TETRA TECH

October 15, 2014

Ms. Lisa DeWitt
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Subject: Final 2012 Annual Sampling and Monitoring Report, for the Montana Pole and Treating Plant, Butte-Silver Bow, Montana, Revision 1

Dear Ms. DeWitt:

Tetra Tech, Inc. (Tetra Tech) is submitting the Final 2012 Annual Sampling and Monitoring Report, for the Montana Pole and Treating Plant, Butte-Silver Bow, Montana, Revision 1. This document incorporates all Montana Department of Environmental Quality (DEQ) comments on the Draft 2012 Annual Sampling and Monitoring Report, Revision 1, received via email from DEQ on September 22, 2014.

If you have any questions, please call me at (406) 442-5588.

Sincerely,

Kathie M. Roos

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FINAL

2012
ANNUAL SAMPLING AND MONITORING REPORT
FOR THE
MONTANA POLE AND TREATING PLANT
BUTTE-SILVER BOW, MONTANA

Revision 1

Prepared for:

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October 2014

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ACRONYMS AND ABBREVIATIONS

µg/L	Micrograms per liter
µg/kg	Micrograms per kilogram
ARCO	Atlantic Richfield Company
BPSOU	Butte Priority Soils Operable Unit
BSB	Butte-Silver Bow
CDM	Camp Dresser & McKee
CIP	Community involvement plan
COC	Chain of custody
Dioxin	Polychlorinated dibenzo-p-dioxins
DEQ	Montana Department of Environmental Quality
EDD	Electronic data deliverable
EPA	U.S. Environmental Protection Agency
Furans	Polychlorinated dibenzofurans
GAC	Granulated activated carbon
gpm	Gallons per minute
GWMP	Groundwater and Surface Water Monitoring Plan
LAO	Lower Area One
LNAPL	Light non-aqueous phase liquid
LTU	Land treatment unit
MBMG	Montana Bureau of Mines and Geology
MDHES	Montana Department of Health and Environmental Sciences
MDT	Montana Department of Transportation
mg/kg	Milligrams per kilogram
MPTP	Montana Pole and Treating Plant
NCRT	Near Creek Recovery Trench
NHRT	Near Highway Recovery Trench
O&M	Operations and maintenance
Pace	Pace Analytical Services, Inc.
PAH	Polycyclic aromatic hydrocarbons
PCP	Pentachlorophenol
pg/L	Picograms per liter
PRP	Potentially responsible party
QC	Quality control
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial investigation and feasibility study
ROD	Record of decision

ACRONYMS AND ABBREVIATIONS (Cont.)

RPD	Relative percent difference
SDG	Sample delivery group
SSP	Soil staging and pretreatment piles
Tetra Tech	Tetra Tech, Inc.
TEQ	Toxicity equivalence quotient
WTP	MPTP water treatment plant
WWTP	Butte Metro Sewer Treatment Plant

EXECUTIVE SUMMARY

This annual report for the Montana Pole and Treating Plant (MPTP) site describes site monitoring, summarizes analytical data generated, and evaluates the progress made toward remedial objectives during the 2012 calendar year. The report also discusses additional specific site operation and maintenance (O&M) activities for 2012, such as non-routine maintenance activities at the MPTP water treatment plant (WTP), use of the south-side infiltration system, operation of the land treatment unit (LTU), and other related projects completed at the site during the year.

The primary activities at the MPTP in 2012 included (1) O&M activities, and (2) sampling. The WTP facilities are currently in good working order; however, some potential piping upgrades may be evaluated in the future. The following summarizes activities outside of normal WTP operation:

- On May 14, 2012, a power surge set off several system alarms, and the variable speed drive for a pump in the Near Creek Recovery Trench (NCRT) stopped functioning. A new pump drive for the NCRT was ordered and then installed on July 9, 2012. The refurbished pump drive was delivered on November 16, 2012. The refurbished unit has a 1-year warranty and is being kept on site as a spare.

- The area where contaminated soils were removed in December 2011 and January 2012 was revegetated in April 2012. The area was reseeded by Big Sky Reclamation, Inc., on April 18 to 20, 2012. NorthWestern Energy power pole ends were removed from the site and relocated to the NorthWestern Energy yard on May 21, 2012.

- Full Armor, LLC (Butte, Montana), sprayed for noxious weeds on June 19 and 20, 2012. A second pass was conducted on September 5 and 6, 2012.

- On October 3, 2012, the hazardous waste transporter, Clean Harbors Environmental Services Inc., pumped approximately 1,150 gallons of light non-aqueous phase liquid (LNAPL) from the MPTP site storage tank. The liquid was then transported to the Clean Harbors Aragonite Incineration Facility (EPA identification number: UTD981552177) located in Grantsville, Utah, and was incinerated in October 2012.

