. 35)	

EMAIL M

From: John Ray [mailto:bodinman2003@yahoo.com]
Sent: Thursday, March 03, 2016 6:39 AM
Subject: Fw: Comments--Montana Pole Plant

Please consider the following as public comment on the current Five Year Review of Montana Pole Plant. I would like to submit the following as public comment regarding issues that need to be addressed in the current Five Year Review of the Montana Pole Plant. Please see the attached documents. These documents present issues that need to be considered in the current Five Year Review. The following are my comments regarding the Montana Pole Plant presentation by MDEQ of October 29, 2013	M1

1. The Record of Decision for the Montana Pole Plant clearly calls for active treatment of the waste as the primary cleanup method. The ROD does not support keeping waste in place as the primary or major approach to cleanup. Somewhere along the way, the emphasis on active treatment was changed to an emphasis on containment under caps. That was pretty clear at the Tuesday night (October 29, 2013) Pole Plant meeting. Pages 6, 7, and 35 of the Pole Plant ROD clearly stipulate that active treatment will be the cleanup method. In the Record of Decision—Montana Pole Plant we find this quotation that exemplifies the position in the Record of Decision: All accessible contaminated soils and LNAPL will be excavated to the extent practicable and treated, preventing this material from continuing to contaminate groundwater. The selected remedy will also satisfy the preference for treatment as a principal element of the remedy. Page 35	M2

2. Active biological treatment does work on wastes such as we find at the Pole Plant and in our climate. For example, an article entitled: "Treatment of Dioxin Contaminate Soils," Standberg, et. al, published in November 2011 by the Swedish Environmental Research Institute provides compelling evidence of the efficacy of active biological treatment on wastes similar to those found at the Pole Plant and in a climate similar to Butte's climate. See also: Biodgredation of Dioxins and Furans by Rolf Wittich, July 15, 1998): Bioremediation of organic pollutants and heavy metals by use of microorganisms represents a safe, inexpensive, and environmentally-friendly concept in modern environmental engineering. During the last three decades intense efforts have been made by microbiologists and environmental engineers in the isolation and characterization of microorganisms capable of degradation, transformation and detoxification of recalcitrant chemical compounds of environmental concern: (polyhalogenated) dibenzo-p-dioxins, dibenzofurans, and diphenyl ethers. Special emphasis is placed on the potential of molecular biology techniques to improve presently available biocatalysts. (Biodgredation of Dioxins and Furans by Rolf Wittich, July 15, 1998)	M3

3. Dioxin is mobile in soils such as those at the Montana Pole Plant. The ROD itself says that it is possible for dioxin in soils to migrate. (Page 14) There are present in the Montana Pole Plant soils co-contaminants that can mobilize dioxin. In addition, the caps that are used will not prevent surface water and other contaminants from leaching down and mobilizing dioxin. Given the problems of caps with bio-irrigation, advection, desiccation, erosion, weathering, bio-intrusion and stabilization, the dioxin in the soil will be mobilized. Only in a pure lab setting does dioxin remain non-mobile. Certainly the Montana Pole Plant is not a pure lab setting. (See: Dioxin reservoirs in southern Viet Nam--A legacy of Agent Orange by Divernychuk, et al in Chemoshpere 47 (2002) 117-137.	M4

Similar findings are reported in the following: 1. Soil-Plant Transfer of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans to Vegetables of the Cucumber Family (Cucurbitaceae) Anke. Huelster, Jochen F. Mueller , Horst. Marschner Environ. Sci. Technol., 1994, 28 (6), pp 1110–1115DOI: 10.1021/es00055a021Publication Date: June 1994 (Article: Indicates that dioxin is mobilized in soils as the result of plant activitiy. Given that there will only be a 12 inch cap over dioxin contaminated soils and the cap will have vegetative cover, the vegetative cover will absorb dioxin and bring it to the surface.)	M5

1. Sorption of 2,3,7,8-tetrachlorodibenzo-p-dioxin to soils from water/methanol mixtures Richard W. Walters , Annette. Guiseppi-Elie Environ. Sci. Technol., 1988, 22 (7), pp 819–825DOI: 10.1021/es00172a012 Publication Date: July 1988 2. Study by U.S. Dept. of Agriculture indicated that dioxin is only immobile in soils devoid of other organic material. If any organic co-solvents, as are present at the Pole Plant, are in the soil, mobility will occur. 3. SUBSTANTIAL MIGRATION OF DIOXINS IN AGROCHEMICAL FORMULATIONS, Grant, Sharon, Mortimer, Munro, Stevenson, Gavin, Malcolm, Don and Gaus, Caroline, The University of Queensland (National Research Centre for Environmental Toxicology (EnTox)), 39 However, the presence of co-contaminants can act as transport facilitators for otherwise low mobility organic compounds (LMOCs) These results highlight that the paradigm of LMOCs being non mobile in soils should be considered carefully together with application specific and environmental factors which may have the ability to considerably change the predicted environmental fate of these chemicals. (This article supports the above mentioned study by the U.S. Department of Agriculture that if, as we find at the Pole Plant, co-contaminates are present, dioxin does become mobile in soil. The point is that since the remedy for the Pole Plant was changed from one of active treatment to containment, co-contaminants that will make dioxin mobile in soil will be present. 4. Assessment of Dioxin Contamination at Sawmill Sites: A Report to the Ministry for the Environment by Tonkin & Taylor Ltd and SPHERE, Prepared for the New Zealand Ministry for the Environment October 2008 (conclusions are similar to the one's I included in my earlier email to you today, i.e. that dioxin is mobile in both soil and water.	M6

Also, data presented by the MDEQ at the Tuesday meeting indicated that dioxin is present in the recovery trenches at the Pole Plant. If dioxin isn't mobile in soil at the Pole Plant, how did the dioxin get in the recovery trenches? Another point that Ian made: MDEQ is in charge of	M7

the cleanup in Missoula of the White Pine Sash site. This site was a wood treatment facility similar to Montana Pole. The MDEQ acknowledges at this site that dioxin can be mobile in soils. Why not acknowledge the same at Montana Pole? Finally, the dioxin levels that we are now seeing in groundwater at the Montana Pole Plant were not supposed to have been reached until 200,000 years from now according to MDEQ. Why, if dioxin is not mobile, are we seeing dioxin now that we should not have seen for 200,000 years?	

Summary of my position: 1. The bottom line is that the dioxins, pcps, pahs and furans found at the site are highly toxic and carcinogenic. Dioxin poses a serious threat to both human health and the environment. There are no safe levels of exposure to dioxin. (EPA) In fact, dioxin has been referred to as the "most toxic chemical known." (Hazardous Waste in America, Epstein, Brown and Pope) Lethal effects of dioxin can be seen at very low levels—a millionth of a gram can kill lab animals. Dioxin was the toxic found in Agent Orange and at New York's Love Canal. Dioxin causes serious cancerous and non-cancerous human health effects. (World Health Organization) Dioxin can produce multiple types of cancer. Non-cancerous health effects include type 2 diabetes, impaired immune system, ischemic heart disease, endometriosis, decreased fertility, inability to carry pregnancies to term, birth defects and learning disabilities. According to the National Institute of Environmental Health Sciences, the "dangers of dioxin last for decades after initial exposure." Just dealing with contaminant level statistics can mask the danger posed by these contaminants.	M8

2. These toxics will largely remain on site to pose a perpetual threat to human health and the environment. The site will never be cleaned up.	M9

3. Even the data presented tonight shows that these toxics have been released. Perhaps not in large quantities, perhaps not all the time, but given the toxicity of the materials even relatively small releases are problematic. And given that the site will not be cleaned up, these releases will continue in perpetuity.	M10

4. Based on the discussion of the DEQ 7 standards, it is obvious that the cleanup levels in the original Record of Decision for the Pole Plant are not protective. The problem is that the current cleanup is not meeting, in a significant number of cases, the DEQ 7 standards. Yet the presentation tonight continually referred to meeting the outdated, non-protective EPA standards in the Record of Decision. Probably, the old Record of Decision will never be reopened.	M11

5. The comparisons of the Pole Plant site to other sites presented at tonight's meeting don't prove anything. Because, for example, the Pole Plant is comparable to other similar sites does not mean that the Butte cleanup is working to protect human health and the environment.	M12

6. The extensive use of caps for the Pole Plant is very problematic. Butte's history with capping toxic waste has not been good. Caps have been very problematic. The dioxins and other contaminants at the Pole Plant will all be just left in place, covered with only 12 inches	M13

of topsoil caps. Previous capping on the Butte Hill, which uses more soil than the level at the Pole Plant, has not worked well. We have a situation where the most toxic substances in Butte (dioxins, PCPs and furans) are to be covered with the least amount of soil. Caps, as we have seen in Butte, already are susceptible to failure by means of bio-irrigation, advection, dessication, erosion, weathering, bio-intrusion and stabilization problems. Caps also have significant construction, repair and maintenance problems.	

7. Because the responsible parties for the cleanup cashed out, we better get it right now. The money for the cleanup is limited.	M14

In short: The Record of Decision for Montana Pole promised that the dioxins, furans, PCPs and PAHs found at the site (all are serious health threats) would be biologically treated and the site cleaned up. Contrary to the promise of cleanup, the MDEQ and EPA have reneged on this promise. MDEQ and EPA have largely abandoned treatment in favor of containment, leaving the threat in place.	M15

Now, cleanup will consist of leaving all of these toxics on site and "managing them" through institutional controls. The EPA itself says that the toxicity of dioxin exists for an extended period of time. Containment is contrary to the Superfund mandate that treatment is to be preferred over leaving waste in place. The shoddy cleanup at the Pole Plant perpetuates a public health threat that should and could have been fixed.	M16

However, the current containment remedy is not working. Dioxin is still being released .The groundwater treatment system that was implemented at the Pole Plant site still allows for significant discharge of dioxin into Silver Bow Creek—100 times the current dioxin surface water standard. Such discharges will continue for decades to come. MDEQ's own discharge study said that MDEQ's planned cleanup approach would still allow dioxin to be discharged into Silver Bow Creek. MDEQ has ignored this problem and continues to implement a non-protective cleanup. Why was a sub-par cleanup approach selected? The threat to human health is particularly acute for those living near the Pole Plant. So, while progress has been made, the rosy picture presented at the October 29th meeting does not give us a full picture of what is going on at the Pole Plant.	M17

In addition to the citations I provided in this document, I would also ask that you review Ian's submission of November 5, 2013 to the CTEC board giving his reactions to the conclusions presented at the October 29, 2013 meeting. The following is the email from Ian of March 27, 2013 which I include as a reference point. CTEC members- I thought I would summarize for you the important points from the Montana Pole update at the meeting the other night.	M18

1. The groundwater treatment system discharges dioxin into Silver Creek at 100 times the current very low surface water standard. This is expected to continue for decades under the current plan. It needs to be shown that this will not impact the health of aquatic life, fish, or people who eat them.	

2. The Five Year Review from 2011 included three action items that the agencies would summarize for the layperson and distribute to the public the review findings, air monitoring health risks,	M19

and that they sampled soil where the wind-break trees died. This was to be an important response to citizens comments and still needs to happen.	M20

Eternal vigilance is the price of liberty. Thomas Jefferson Wouldn't it be nice if citizens could trust government to do the right thing. Unfortunately, that doesn't always happen. Anytime power is given to a government institution, that institution can escape popular accountability. Even when government is supposedly acting to promote and protect public health and safety, citizens need to be on their guard. The public interest is best promoted and protected by a vigilant public.	M21

The Montana Pole Plant Superfund site in Butte usually flies below the public radar, except for those living near the site. Because surface water, groundwater, soils and sediments at the Pole Plant are contaminated with dioxins, the Pole Plant is, perhaps, the most dangerous of the Superfund sites in Butte. The Pole Plant cleanup by the Montana Department of Environmental Quality (MDEQ) leaves much to be desired. Dioxin poses a serious threat to both human health and the environment. There are no safe levels of exposure to dioxin. (EPA) In fact, dioxin has been referred to as the "most toxic chemical known." (Hazardous Waste in America, Epstein, Brown and Pope) Lethal effects of dioxin can be seen at very low levels—a millionth of a gram can kill lab animals. Dioxin was the toxic found in Agent Orange and at New York's Love Canal. Dioxin causes serious cancerous and non-cancerous human health effects. (World Health Organization) Dioxin can produce multiple types of cancer. Non-cancerous health effects include type 2 diabetes, impaired immune system, ischemic heart disease, endometriosis, decreased fertility, inability to carry pregnancies to term, birth defects and learning disabilities. According to the National Institute of Environmental Health Sciences, the "dangers of dioxin last for decades after initial exposure."	M22

The Record of Decision for Montana Pole promised that the dioxins, furans, PCPs and PAHs found at the site (all are serious health threats) would be biologically treated and the site cleaned up. Contrary to the promise of cleanup, the MDEQ and EPA have reneged on this promise. MDEQ and EPA have largely abandoned treatment in favor of containment, leaving the threat in place. Now, cleanup will consist of leaving all of these toxics on site and	M23

"managing them" through institutional controls. The EPA itself says that the toxicity of dioxin exists for an extended period of time. Containment is contrary to the Superfund mandate that treatment is to be preferred over leaving waste in place. The shoddy cleanup at the Pole Plant perpetuates a public health threat that should and could have been fixed.	

However, the current containment remedy is not working. Dioxin is still being released .The groundwater treatment system that was implemented at the Pole Plant site still allows for significant discharge of dioxin into Silver Bow Creek—100 times the current dioxin surface water standard. Such discharges will continue for decades to come. MDEQ's own discharge study said that MDEQ's planned cleanup approach would still allow dioxin to be discharged into Silver Bow Creek. MDEQ has ignored this problem and continues to implement a non-protective cleanup. Why was a sub-par cleanup approach selected?	M24

The threat to human health is particularly acute for those living near the Pole Plant. Local residents have had to endure not only a failed cleanup but tremendous odor problems caused by the MDEQ's waste in place remedy.	M25

Citizens have a right to know if and why government is not doing what it said it would do to protect human health and the environment. Agency decisions are binding.	M26

The Pole Plant cleanup, again contrary to what was promised regarding community involvement, has failed to provide the public with timely information about the problems with the cleanup. The lack of any coordinated or effective program for citizen involvement means that citizens are prevented from holding government accountable and influencing government cleanup activities. The lack of transparency by the MDEQ and EPA means that citizens are left to "hope" that government does the right thing.	M27

The public deserves answers to the following questions: (1) Why is the Pole Plant still out of compliance with emission standards for dioxin? And (2) Why hasn't the Pole Plant been cleaned up? After all, the public's safety is the highest law. (Roman law)	M28

Record of Decision—Montana Pole Plant *The biological degradation rate of these compounds is generally very slow when compared to other organic compounds. Because PCDDs and PCDFs have very low vapor pressures, they do not readily evaporate or volatilize to the atmosphere. The compounds adhere tightly to soil particles and do not migrate readily or leach into groundwater or surface water* ***unless the contaminated soil particles themselves migrate via erosion processes*** *(Freeman, 1989).* (Emphasis supplied.) page 14	M29

All accessible contaminated soils and LNAPL will be excavated to the extent practicable and treated, preventing this material from continuing to contaminate groundwater. Page 35	M30

The selected remedy will also satisfy the preference for treatment as a principal element of the remedy	

Soil-Plant Transfer of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans to Vegetables of the Cucumber Family (Cucurbitaceae) Anke. Huelster , Jochen F. Mueller , Horst. Marschner *Environ. Sci. Technol.*, 1994, 28 (6), pp 1110–1115DOI: 10.1021/es00055a021Publication Date: June 1994 (Article: Indicates that dioxin is mobilized in soils as the result of plant activitiy. Given that there will only be a 12 inch cap over dioxin contaminated soils and the cap will have vegetative cover, the vegetative cover will absorb dioxin and bring it to the surface.)	M31

Sorption of 2,3,7,8-tetrachlorodibenzo-p-dioxin to soils from water/methanol mixtures Richard W. Walters , Annette. Guiseppi-Elie *Environ. Sci. Technol.*, 1988, 22 (7), pp 819–825DOI: 10.1021/es00172a012 Publication Date: July 1988 Study by U.S. Dept of Agriculture indicated that dioxin is only immobile in soils devoid of other organic material. If any organic co-solvents as are present at the Pole Plant are in the soil, mobility will occur.	M32

SUBSTANTIAL MIGRATION OF DIOXINS IN AGROCHEMICAL FORMULATIONS, Grant, Sharon, Mortimer, Munro, Stevenson, Gavin, Malcolm, Don and Gaus, Caroline, The University of Queensland (National Research Centre for Environmental Toxicology (EnTox)), 39 *However, the presence of co-contaminants can act as transport facilitators for otherwise low mobility organic compounds (LMOCs) These results highlight that the paradigm of LMOCs being non mobile in soils should be considered carefully together with application specific and environmental factors which may have the ability to considerably change the predicted environmental fate of these chemicals*. (This article supports the above mentioned study by the U.S. Department of Agriculture that if, as we find at the Pole Plant, co-contaminates are present, dioxin does become mobile in soil. The point is that since the remedy for the Pole Plant was changed from one of active treatment to containment, co-contaminants that will make dioxin mobile in soil will be present.	M33

Biodegredation of Dioxins and Furans—Rolf Wittich, July 15, 1998 *Bioremediation of organic pollutants and heavy metals by use of microorganisms represents a safe, inexpensive, and environmentally-friendly concept in modern environmental engineering. During the last three decades intense efforts have been made by microbiologists and environmental engineers in the isolation and characterization of microorganisms capable of degradation, transformation and detoxification of recalcitrant chemical compounds of environmental concern: (polyhalogenated) dibenzo-p-dioxins, dibenzofurans, and diphenyl ethers. Special emphasis is placed on the potential of molecular biology techniques to improve presently available biocatalysts.*	M34