The WTP influent, water between the carbon beds, and WTP effluent were sampled and evaluated on a weekly basis. With the exception of a single detection of pentachlorophenol (PCP) in a sample on June 25, 2012 (1.03 micrograms per liter [µg/L]), the WTP effluent water met the Record of Decision (ROD) PCP cleanup level (1.0 µg/L) prior to discharge for the entire year.

Two concerns were identified during 2012:

- There has been a continued decrease in the maximum sustainable pumping rate in the Near Highway Recovery Trench (NHRT) at a given trench water elevation.

- There was a transitory increase in the concentration of PCP in monitoring well MW-S-01 along the eastern edge of the site. Specifically, the concentration of PCP in monitoring well MW-S-01 increased from historical values (at, or near, the detection limit) to 164 µg/L in August 2012.

While several theories can be advanced to explain the changes in the sustainable pumping rate in the NHRT, plant operations and pumping rates will be monitored to determine if additional investigation or modification to plant operations is required.

A variety of factors may have contributed to the recent increase in concentration of PCP in well MW-S-01 along the eastern edge of the site. These factors could include, but are not limited to: (1) an epic rain-on-snow event that resulted in regional flooding and localized ponding of water on site, additional recharge to groundwater caused by heavy rainfall and localized ponding, and likely mobilization of PCP in both the unsaturated zone and aquifer (in 2011), (2) injection of land treatment unit (LTU) retention pond water into groundwater during emergency management of the LTU pond during the flood event (in 2011), and (3) reinjection of treated WTP effluent into the south-side infiltration system (in 2012).

Routine groundwater monitoring continued on a semi-annual basis for the majority of wells at the site and on a monthly basis for the NHRT and NCRT effluent. Results of surface water and groundwater monitoring were evaluated and overall system performance and compliance cleanup levels outlined in the ROD were assessed. Other than a slight and likely temporary increase (2.8 acres) in the area of the PCP plume in 2012, remediation of contaminated groundwater progressed and all requirements of the ROD were satisfied.

No floating product was recovered within the groundwater collection system during 2012, continuing a trend that started in February 2009.

The LTU was tilled during the second quarter of 2012 for the five sampling zones (LTU zones 2, 3, 4, 5 and 10) that had not met the cleanup standard for PCP during the 2011 LTU soil sampling event. There was very little dust and no noticeable odors during these operations. In addition, the LTU was irrigated on eight separate days on an as-needed basis through the summer of 2012 to control fugitive dust when conditions were dry.

Soil in the LTU was sampled on September 26, 2012, at which time 20 soil samples (two samples from each of the 10 LTU zones - one shallow soil sample [0 to 24 inches] and one deep soil sample [24 to 36 inches]) were collected and analyzed for PCP. Additionally, 10 soil samples (one soil sample from each of the 10 LTU zones – one composite sample [0 to 36 inches]) were collected and analyzed for dioxin

(polychlorinated dibenzo-p-dioxins) and polychlorinated dibenzofurans (furans), collectively referred to in this document as “dioxins.” LTU soils were not analyzed for polycyclic aromatic hydrocarbons (PAH) during the 2012 round of sampling, as previous analytical results showed these cleanup levels had already been achieved.

The average concentration of PCP in LTU soils in 2012 was 26.7 milligrams per kilogram (mg/kg) which was below the ROD cleanup level (34 mg/kg). The concentrations of PCP exceeded the ROD cleanup level in LTU zones 2, 3, 5, and 6.

The average concentration of dioxins in LTU soils in 2012 was 2.8 micrograms per kilogram (µg/kg) which was above the ROD cleanup level (0.2 µg/kg). The concentrations of dioxins exceeded the ROD cleanup level in all LTU zones.

The LTU retention pond water was sampled for PCP during the August 13, 2012 annual sampling event. The concentration of PCP in retention pond water on this date was 12.5 µg/L.

Database management activities continued in 2012.

1.0 INTRODUCTION AND PURPOSE

This annual report for the Montana Pole and Treating Plant (MPTP) site describes site monitoring, summarizes analytical data generated, and evaluates the progress made toward remedial objectives during the 2012 calendar year. The report also discusses additional specific site operation activities for 2012, such as non-routine operation and maintenance (O&M) activities at the MPTP water treatment plant (WTP), use of the south-side infiltration system, operation of the land treatment unit (LTU), and other related projects completed at the site during the year.