Ctec members, Here is an update on the Montana Pole meeting last week where Janice and I met with Lisa DeWitt of DEQ and their contractors Dan Buffalo and Kathie Roos of TetraTech. I'd be happy to meet with CTEC to discuss further, at say 400 or 430pm prior to next week's meeting on the 29th if interested. Just let me know. Purpose of Meeting: The purpose of the meeting was laid out in an email from John in August: "The particular focus of the meeting will be to try to "clear the air" regarding what appears to be conflicting data pertaining to emissions/discharges from the Montana Pole Plant. Last spring there was conflicting data presented regarding the nature, extent and potential risk associated with current discharges of toxic materials from the Pole Plant. We thought having a meeting on this topic would afford a good opportunity to discuss the differing data and perhaps reach some consensus as to what is occurring at the Pole Plant." At the meeting we discussed the status of the remedy and the treatment system. In this we talked about the effectiveness of the remedy for capturing and treating the wood treatment contaminant pentachlorophenol (PCP) and dioxin which is a by-product contaminant in PCP. We went over all of the water quality monitoring data and we put together a list of important topics to cover at the Oct 29th meeting next week. Issues: In April this year I prepared a Dioxin Technical Review for CTEC (this is attached to this email). If you remember, DEQ and EPA took major issue with what they called inaccuracies in my reporting. CTEC met with EPA and DEQ on June 5th as part of a meeting to discuss Montana Pole as well as general grant-funding questions. At the June 5th meeting DEQ indicated that the issue they had with the report was not the accuracy of the content, but rather how the information was reported. Lisa DeWitt's main point is that they believe it was inappropriate to provide a table of the higher concentrations of dioxin measured in groundwater and discharge from Montana Pole because it could lead to the conclusion that dioxin levels were always measured that high. Lisa has also said she believes it was inappropriate to give that information to a Montana Standard reporter. My belief is the table was appropriately caveated with the statement "These are some of the higher values; complete data is graphed below." I intended for the Dioxin Data Review to inform CTEC members about dioxin at the site and to inform discussion on management of residual dioxin contamination. I did not intend it to be given to the reporter.	M35

Resolution: At the meeting we discussed how dioxin levels measured in groundwater at Montana Pole may be influenced by the infiltration-pump-and-treat system they use which is designed to recover contaminants from groundwater faster than would occur normally. I agree with DEQ that the pump and treat system is necessary for the removal of PCP and petroleum contaminants from the soil and groundwater. Dioxin which is produced from the treatment system is an unintended consequence of the groundwater treatment system for	M36

PCP and petroleum contaminants. TetraTech provided background dioxin data for Silver Bow Creek which generally shows that the treatment plant discharge does not make the water quality in Silver Bow Creek any worse because the creek contains elevated dioxin from other sources in the environment. Dioxin is ubiquitous in the industrial world and I agree with DEQ that Montana Pole dioxin discharge does not degrade the quality of Silver Bow Creek. Both the creek (from the greater environment) and the Pole Plant system discharge exceed current water quality standards which ideally they would not. DEQ legally must meet site specific cleanup levels in the ROD; which in general the groundwater and surface water discharge meets the ROD. The ROD cleanup levels for dioxin are significantly less conservative than new EPA federal and DEQ state-wide water quality standards. Compared to current DEQ water quality standards the ROD standard for groundwater is 15 times less conservative and for surface water is a whopping 2000 times less conservative. The current water quality standards for dioxin are very, very low and are commonly exceeded due to background levels of dioxin in our environment. The meeting also helped for us to improve relations and better our communication with DEQ.	

Where we go from here: Dioxin toxicology is an active area of research both in terms of regulatory approaches for Superfund and academic research. I believe the general consensus is that dioxin is now understood to be significantly more toxic, especially considering bio-magnification (where old predator fish have much high levels) effects than it was in the past.	M37

Ideally there would not be dioxin discharge from Montana Pole. Also, ideally the background levels in Silver Bow Creek would be lower. However, currently dioxin is ubiquitous in the industrial world. This week Montana Fish, Wildlife, and Parks (FWP) released a “Do not eat” advisory for northern pike and a “four meal per month” limit for rainbow trout below the former Smurfit Stone paper mill in Frenchtown which also suffers from dioxin contamination. Dioxin levels in the water of the Clark Fork and in Silver Bow Creek near Montana Pole are similar; although I don’t believe there is currently a human health risk in Silver Bow because of the low fish numbers and lack of anglers. I do believe it’s very important to keep an eye on dioxin levels in groundwater at Montana Pole, to carefully evaluate how perpetual dioxin contamination will be managed to limit its release, and to do further research on dioxin sources in Butte to see if/how they could be mitigated. It would also be prudent to keep an eye on the state of dioxin science to see what the research currently being conducted tells us about the toxicity of dioxin at the levels seen in Silver Bow Creek and Montana Pole discharge. DEQ and Montana EPA will have to evaluate Montana Pole institutional controls (caps, water capture, etc) and ROD cleanup standards when EPA’s updates their national-level dioxin regulatory directives (10+ years in the making already!).	M38

One additional question is the 2011 Five Year Review states DEQ and EPA evaluated changing	M39

the ROD dioxin cleanup standard to match the new, lower water quality standards, found it was unnecessary, but does not give any details. I don't believe the public was informed how that was accomplished and think it is worth asking how that conclusion was made.	

EMAIL N

From: John Ray [mailto:bodinman2003@yahoo.com]
Sent: Thursday, March 03, 2016 8:09 AM
Subject: Re: Additional Input Five Year Review Montana Pole Plant

Clarification Although the comments that I made earlier regarding institutional controls at the Montana Pole Plant were originally directed toward the use of institutional controls in terms of the Butte Priority Soils Superfund site, the concerns that I expressed in my earlier email would also apply to the use of institutional controls at the Montana Pole Plant. The use and implementation of institutional controls are problematic and need to be addressed during the Five Year Review of the Montana Pole Plant site.How would they be used? Will they be protective? Will they be effective? Will they be maintained? All of these are questions that need to be addressed during the Montana Pole Plant Five Year Review.	N1

The Public should be concerned about too great a Reliance on Institutional Controls. Institutional controls per se do nothing to reduce the mobility, toxicity, or volume of contaminants. Institutional controls do nothing to clean up a site. The institutional controls being considered in the EPA's Montana Pole Plant remedy would seriously limit productive land uses. The extensive reliance on institutional controls is also contrary to the Superfund mandate of preference for treatment over restricted land use. Institutional controls do nothing to treat a site. The EPA's own document "Rules of Thumb for Superfund Remedy Selection" states that the law mandates a clear preference for treatment over all other approaches. "EPA expects to use treatment to address the principal threats posed by a site. . . ." [40 CFR 300.430(a)(1)(iii)(A)]. The above document also notes: "Institutional controls. . .generally shall not substitute for more active measures. . . ." (pp. 12-13) *The EPA itself has found significant problems with institutional controls at its other sites*. In an article entitled "EPA, Think Tank Studies Show Superfund Land-use Controls Flawed, December 10, 2001" which summarizes "Superfund Report via Inside EPA.com" by Resources for the Future, we find these conclusions, *reached by the EPA itself*, which due to their significance, I will quote at length: "EPA and environmental think tank studies have shown that the federal and state governments' land-use restrictions at Superfund sites, known as institutional controls (IC), are seriously flawed, with an agency study showing the controls are not reliably implemented and the think tank report finding the controls are dramatically under-funded." "During a November 27 land use control summit, sponsored by the International City/County Management Association (ICMA), EPA officials and the Environmental Law Institute (ELI), outlined numerous shortcomings they have found with EPA's IC monitoring and enforcement efforts nationwide. While EPA released the results of a study showing EPA has failed to ensure Superfund ICs are reliably implemented, and ELI study indicates that EPA's ICs are dramatically under-funded."	N2

"Bruce Means, of EPA's Federal Facilities Restoration and Reuse Office, told attendees that preliminary studies show that half of the ICs implemented under Superfund records of decisions (ROD) were mischaracterized. During a study of RODs conducted during 1999 and 2000, the agency found that half of the ICs established under RODs were not implemented as the agency had planned."

"And Jay Pendergrass of ELI outlined the preliminary findings of ELI's study of state's IC programs, which showed that the programs are severely under-funded."

"In a draft version of the report, Pendergrass found that state environmental programs are underfunded and as a result the sites allocate very little time on IC implementation. The funding and staffing shortfall 'raises concerns about whether [ICs] are implemented as intended and [are] as protective as intended."

"An ICMA source agrees that EPA has serious problems with its IC program, saying that the agency has many RODs with vague or inconsistent references to such controls."
(pages 1-2)

The greater the cleanup of the Montana Pole Plant Operable Unit, the more the site can be used productively. The less cleanup of the Montana Pole Plant, the less the site can be used for residences and recreational uses. Given the EPA's admission that institutional controls have failed it in the past, it is amazing that there will be such extensive use of institutional controls at the Montana Pole Plant site.

Other Problems with Institutional Controls:

a. There is a tendency not to implement institutional controls as time passes. Frequently institutional control mandates are not carried to completion.
b. The effectiveness of institutional controls usually depends upon the ability, personnel and resources of the local government to implement. Often local governments do not have the personnel or resources to devote to the implementation and monitoring of institutional controls. Given the national administration's proposed cutbacks in Superfund allocations, resources will be increasingly unavailable on the national level to monitor implementation and effectiveness of institutional controls. Certainly the financial capacity of Butte's local government to implement and monitor institutional controls is greatly limited. Nowhere does the EPA's comprehensively address the above issue.
c. "Institutional controls rely heavily on humans to implement, oversee, and administer them. It is human nature to ignore tasks that no one else seems to care about or where the purpose is not readily apparent. Residual hazardous substances are a classic example of a problem that is not readily apparent." ("Protecting Public Health at Superfund Sites: Can Institutional Controls Meet the Challenge?" Environmental Law Institute, p. 2)
d. Although EPA must review the remedy every five years, the frequency of this review process may be insufficient to detect the failure of institutional controls.
e. The use of education as part of the institutional controls strategy is a substantial part of the EPA's approach to implementing institutional controls. Research of previous remedies under Superfund indicates that education programs fail to materialize.
f. "In addition to the direct costs of implementing institutional controls, their use can impose

substantial indirect costs on communities, property owners, prospective purchasers and developers by limiting the ways a site may be used. The burden of the restrictions on use of the site falls on the property owner and the community, with the owner reaping potentially lower profits from use of the property and the community receiving lower social benefits from the allowed uses than would have been possible if no restrictions existed." (ELI, *Ibid.)*

g. Because the sites where institutional controls will be implemented will not be cleaned up and will present a continuing potential threat to human health, these sites will be off limits to development in perpetuity. It is difficult to see how the use of institutional controls meshes with the goals of the EPA's Superfund Redevelopment Initiative.
h. It is impossible to determine future possible land uses for the site nor is it possible to predict unanticipated land uses. (See: "Linking Land Use and Superfund Cleanups: Uncharted Territory," by Probst, Hersh, Wernstedy and Mazurek, *Summary of Findings*, RFF, p. 1)
i. "Institutional controls have more problems than just risk miscalculation. Breeches in the site because of future construction, or even animals may cause the control to fail. The lack of a required contingency plan, would not account for new remedies, new information, or failed institutional controls negatively impacts the effectiveness of the treatment. Institutional memory loss was well is an important factor. This memory loss occurs when a party decides to breach the original institutional control without its own knowledge. In fact, in the ICMA (International City/County Management Association) study, the majority of respondents (63%) said that breaches in the institutional controls on a site were highly or somewhat likely. Following up on that question, 30% of the respondents reported that no formal inspection schedule was set up to evaluate the site as require by law." (Erwin Tam, Environmental Science and Economics, UC Berkeley, "Analysis of Institutional Controls at California Superfund Sites.")
j. "Concern has been expressed about the long-term viability of institutional controls as a remediation tool. For example, they may be forgotten; enforcement agencies may not effectively review properties or land users' actions; or land users simply may take their chances. Decision makers should weigh the full costs of such options, including capital costs, costs of long-term sampling and analysis, and costs of replacing equipment, as well as concerns about potential long-term risks associated with contaminants left in place, against the cost options that would remove the contaminants completely. Many local governments do not yet have the capacity and resources necessary to meet the challenges of long-term stewardship." ("Understanding the Role of Institutional Controls at Brownfields Sites: Major Concepts and Issues.")
k. Because institutional controls leave large amounts of contaminants in place, institutional controls will have to be perpetual. Who is to say what anticipated land uses come up for an institutionally controlled area? For example, fifty years after the record of decision for Montana Pole Plant is implemented, the contaminants will still be there threatening human health and the environment, but will the will be there to restrict land uses in order to prevent the release of contaminants. "Institutional controls 'work' only if they are complied with. And while this is true of any site remedy, institutional controls require monitoring and enforcement over long time periods." ("Linking Land Use and Superfund Cleanups: Unchartered Territory, Probst, et al., Resources for the Future Center for Risk Management.) Will the will to enforce institutional controls exist fifty to a hundred years in the future?
l. Legal, social and political pressures limit the effectiveness of institutional controls. (*Ibid*.)

m. The long-term effectiveness of institutional controls is unknown. "There has, however, been little investigation of what happens at sites on the National Priorities List (NPL) when land use plays a prominent role in the remedy selection process. There also has been little analysis of what institutions are involved in making land use decisions and maintaining land use restrictions over time. It is unclear what legal mechanisms are most effective, what institutions will be responsible for enforcing institutional controls, and who's going to pay for these additional responsibilities. We need to be able to answer these questions if land use-based remedies are to be protective over the long term." (*Ibid*.)

"Planners of long-term disposal systems have long recognized the difficulty of maintaining institutional control over property. . . ." (Jack A. Caldwell and Charles C. Reith, *Principles and Practice of Waste Encapsulation*, 1993, p. 35)

Five Year Review Issue
Institutional Controls will be a major part of the remedy for the Montana Pole Plant. There are major problems/issues regarding the use of institutional controls that must be addressed during the Five Year Review. Please consider the following as additional public input.

The Public should be concerned about too great a Reliance on Institutional Controls at the Montana Pole Plant.

Institutional controls per se do nothing to reduce the mobility, toxicity, or volume of contaminants. Institutional controls do nothing to clean up a site. The institutional controls being considered in the EPA's RI/FS for Priority Soils would seriously limit productive land uses and greatly compromise the property rights of owners to use their land as they determine. The extensive reliance on institutional controls is also contrary to the Superfund mandate of preference for treatment over restricted land use. Institutional controls do nothing to treat a site.

The EPA's own document "Rules of Thumb for Superfund Remedy Selection" states that the law mandates a clear preference for treatment over all other approaches. "EPA expects to use treatment to address the principal threats posed by a site. . . ." [40 CFR 300.430(a)(1)(iii)(A)]. The above document also notes: "Institutional controls. . .generally shall not substitute for more active measures. . . ." (pp. 12-13)

The EPA itself has found significant problems with institutional controls at its other sites. In an article entitled "EPA, Think Tank Studies Show Superfund Land-use Controls Flawed, December 10, 2001" which summarizes "Superfund Report via Inside EPA.com" by Resources for the Future, we find these conclusions, *reached by the EPA itself*, which due to their significance, I will quote at length:

"EPA and environmental think tank studies have shown that the federal and state governments' land-use restrictions at Superfund sites, known as institutional controls (IC), are seriously flawed, with an agency study showing the controls are not reliably implemented and the think tank report finding the controls are dramatically under-funded."

"During a November 27 land use control summit, sponsored by the International City/County Management Association (ICMA), EPA officials and the Environmental Law Institute (ELI),

outlined numerous shortcomings they have found with EPA's IC monitoring and enforcement efforts nationwide. While EPA released the results of a study showing EPA has failed to ensure Superfund ICs are reliably implemented, and ELI study indicates that EPA's ICs are dramatically under-funded."

"Bruce Means, of EPA's Federal Facilities Restoration and Reuse Office, told attendees that preliminary studies show that half of the ICs implemented under Superfund records of decisions (ROD) were mischaracterized. During a study of RODs conducted during 1999 and 2000, the agency found that half of the ICs established under RODs were not implemented as the agency had planned."

"And Jay Pendergrass of ELI outlined the preliminary findings of ELI's study of state's IC programs, which showed that the programs are severely under-funded."
"In a draft version of the report, Pendergrass found that state environmental programs are underfunded and as a result the sites allocate very little time on IC implementation. The funding and staffing shortfall 'raises concerns about whether [ICs] are implemented as intended and [are] as protective as intended."

"An ICMA source agrees that EPA has serious problems with its IC program, saying that the agency has many RODs with vague or inconsistent references to such controls."
(pages 1-2)

The greater the cleanup of the Butte Priority Soils Operable Unit, the more the site can be used productively. The less cleanup of the BPSOU, the less the site can be used for residences and recreational uses. Given the EPA's admission that institutional controls have failed it in the past, it is amazing that the remedies listed in the RI/FS for Priority Soils call for such extensive use of institutional controls.