1.1 REPORT ORGANIZATION

Section 1.0 provides a summary of the site's operational and regulatory history. WTP operation and related activities are discussed in Section 2.0. LTU operations, soil treatment, and soil sampling are summarized in Section 3.0. Section 4.0 provides the results of surface water and groundwater monitoring and an assessment of overall system performance and compliance with the requirements of the MPTP Record of Decision (ROD) (U.S. Environmental Protection Agency [EPA] and Montana Department of Environmental Quality [DEQ] 1993). Historical residential well sampling results are summarized in Section 5.0. Additional site activities are discussed in Section 6.0. Section 7.0 summarizes database management. Tables and figures follow the text. An electronic copy of the Microsoft Access database for the MPTP site is provided in Appendix A. Pentachlorophenol (PCP) sampling results for WTP, groundwater, and surface water are provided in Appendix B. Appendices C through F provide plume maps, results from Mann-Kendall statistical testing, and miscellaneous project documentation.

1.2 SITE HISTORY

The MPTP is located in Butte, Montana, and operated as a wood treating facility from 1946 to 1984 (EPA and DEQ 1993) (Figure 1.1). During most of this period, a solution of about 5 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.

The plant initially included a pole peeling machine, two butt treating vats, on-site chemical storage tanks, and related ancillary facilities. Major modifications to the plant occurred between 1949 and 1951 and again around 1956. Sometime between 1949 and 1951, a 73-foot-long, 6-foot-diameter retort was installed to increase the efficiency of timber treatment production. A second retort, 66 feet long and 7 feet in diameter, was installed around 1956.

On May 5, 1969, an explosion occurred while a charge of poles was being treated in the east butt-treating vat. The explosion generated a fire that destroyed the east vat, boiler room, and retort building. Although the boiler, retorts, and auxiliary equipment were damaged, the plant was rebuilt and functional by December 1969. Petroleum and PCP product reportedly spilled from the east butt-treating vat as a result of the explosion and fire. Additional seepage of product occurred from both retorts as a result of broken pipes and valves damaged by the fire. Reportedly, none of the on-site chemical storage tanks was ruptured as a result of the fire.

In response to implementation of the Resource Conservation and Recovery Act (RCRA), a closed-loop process water system was constructed in 1980. The closed-loop water recovery system was operated by collecting wastewater in storage tanks, recirculating this water through the condensing system, and then evaporating excess water using aeration sprays. On May 17, 1984, the MPTP ceased operations.

1.3 SITE INVESTIGATION

In March 1983, a complaint was filed by a local citizen concerning oil seeping into Silver Bow Creek near the MPTP facility. The Montana Department of Health and Environmental Sciences (MDHES) (now DEQ) investigated the complaint and discovered an oil seep on the south side of Silver Bow Creek directly downgradient from the MPTP facility. Further investigation of the site revealed oil-saturated soils adjacent to the creek and on MPTP property. Subsequent sampling confirmed the presence of PCP, polycyclic aromatic hydrocarbons (PAH), polychlorinated dibenzo-p-dioxins (dioxin), and polychlorinated dibenzofurans (furans) — collectively referred to in this document as “dioxins,” — in site soils and oil samples. MDHES and EPA completed both a preliminary assessment and site inspection and a subsequent Hazard Ranking Score in July 1985.

Also in July 1985, the EPA Emergency Response Program began a removal action on the site to minimize impacts to Silver Bow Creek, to stabilize the site, and to install the initial groundwater recovery and treatment system. In October 1989, EPA granted MDHES the initial enforcement funding to conduct potentially responsible party (PRP) noticing and to negotiate and issue an administrative order. In April 1990, MDHES signed an administrative order on consent with Atlantic Richfield Company (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.

In June 1992, EPA proposed an additional removal action to control and recover the light non-aqueous phase liquid (LNAPL) (floating oils) in groundwater identified during the RI. The older remedial system installed in 1985 was shut down when the MPTP water treatment facility went into operation on January 22, 1993.

1.4 REMEDY IMPLEMENTATION AND STATUS

The MPTP cleanup is being implemented in six phases, as described below.

Phase 1. The design for Phase 1 of the remedial action was finalized in June 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 (SSP), building an addition to the previous WTP, construction of two groundwater recovery trenches that form the current remedy extraction system (the near highway recovery trench [NHRT] and the Near Creek Recovery Trench [NCRT]), removal of the previous EPA groundwater recovery system, and excavation of the north-side contaminated soils.

Phase 2. Phase 2 consisted of removal and disposal of hazardous and nonhazardous waste debris remaining on site. The design for Phase 2 of the remedial action was finalized in December 1998; construction occurred from March 1999 to May 1999. Off-site disposal methods included incineration or placement in hazardous and nonhazardous waste landfills, as appropriate. Metal debris was pressure washed and recycled.