<u>Other Problems with Institutional Controls:</u>

a. There is a tendency not to implement institutional controls as time passes. Frequently institutional control mandates are not carried to completion.
b. The effectiveness of institutional controls usually depends upon the ability, personnel and resources of the local government to implement. Often local governments do not have the personnel or resources to devote to the implementation and monitoring of institutional controls. Given the national administration's proposed cutbacks in Superfund allocations, resources will be increasingly unavailable on the national level to monitor implementation and effectiveness of institutional controls. Certainly the financial capacity of Butte's local government to implement and monitor institutional controls is greatly limited. Nowhere does the EPA's comprehensively address the above issue.
c. "Institutional controls rely heavily on humans to implement, oversee, and administer them. It is human nature to ignore tasks that no one else seems to care about or where the purpose is not readily apparent. Residual hazardous substances are a classic example of a problem that is not readily apparent." ("Protecting Public Health at Superfund Sites: Can Institutional Controls Meet the Challenge?" Environmental Law Institute, p. 2)
d. Although EPA must review the remedy every five years, the frequency of this review process may be insufficient to detect the failure of institutional controls.
e. The use of education as part of the institutional controls strategy is a substantial part of

the EPA's approach to implementing institutional controls. Research of previous remedies under Superfund indicates that education programs fail to materialize. f. "In addition to the direct costs of implementing institutional controls, their use can impose substantial indirect costs on communities, property owners, prospective purchasers and developers by limiting the ways a site may be used. The burden of the restrictions on use of the site falls on the property owner and the community, with the owner reaping potentially lower profits from use of the property and the community receiving lower social benefits from the allowed uses than would have been possible if no restrictions existed." (ELI, *Ibid.)* g. Because the sites where institutional controls will be implemented will not be cleaned up and will present a continuing potential threat to human health, these sites will be off limits to development in perpetuity. It is difficult to see how the use of institutional controls meshes with the goals of the EPA's Superfund Redevelopment Initiative. h. It is impossible to determine future possible land uses for the site nor is it possible to predict unanticipated land uses. (See: "Linking Land Use and Superfund Cleanups: Uncharted Territory," by Probst, Hersh, Wernstedy and Mazurek, *Summary of Findings*, RFF, p. 1) i. "Institutional controls have more problems than just risk miscalculation. Breeches in the site because of future construction, or even animals may cause the control to fail. The lack of a required contingency plan, would not account for new remedies, new information, or failed institutional controls negatively impacts the effectiveness of the treatment. Institutional memory loss was well is an important factor. This memory loss occurs when a party decides to breach the original institutional control without its own knowledge. In fact, in the ICMA (International City/County Management Association) study, the majority of respondents (63%) said that breaches in the institutional controls on a site were highly or somewhat likely. Following up on that question, 30% of the respondents reported that no formal inspection schedule was set up to evaluate the site as require by law." (Erwin Tam, Environmental Science and Economics, UC Berkeley, "Analysis of Institutional Controls at California Superfund Sites.") j. "Concern has been expressed about the long-term viability of institutional controls as a remediation tool. For example, they may be forgotten; enforcement agencies may not effectively review properties or land users' actions; or land users simply may take their chances. Decision makers should weigh the full costs of such options, including capital costs, costs of long-term sampling and analysis, and costs of replacing equipment, as well as concerns about potential long-term risks associated with contaminants left in place, against the cost options that would remove the contaminants completely. Many local governments do not yet have the capacity and resources necessary to meet the challenges of long-term stewardship." ("Understanding the Role of Institutional Controls at Brownfields Sites: Major Concepts and Issues.") k. Because institutional controls leave large amounts of contaminants in place, institutional controls will have to be perpetual. Who is to say what anticipated land uses come up for an institutionally controlled area? For example, fifty years after the record of decision for Butte Priority Soils is implemented, the contaminants will still be there threatening human health and the environment, but will the will be there to restrict land uses in order to prevent the release of contaminants. "Institutional controls 'work' only if they are complied with. And while this is true of any site remedy, institutional controls require monitoring and enforcement over long time periods." ("Linking Land Use and Superfund Cleanups: Unchartered Territory, Probst, et al., Resources for the Future Center for Risk	

Management.) Will the will to enforce institutional controls exist fifty to a hundred years in the future? l. Legal, social and political pressures limit the effectiveness of institutional controls. (*Ibid*.) m. The long-term effectiveness of institutional controls is unknown. "There has, however, been little investigation of what happens at sites on the National Priorities List (NPL) when land use plays a prominent role in the remedy selection process. There also has been little analysis of what institutions are involved in making land use decisions and maintaining land use restrictions over time. It is unclear what legal mechanisms are most effective, what institutions will be responsible for enforcing institutional controls, and who's going to pay for these additional responsibilities. We need to be able to answer these questions if land use-based remedies are to be protective over the long term." (*Ibid*.) "Planners of long-term disposal systems have long recognized the difficulty of maintaining institutional control over property. . . ." (Jack A. Caldwell and Charles C. Reith, *Principles and Practice of Waste Encapsulation*, 1993, p. 35)	

EMAIL O

From: John Ray [mailto:bodinman2003@yahoo.com]
Sent: Thursday, March 17, 2016 8:30 AM
Subject: Montana Pole Plant--Not as Safe as Alleged? Do we have a whitewash?

I have attached three documents that call into question the glowing report that the MDEQ gave to the Council of Commissioners regarding the cleanup of the Montana Pole Plant. My view, supported by independent evidence and conclusions of experts not associated with EPA or MDEQ, is that the Montana Pole Plant is not as safe as alleged by MDEQ and EPA.	O1

A. Caps are very problematic. They are not protective of human health. Since deadly dioxin remains on site, the failure of caps to protect human health is very disturbing given that MDEQ places primary reliance on them. Evidence is provided in my attachments. The following are problems with caps: Caps are not Permanently Protective of Human Health and the Environment. <u>Problems with caps</u>: 1. Metals can be remobilized through bio-irrigation. (Dueri, Sibylle, et. al., University of Laval, Quebec, "Modeling the Transport of Heavy Metals through a Capping-Layer: The case Study of the Flood Sediments Deposited in the Saguenay Fjord, Quebec.") 2. The long term efficacy of caps can be compromised by advection "related to consolidation, diffusion, chemical reactions, and the effect of . . . burrowing activity." (*Ibid.*) 3. Desiccation can cause cracking of the cap cover. (David Daniel, Professor of Civil Engineering, University of Texas, *Geotechnical Practice for Waste Disposal*) 4. The freeze-thaw cycle can produce changes in the structure and fabric of the cover and a way that increases hydraulic conductivity. (*Ibid*.) 5. Caps are difficult to construct correctly. (*Ibid*.) 6. Caps are difficult to maintain and repair. (*Ibid*.) 7. Erosion is a serious problem. (Jack Caldwell, U.S. Department of Energy, *Principles and Practice of Waste Encapsulation*.) 8. Biointrusion can compromise the effectiveness of the cap. (*Ibid*.) 9. Differential settlement of the cap can cause cracking. (Oweis and Khera, New Jersey Institute of Technology, *Geotechnology of Waste Management.)* 10. Caps require regular and often expensive repair. (*Ibid*.) 11. Stabilization of the cap is a problem. (*Ibid*.) 12. Caps present long-term subsidence and settlement issues. (*Ibid*.) 13. Because of their susceptibility to "weathering, cracking and subsidence" caps have limited long term utility. "Wind, rain, and generalized erosion over time can severely damage even a well-designed . . . cover." (U.S. Department of Energy, Office of Environmental Management, "Remediation Technology Descriptions: Containment.") See also: Merritt, Frederick (ed.) *Standard Handbook for Civil Engineers*, McGraw-Hill, New York. The extensive use of caps as a cleanup method for Montana Pole Plant would do nothing to reduce the toxicity and volume and mobility of contaminants. Caps do nothing to clean up a site. The extensive use of caps as a cleanup method for Montana Pole Plant would not	O2

provide a permanent remedy. The extensive use of caps as a cleanup method for Montana Pole Plant would violate the Superfund mandate for treatment over containment. In short, the extensive use of caps for the Montana Pole Plant would not be protective of human health and the environment.	

B. Storm water runoff remains a serious problem at Montana Pole. Given the thinness of the caps, storm water runoff, which regularly flows through the Pole Plant, washes toxics into Silver Bow Creek. Silver Bow Creek can never be restored until this problem is addressed.	O3

C. The use of institutional controls at Montana Pole is very problematic.	O4

These are just three of the serious shortcomings of the "cleanup" at Montana Pole Plant. The documents I have attached list many more. What I ask is that the Council of Commissioners be an independent voice for a good cleanup and not rely solely on the self-serving information provided by MDEQ that says all is good at the Pole Plant. Would MDEQ really criticize its own work? I was watching the hearings about Flint Michigan's water problems and one of the lessons is that relying exclusively on government agencies for information and action doesn't work very well. I ask the Council to independently investigate this issue.	O5

Eternal vigilance is the price of liberty. Thomas Jefferson Wouldn't it be nice if citizens could trust government to do the right thing. Unfortunately, that doesn't always happen. Anytime power is given to a government institution, that institution can escape popular accountability. Even when government is supposedly acting to promote and protect public health and safety, citizens need to be on their guard. The public interest is best promoted and protected by a vigilant public. The Montana Pole Plant Superfund site in Butte usually flies below the public radar, except for those living near the site. Because surface water, groundwater, soils and sediments at the Pole Plant are contaminated with dioxins, the Pole Plant is, perhaps, the most dangerous of the Superfund sites in Butte. The Pole Plant cleanup by the Montana Department of Environmental Quality (MDEQ) leaves much to be desired.	O6

Dioxin poses a serious threat to both human health and the environment. There are **no** safe levels of exposure to dioxin. (EPA) In fact, dioxin has been referred to as the "most toxic chemical known." (*Hazardous Waste in America*, Epstein, Brown and Pope) Lethal effects of dioxin can be seen at very low levels—a millionth of a gram can kill lab animals. Dioxin was the toxic found in Agent Orange and at New York's Love Canal. Dioxin causes serious cancerous and non-cancerous human health effects. (World Health Organization) Dioxin can produce multiple types of cancer. Non-cancerous health effects include type 2 diabetes, impaired immune system, ischemic heart disease, endometriosis, decreased fertility, inability to carry pregnancies to term, birth defects and learning disabilities. According to the National Institute of Environmental Health Sciences, the "dangers of dioxin last for decades after initial exposure."	O7

The Record of Decision for Montana Pole promised that the dioxins, furans, PCPs and PAHs found at the site (all are serious health threats) would be biologically treated and the site cleaned up. Contrary to the promise of cleanup, the MDEQ and EPA have reneged on this promise. MDEQ and EPA have largely abandoned treatment in favor of containment, leaving the threat in place.	