Phase 3. Phase 3 consisted of excavating the south-side contaminated soils, off-loading Phase 1 treated soils from the LTU, placing approximately 132,000 cubic yards of contaminated soil on the LTU, installing the north- and south-side infiltration systems, and relocating sewer and potable water lines. The design for Phase 3 of the remedial action was finalized in July 1999; construction occurred from October 1999 to December 2000. The infiltration system was operated continuously through November 2002. Since that time, the south-side infiltration system has been used periodically to maintain adequate groundwater levels to operate recovery trench pumps and aid in flushing the contaminated soils remaining beneath the interstate. The north-side infiltration system has not been used since 2002.

Phase 4. Phase 4 is ongoing and involves the continued capture and treatment of contaminated groundwater and the biological treatment of contaminated soils. This phase includes off-loading the

LTU as surface soil lifts are remediated to below the action limits set for the site in the ROD. The next and final off-load will likely include all remaining soil on the LTU.

Phase 5. Phase 5 addresses the contaminated soils beneath the interstate that divides the site. In March 2009, Tetra Tech, Inc. (Tetra Tech) submitted a report titled "Final Treatability Study Workplan, Montana Pole and Treating Plant Site – Phase 5" (Tetra Tech 2009) that evaluated areas of residual soil contamination and potential remedial technologies. The report incorporated a literature review of three in situ treatment technologies: in situ chemical oxidation, in situ soil flushing, and in situ bioremediation. Two technologies were retained at that time for further evaluation:

- Modified Fenton's Reagent
- In Situ Soil Flushing

The treatability study will be revisited in 2013, and will consider the additional site data collected over the last few years. It will also take into consideration planned construction activities and associated construction dewatering at the Butte Metro Sewer Treatment Plant, also referred to as the wastewater treatment plant (WWTP), and the impact of dewatering on ongoing remediation at the MPTP site. As described on page 44 of the ROD (EPA and DEQ 1993): "After it has been determined by the lead agency, in consultation with the support agency, that recovery of hazardous substances from these areas 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."

Phase 6. Phase 6 consists of removal and disposal of the soil treatment facilities on the south side of the site and final revegetation of all disturbed areas. Phase 6 began with dismantling the SSPs in 2004. It is expected that the final land use at the site will be determined in conjunction with Butte-Silver Bow (BSB) County and interested citizens, with certain constraints on land use specified by the EPA and DEQ to ensure long-term protectiveness of the remedy, consistent with the ROD.

2.0 WATER TREATMENT PLANT

The following sections provide information related to WTP operations and analytical results for 2012. Overall plant operations including normal WTP operations, redirection of treated WTP effluent to the south-side infiltration system, operational issues encountered and corrective actions taken to address these issues, and collection and analysis of trench and WTP samples are discussed in the sections below.

2.1 WATER TREATMENT PLANT OPERATIONS

The groundwater treatment system at the site consists of a WTP, two groundwater recovery trenches (NHRT and NCRT), and the south-side infiltration system consisting of eight infiltration cells (Figure 2.1). In 2012, the WTP operated at an average flow rate of 340 gallons per minute (gpm) for the entire reporting period (Table 2.1).

Water from the NHRT is first pumped to an oil and water separator to facilitate recovery of any floating product. (No product has been recovered in this system since early 2009.) The combined water from the NHRT (via the oil and water separator) and from the NCRT is then pumped through a four-tank (two parallel carbon trains consisting of primary and secondary carbon tanks connected in series) granulated activated carbon (GAC) treatment system. After carbon treatment, the water (treated effluent) is discharged to Silver Bow Creek. In 2012, some WTP treated effluent was pumped to the south-side infiltration system, as discussed in Section 2.2.

The WTP samples collected between the lead and lag carbon units (station BABB), while higher than the effluent, remained near or below the discharge standard for the entire year. At the end of 2012, the present carbon load has been in operation for 2,300 days (since September 14, 2006).

Approximately 77 kilograms of dissolved PCP were removed from groundwater at the site in 2012. Since the facility went into operation in January 1993, the WTP has treated approximately 2.8 billion gallons of contaminated water (Table 2.2) and has removed approximately 1,638 kilograms of dissolved PCP from the groundwater, in addition to PCP removed through oil recovery operations and natural attenuation. More than 60,000 gallons of free product have also been recovered and disposed of since January 1993.

The NHRT and NCRT, along with their associated pumps, have been reasonably effective in capturing site groundwater. Groundwater capture and plume containment monitoring are evaluated by verifying gradients from downgradient wells toward the trenches and through numerous water level readings. Performance monitoring including an assessment of compliance with ROD cleanup levels is discussed in Section 4.0.