Now, cleanup will consist of leaving all of these toxics on site and "managing them" through institutional controls. The EPA itself says that the toxicity of dioxin exists for an extended period of time. Containment is contrary to the Superfund mandate that treatment is to be preferred over leaving waste in place. The shoddy cleanup at the Pole Plant perpetuates a public health threat that should and could have been fixed.	O8

However, the current containment remedy is not working. Dioxin is still being released .The groundwater treatment system that was implemented at the Pole Plant site still allows for significant discharge of dioxin into Silver Bow Creek—100 times the current dioxin surface water standard. Such discharges will continue for decades to come. MDEQ's own discharge study said that MDEQ's planned cleanup approach would still allow dioxin to be discharged into Silver Bow Creek. MDEQ has ignored this problem and continues to implement a non-protective cleanup. Why was a sub-par cleanup approach selected?	O9

The threat to human health is particularly acute for those living near the Pole Plant. Local residents have had to endure not only a failed cleanup but tremendous odor problems caused by the MDEQ's waste in place remedy.	O10

Citizens have a right to know if and why government is not doing what it said it would do to protect human health and the environment. Agency decisions are binding.	O11

The Pole Plant cleanup, again contrary to what was promised regarding community involvement, has failed to provide the public with timely information about the problems with the cleanup. The lack of any coordinated or effective program for citizen involvement means that citizens are prevented from holding government accountable and influencing government cleanup activities. The lack of transparency by the MDEQ and EPA means that citizens are left to "hope" that government does the right thing.	O12

The public deserves answers to the following questions: (1) Why is the Pole Plant still out of compliance with emission standards for dioxin? And	O13

(2) Why hasn't the Pole Plant been cleaned up? After all, the public's safety is the highest law. (Roman law)	O14

Ctec members, Here is an update on the Montana Pole meeting last week where Janice and I met with Lisa DeWitt of DEQ and their contractors Dan Buffalo and Kathie Roos of TetraTech. I'd be happy to meet with CTEC to discuss further, at say 400 or 430pm prior to next week's	O15

meeting on the 29th if interested. Just let me know, Purpose of Meeting: The purpose of the meeting was laid out in an email from John in August: "The particular focus of the meeting will be to try to "clear the air" regarding what appears to be conflicting data pertaining to emissions/discharges from the Montana Pole Plant. Last spring there was conflicting data presented regarding the nature, extent and potential risk associated with current discharges of toxic materials from the Pole Plant. We thought having a meeting on this topic would afford a good opportunity to discuss the differing data and perhaps reach some consensus as to what is occurring at the Pole Plant." At the meeting we discussed the status of the remedy and the treatment system. In this we talked about the effectiveness of the remedy for capturing and treating the wood treatment contaminant pentachlorophenol (PCP) and dioxin which is a by-product contaminant in PCP. We went over all of the water quality monitoring data and we put together a list of important topics to cover at the Oct 29th meeting next week. Issues: In April this year I prepared a Dioxin Technical Review for CTEC (this is attached to this email). If you remember, DEQ and EPA took major issue with what they called inaccuracies in my reporting. CTEC met with EPA and DEQ on June 5th as part of a meeting to discuss Montana Pole as well as general grant-funding questions. At the June 5th meeting DEQ indicated that the issue they had with the report was not the accuracy of the content, but rather how the information was reported. Lisa DeWitt's main point is that they believe it was inappropriate to provide a table of the higher concentrations of dioxin measured in groundwater and discharge from Montana Pole because it could lead to the conclusion that dioxin levels were always measured that high. Lisa has also said she believes it was inappropriate to give that information to a Montana Standard reporter. My belief is the table was appropriately caveated with the statement "These are some of the higher values; complete data is graphed below." I intended for the Dioxin Data Review to inform CTEC members about dioxin at the site and to inform discussion on management of residual dioxin contamination. I did not intend it to be given to the reporter.	

Resolution: At the meeting we discussed how dioxin levels measured in groundwater at Montana Pole may be influenced by the infiltration-pump-and-treat system they use which is designed to recover contaminants from groundwater faster than would occur normally. I agree with DEQ that the pump and treat system is necessary for the removal of PCP and petroleum contaminants from the soil and groundwater. Dioxin which is produced from the treatment system is an unintended consequence of the groundwater treatment system for PCP and petroleum contaminants. TetraTech provided background dioxin data for Silver Bow Creek which generally shows that the treatment plant discharge does not make the water quality in Silver Bow Creek any worse because the creek contains elevated dioxin from other sources in the environment. Dioxin is ubiquitous in the industrial world and I agree with DEQ that Montana Pole dioxin discharge does not degrade the quality of Silver Bow Creek. Both	O16

the creek (from the greater environment) and the Pole Plant system discharge exceed current water quality standards which ideally they would not. DEQ legally must meet site specific cleanup levels in the ROD; which in general the groundwater and surface water discharge meets the ROD. The ROD cleanup levels for dioxin are significantly less conservative than new EPA federal and DEQ state-wide water quality standards. Compared to current DEQ water quality standards the ROD standard for groundwater is 15 times less conservative and for surface water is a whopping 2000 times less conservative. The current water quality standards for dioxin are very, very low and are commonly exceeded due to background levels of dioxin in our environment. The meeting also helped for us to improve relations and better our communication with DEQ.	

Where we go from here: Dioxin toxicology is an active area of research both in terms of regulatory approaches for Superfund and academic research. I believe the general consensus is that dioxin is now understood to be significantly more toxic, especially considering bio-magnification (where old predator fish have much high levels) effects than it was in the past.	O17

Ideally there would not be dioxin discharge from Montana Pole. Also, ideally the background levels in Silver Bow Creek would be lower. However, currently dioxin is ubiquitous in the industrial world. This week Montana Fish, Wildlife, and Parks (FWP) released a "Do not eat" advisory for northern pike and a "four meal per month" limit for rainbow trout below the former Smurfit Stone paper mill in Frenchtown which also suffers from dioxin contamination. Dioxin levels in the water of the Clark Fork and in Silver Bow Creek near Montana Pole are similar; although I don't believe there is currently a human health risk in Silver Bow because of the low fish numbers and lack of anglers. I do believe it's very important to keep an eye on dioxin levels in groundwater at Montana Pole, to carefully evaluate how perpetual dioxin contamination will be managed to limit its release, and to do further research on dioxin sources in Butte to see if/how they could be mitigated. It would also be prudent to keep an eye on the state of dioxin science to see what the research currently being conducted tells us about the toxicity of dioxin at the levels seen in Silver Bow Creek and Montana Pole discharge. DEQ and Montana EPA will have to evaluate Montana Pole institutional controls (caps, water capture, etc) and ROD cleanup standards when EPA's updates their national-level dioxin regulatory directives (10+ years in the making already!).	O18

One additional question is the 2011 Five Year Review states DEQ and EPA evaluated changing the ROD dioxin cleanup standard to match the new, lower water quality standards, found it was unnecessary, but does not give any details. I don't believe the public was informed how that was accomplished and think it is worth asking how that conclusion was made.	O19

The following are my comments regarding the Montana Pole Plant presentation by MDEQ of October 29, 2013	O20

1. The *Record of Decision* for the Montana Pole Plant clearly calls for active treatment of the waste as the primary cleanup method. The ROD does not support keeping waste in place as the primary or major approach to cleanup. Somewhere along the way, the emphasis on active treatment was changed to an emphasis on containment under caps. That was pretty clear at the Tuesday night (October 29, 2013) Pole Plant meeting. Pages 6, 7, and 35 of the Pole Plant ROD clearly stipulate that active treatment will be the cleanup method. In the *Record of Decision—Montana Pole Plant* we find this quotation that exemplifies the position in the Record of Decision: *All accessible contaminated soils and LNAPL will be excavated to the extent practicable and treated, preventing this material from continuing to contaminate groundwater.* *The selected remedy will also satisfy the preference for treatment as a principal element of the remedy*. Page 35	

2. Active biological treatment does work on wastes such as we find at the Pole Plant and in our climate. For example, an article entitled: "Treatment of Dioxin Contaminate Soils," Standberg, et. al, published in November 2011 by the Swedish Environmental Research Institute provides compelling evidence of the efficacy of active biological treatment on wastes similar to those found at the Pole Plant and in a climate similar to Butte's climate. See also: *Biodgredation of Dioxins and Furans* by Rolf Wittich, July 15, 1998): *Bioremediation of organic pollutants and heavy metals by use of microorganisms represents a safe, inexpensive, and environmentally-friendly concept in modern environmental engineering. During the last three decades intense efforts have been made by microbiologists and environmental engineers in the isolation and characterization of microorganisms capable of degradation, transformation and detoxification of recalcitrant chemical compounds of environmental concern: (polyhalogenated) dibenzo-p-dioxins, dibenzofurans, and diphenyl ethers. Special emphasis is placed on the potential of molecular biology techniques to improve presently available biocatalysts.* (*Biodgredation of Dioxins and Furans* by Rolf Wittich, July 15, 1998)	O21

3. Dioxin is mobile in soils such as those at the Montana Pole Plant. The ROD itself says that it is possible for dioxin in soils to migrate. (Page 14) There are present in the Montana Pole Plant soils co-contaminants that can mobilize dioxin. In addition, the caps that are used will not prevent surface water and other contaminants from leaching down and mobilizing dioxin. Given the problems of caps with bio-irrigation, advection, desiccation, erosion, weathering, bio-intrusion and stabilization, the dioxin in the soil will be mobilized. Only in a pure lab setting does dioxin remain non-mobile. Certainly the Montana Pole Plant is not a pure lab setting. (See: Dioxin reservoirs in southern Viet Nam--A legacy of Agent Orange by Divernychuk, et al in *Chemoshpere* 47 (2002) 117-137. Similar findings are reported in the following: 1. Soil-Plant Transfer of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans to Vegetables of the Cucumber Family (Cucurbitaceae) Anke. Huelster , Jochen F. Mueller , Horst.	O22

Marschner *Environ. Sci. Technol.*, 1994, 28 (6), pp 1110–1115DOI: 10.1021/es00055a021Publication Date: June 1994 (Article: Indicates that dioxin is mobilized in soils as the result of plant activitiy. Given that there will only be a 12 inch cap over dioxin contaminated soils and the cap will have vegetative cover, the vegetative cover will absorb dioxin and bring it to the surface.) 2. Sorption of 2,3,7,8-tetrachlorodibenzo-p-dioxin to soils from water/methanol mixtures Richard W. Walters , Annette. Guiseppi-Elie *Environ. Sci. Technol.*, 1988, 22 (7), pp 819–825DOI: 10.1021/es00172a012 Publication Date: July 1988 3. Study by U.S. Dept. of Agriculture indicated that dioxin is only immobile in soils devoid of other organic material. If any organic co-solvents, as are present at the Pole Plant, are in the soil, mobility will occur. 4. SUBSTANTIAL MIGRATION OF DIOXINS IN AGROCHEMICAL FORMULATIONS, Grant, Sharon, Mortimer, Munro, Stevenson, Gavin, Malcolm, Don and Gaus, Caroline, The University of Queensland (National Research Centre for Environmental Toxicology (EnTox)), 39 *However, the presence of co-contaminants can act as transport facilitators for otherwise low mobility organic compounds (LMOCs) These results highlight that the paradigm of LMOCs being non mobile in soils should be considered carefully together with application specific and environmental factors which may have the ability to considerably change the predicted environmental fate of these chemicals*. (This article supports the above mentioned study by the U.S. Department of Agriculture that if, as we find at the Pole Plant, co-contaminates are present, dioxin does become mobile in soil. The point is that since the remedy for the Pole Plant was changed from one of active treatment to containment, co-contaminants that will make dioxin mobile in soil will be present. 5. *Assessment of Dioxin Contamination at Sawmill Sites:* A Report to the Ministry for the Environment by Tonkin & Taylor Ltd and SPHERE, Prepared for the New Zealand Ministry for the Environment October 2008 (conclusions are similar to the one's I included in my earlier email to you today, i.e. that dioxin is mobile in both soil and water.	

Also, data presented by the MDEQ at the Tuesday meeting indicated that dioxin is present in the recovery trenches at the Pole Plant. If dioxin isn't mobile in soil at the Pole Plant, how did the dioxin get in the recovery trenches? Another point that Ian made: MDEQ is in charge of the cleanup in Missoula of the White Pine Sash site. This site was a wood treatment facility similar to Montana Pole. The MDEQ acknowledges at this site that dioxin can be mobile in soils. Why not acknowledge the same at Montana Pole? Finally, the dioxin levels that we are now seeing in groundwater at the Montana Pole Plant were not supposed to have been reached until 200,000 years from now according to MDEQ. Why, if dioxin is not mobile, are we seeing dioxin now that we should not have seen for 200,000 years?	O23

Summary of my position: 1. The bottom line is that the dioxins, pcps, pahs and furans found at the site are highly toxic and carcinogenic. Dioxin poses a serious threat to both human health and the environment. There are no safe levels of exposure to dioxin. (EPA) In fact, dioxin has been referred to as the “most toxic	O24

chemical known." (*Hazardous Waste in America*, Epstein, Brown and Pope) Lethal effects of dioxin can be seen at very low levels—a millionth of a gram can kill lab animals. Dioxin was the toxic found in Agent Orange and at New York's Love Canal. Dioxin causes serious cancerous and non-cancerous human health effects. (World Health Organization) Dioxin can produce multiple types of cancer. Non-cancerous health effects include type 2 diabetes, impaired immune system, ischemic heart disease, endometriosis, decreased fertility, inability to carry pregnancies to term, birth defects and learning disabilities. According to the National Institute of Environmental Health Sciences, the "dangers of dioxin last for decades after initial exposure." Just dealing with contaminant level statistics can mask the danger posed by these contaminants.	

2. These toxics will largely remain on site to pose a perpetual threat to human health and the environment. The site will never be cleaned up.	O25

3. Even the data presented tonight shows that these toxics have been released. Perhaps not in large quantities, perhaps not all the time, but given the toxicity of the materials even relatively small releases are problematic. And given that the site will not be cleaned up, these releases will continue in perpetuity.	O26

4. Based on the discussion of the DEQ 7 standards, it is obvious that the cleanup levels in the original Record of Decision for the Pole Plant are not protective. The problem is that the current cleanup is not meeting, in a significant number of cases, the DEQ 7 standards. Yet the presentation tonight continually referred to meeting the outdated, non-protective EPA standards in the Record of Decision. Probably, the old Record of Decision will never be reopened.	O27

5. The comparisons of the Pole Plant site to other sites presented at tonight's meeting don't prove anything. Because, for example, the Pole Plant is comparable to other similar sites does not mean that the Butte cleanup is working to protect human health and the environment.	O28

6. The extensive use of caps for the Pole Plant is very problematic. Butte's history with capping toxic waste has not been good. Caps have been very problematic. The dioxins and other contaminants at the Pole Plant will all be just left in place, covered with only 12 inches of topsoil caps. Previous capping on the Butte Hill, which uses more soil than the level at the Pole Plant, has not worked well. We have a situation where the most toxic substances in Butte (dioxins, PCPs and furans) are to be covered with the least amount of soil. Caps, as we have seen in Butte, already are susceptible to failure by means of bio-irrigation, advection, dessication, erosion, weathering, bio-intrusion and stabilization problems. Caps also have significant construction, repair and maintenance problems.	O29

7. Because the responsible parties for the cleanup cashed out, we better get it right now. The money for the cleanup is limited.	O30

In short:	O31

The Record of Decision for Montana Pole promised that the dioxins, furans, PCPs and PAHs found at the site (all are serious health threats) would be biologically treated and the site cleaned up. Contrary to the promise of cleanup, the MDEQ and EPA have reneged on this promise. MDEQ and EPA have largely abandoned treatment in favor of containment, leaving the threat in place. Now, cleanup will consist of leaving all of these toxics on site and "managing them" through institutional controls. The EPA itself says that the toxicity of dioxin exists for an extended period of time. Containment is contrary to the Superfund mandate that treatment is to be preferred over leaving waste in place. The shoddy cleanup at the Pole Plant perpetuates a public health threat that should and could have been fixed.	

However, the current containment remedy is not working. Dioxin is still being released .The groundwater treatment system that was implemented at the Pole Plant site still allows for significant discharge of dioxin into Silver Bow Creek—100 times the current dioxin surface water standard. Such discharges will continue for decades to come. MDEQ's own discharge study said that MDEQ's planned cleanup approach would still allow dioxin to be discharged into Silver Bow Creek. MDEQ has ignored this problem and continues to implement a non-protective cleanup. Why was a sub-par cleanup approach selected? The threat to human health is particularly acute for those living near the Pole Plant. So, while progress has been made, the rosy picture presented at the October 29th meeting does not give us a full picture of what is going on at the Pole Plant.	O32

In addition to the citations I provided in this document, I would also ask that you review Ian's submission of November 5, 2013 to the CTEC board giving his reactions to the conclusions presented at the October 29, 2013 meeting. The following is the email from Ian of March 27, 2013 which I include as a reference point. CTEC members- I thought I would summarize for you the important points from the Montana Pole update at the meeting the other night. 1. The groundwater treatment system discharges dioxin into Silver Creek at 100 times the current very low surface water standard. This is expected to continue for decades under the current plan. It needs to be shown that this will not impact the health of aquatic life, fish, or people who eat them.	O33

2. The Five Year Review from 2011 included three action items that the agencies would summarize for the layperson and distribute to the public the review findings, air monitoring health risks,	O34

and that they sampled soil where the wind-break trees died. This was to be an important response to citizens comments and still needs to happen.	O35

EMAIL P

From: John Ray [mailto:bodinman2003@yahoo.com]
Sent: Monday, March 21, 2016 5:50 AM
Subject: Woeful Lack of Community Involvement Montana Pole Plant

I want to address what I see as a woeful lack of sufficient community involvement activities regarding the Montana Pole Plant Five Year Review in particular and in the Montana Pole Plant remediation in general. Regarding the Five Year Review (I have raised these issues in earlier emails and received NO response, which in and of itself shows how little regard there is on the part of MDEQ and EPA for public involvement in Superfund decision-making), there is a noticeable lack of community involvement.	P1

There have been some ads in the paper that announce the Five Year Review and indicate that if you want more information, in general, about the Montana Pole Plant go to the MDEQ website. There is no indication given that the public is invited to comment, that the public is invited to make its voice heard. Only a few individuals, handpicked by MDEQ, have been interviewed. Why? Why the lack of community involvement? Is it because the cleanup is not working?	P2

This lack of efficacious community involvement has been a common theme throughout the Montana Pole Plant cleanup. The impression is clearly given that public involvement is a nuisance, do as little as you can get away with at the Pole Plant site, and continue as usual. I greatly fear it is more than an impression but is reality. I do not need to reiterate EPA's glowing official policy statements about how community involvement should mold and shape decisions. It is obvious that MDEQ staff either is unaware of what should be the role of community involvement or has decided to ignore these requirements. MDEQ and EPA are ultimately accountable to the public. How can these agencies be accountable if they ignore the public?	P3

It is one thing for an agency to reject public comment after due consideration and after affording an explanation. It is quite another to ignore it altogether as MDEQ and EPA are doing.	P4

At a minimum: 1. There should be clear announcements in the paper soliciting public comment on the Five Year Review. Also, a fact sheet insert about the Five Year Review should be in the paper.	P5

2. There should be a public meeting on the Five Year Review at which meeting the issues are announced and public comment taken. 3. There needs to be hands-on outreach to the affected neighborhoods.	P6

Again, I have made these comments before and been met with stunning silence. I try again with little hope that these comments will have any efficacy. No wonder trust in MDEQ and EPA in Butte is at such a low level. We seem to be getting the same level of responsiveness the people in Flint got.	

EMAIL Q

From: John Ray [mailto:bodinman2003@yahoo.com]
Sent: Monday, March 28, 2016 5:34 AM
Subject: Unanswered Questions that the Five Year Review of the Montana Pole Plant needs to address

The following are unanswered questions that the current Five Year Review of the Montana Pole Plant must address: 1. Why was no risk assessment done for the site? Is not this a glaring omission?	Q1

2. Will dioxin left on-site interface with the floodplain? If so, isn't this contrary to EPA policy. If so, will this not compromise the protectiveness of the remedy?	Q2

3. Why does it appear that the recommendations given in the last Five Year Review of the Montana Pole Pant have been ignored? Have they been ignored? Please provide a detailed discussion of which of the recommendations have been ignored, why they have been ignored, and what will be done to implement them with a timeframe.	Q3

4. Have the dioxin caps been as yet designed?	Q4

5. What will be done, specifically, to control storm water runoff on the site?	Q5

6. Has any definitive decision been as yet made as to what and how institutional controls will be used on-site? This seems to be missing.	Q6

7. How will the institutional controls that will be used on-site relate to redevelopment of the site?	Q7

8. What specific steps will be taken to include the public in future decision making regarding the Pole Plant?	Q8

EMAIL R

From: John Ray [mailto:bodinman2003@yahoo.com]
Sent: Monday, April 04, 2016 1:42 PM
Subject: Dioxin Contamination Still Serious, Unremediated Threat to Public Health at Montana Pole Plant Superfund Site, Butte, Montana--Additonal Comment for Your Consideration

The following appeared today, April 4, 2016 as a guest editorial in The Montana Standard--Butte's daily newspaper. I would like to submit it to you as input into the Five Year Review of the Montana Pole Plant site. I find it shocking that the EPA and Montana Department of Environmental Quality do not seem to take this threat seriously. Dioxin contamination at the Montana Pole Plant site needs to be addressed.	R1

Also, the woeful record of community/public involvement at the site needs to be corrected.	R2

The Montana Pole Plant is currently undergoing a Five Year Review that evaluates the protectiveness of the EPA/MDEQ (Montana Department of Environmental Quality) remedy at the site. If this review comes as a surprise to you it's because MDEQ has done virtually nothing to publicize the review.	R3

The Pole Plant site has been referred to as the "forgotten" Superfund site in Butte because it doesn't get the attention of the Pit or the Parrott Tailings. In many ways it is the most dangerous site because of the presence of deadly dioxin for which there are no safe exposure limits. Contrary to the assertions of MDEQ and EPA, dioxin at the Montana Pole Plant still presents a significant, unresolved threat to human health and the environment.	R4

Until this problem is corrected, Silver Bow Creek cannot be fully restored and talk of future land use at the site is premature.	R5

Based on the site data, I understand that: 1. The dioxin cleanup levels for soils at Montana Pole are not being met and will not be met in the near future.	R6

2. Current dioxin discharge from the Montana Pole Plant into Silver Bow Creek does not meet water quality standards.	R7

3. The existing water quality standards set for Montana Pole Plant are very permissive and less restrictive/protective than national standards. So meeting these lax standards would not protect human health and the environment. But even these lax standards are not being met.	R8

4. The current ground water treatment system in place at Montana Pole Plant discharges dioxin into Silver Bow Creek at 100 times the lax water quality standards limit. 5. This current dioxin discharge at 100 times the permissive water quality standards will continue for decades.	R9

6. MDEQ has decided not to adhere to the cleanup standards set for Montana Pole but will waive them.	R10

7. Given points 1-6 above, how than can MDEQ honestly claim that the site is cleaned-up? 8. Given points 1-6 above, how can MDEQ legitimately claim that the Montana Pole Plant site does not pose a threat to human health?	R11

9. The public is largely unaware of points 1-6 above. Community involvement activities conducted by MDEQ have been sporadic and ineffective. Not only has the public had little role in impacting the decisions regarding Montana Pole Plant, MDEQ has been remiss in simply informing the public as to what is taking place in regard to the Pole Plant cleanup.	R12

The dioxin contamination problem is made worse because of uncontrolled storm water runoff through the Pole Plant. MDEQ admits that this is a problem but, so far, has done little to fix the problem.	R13

The only protection from the dioxin in the soils at Montana Pole Plant will be the MDEQ mandated dirt caps placed over the soil. However, storm water runoff, which continues to be an unremediated problem, compromises the integrity of the soil caps. After all there will only be a few inches of cap to protect the public. Because of bio-irrigation, advection, desiccation, the freeze-thaw cycle, improper construction, repair and maintenance, erosion, biointrusion, differential settlement, poor stabilization, subsidence and weathering, toxic-waste caps in Butte have been extremely ineffective.	R14

The so-called cleanup of the Montana Pole Plant has been in many important respects a failure.	R15

As I said earlier, the Montana Pole Plant is undergoing another Five Year Review where the EPA and MDEQ will evaluate their own work.	R16

MDEQ has not even solicited public comment on the Five Year Review. In an ad in local newspapers, MDEQ said simply: “If you would like to learn more about the Montana Pole and Treating plant Superfund site, please visit the DEQ website.” This ad did not encourage or solicit public comment.	R17

What confidence can the public have in this clandestine review?	R18

Citizens need to demand a real cleanup of the Montana Pole Plant site, not the ineffective cleanup Butte is once again receiving from EPA and MDEQ.	R19

At a minimum, MDEQ needs to involve the public in the Five Year Review of Montana Pole.	R20

Right now all we have is the MDEQ evaluating its own work and excluding the public from meaningful involvement. We should ask MDEQ: Is this the best you can do for Butte?	R21