The WTP primary carbon tanks were backwashed three times in 2012 (January 30, 2012; July 16, 2012; and October 22, 2012). The secondary carbon tanks were backwashed four times (March 5, 2012; May 17, 2012; August 14, 2012; and December 24, 2012).

The WTP facilities are currently in good working order; however, some potential piping upgrades may be evaluated in the future. Possible upgrades could (1) reduce the complexity of the current WTP, (2) reduce heating costs, and (3) reduce the cost of maintaining and replacing pumps, especially during extremely cold weather.

2.2 INJECTION ACTIVITIES

Approximately 25 to 30 gpm of treated WTP water continued to be directed to the west side storm drainage area near the west end of the NHRT in 2012 (Figure 1.1). Treated water has been directed to this area by gravity flow since April 2010 to improve the groundwater gradient in a critical capture area for the site PCP plume, while at the same time increasing the groundwater gradient within the NHRT to direct more contaminant toward the recovery pump location at manhole #2 (Figure 1.1). This action should also add oxygenated water to the aquifer, which should stimulate biological reactions and increase treatment rates but may also enhance the precipitation of iron and manganese, or the growth of iron bacteria.

Also in 2012, treated WTP effluent was, at times, directed to the south-side infiltration system, as described below (Figure 2.1). The rates of injection are set by the plant operator, taking into consideration capture gradients, general aquifer elevation, impacts of precipitation and ponding caused by beaver activity, as well as contaminant recovery rates in the WTP. Any effluent not directed to the west side of the NHRT as described above or to the south-side infiltration system was discharged to Silver Bow Creek, as described in the following sections. Injection activities for each quarter of 2012 are discussed in detail below.

First Quarter

Low levels of precipitation during the first quarter contributed to lower than normal on-site groundwater elevations. To avoid having the pump “suck air” in the NHRT, 300 gpm of treated effluent from the WTP was directed to the south-side infiltration system (infiltration cells 4, 5, and 6) from February 17 to March 2, 2012. From March 19 to March 31, 2012, 300 gpm of treated effluent was directed to infiltration cells 7 and 8. No WTP effluent was directly discharged to Silver Bow Creek during the time periods mentioned above. No reinjection occurred prior to February 17, 2012.

Second Quarter

For the first 2 days of the second quarter (April 1 and April 2, 2012), 300 gpm of treated WTP effluent continued to be directed to the south-side infiltration system (infiltration cells 7 and 8); the rate was

reduced to 0 gpm on April 3, 2012. From April 9, 2012, until April 29, 2012, approximately 50 gpm to 80 gpm of treated WTP effluent water was directed to infiltration cell 1. On April 30, 2012, the rate was increased to 150 gpm and was maintained at this rate for the remainder of the second quarter.

Third Quarter

Low levels of precipitation during the third quarter contributed to lower than normal on-site groundwater elevations. From July 1, 2012, to September 16, 2012, 150 gpm of treated effluent from the WTP continued to be directed to infiltration cell 1 of the south-side infiltration system. The treated effluent was directed to infiltration cell 8 from September 17 to September 30, 2012.

Fourth Quarter

Beginning September 17, 2012, and throughout the entire fourth quarter, 150 gpm of treated WTP effluent was directed to infiltration cell 1.

2.3 OPERATIONAL ISSUES

Few non-routine operational issues arose in 2012. Those issues that did arise are discussed in detail below.

2.3.1 Plant Control Issues

On May 14, 2012, a power surge set off several system alarms, and the variable speed drive for a pump in the NCRT stopped functioning. After an initial assessment, Trademark Electric was contacted and subsequently made a service call to troubleshoot the trench electronics. Based on this evaluation, a new pump drive was ordered. During the remainder of the second quarter, the NCRT flow rate was controlled by manually adjusting a valve. A new pump drive for the NCRT was installed on July 9, 2012. Trademark Electric refurbished the old pump drive which was delivered on November 16, 2012. The refurbished unit has a 1-year warranty and is being kept on site as a spare.

2.3.2 NHRT Pumping Rate

There has been a continued decrease in the maximum sustainable pumping rate in the NHRT at a given trench water elevation. While several theories can be advanced to explain the changes in the sustainable pumping rate in the NHRT, plant operations and pumping rates will be monitored to determine if additional investigation or modification to plant operations is required.

2.3.3 Monitoring Well MW-S-01

An increase in the concentration of PCP in monitoring well MW-S-01was noted along the eastern edge of the site. Specifically, the concentration of PCP in monitoring well MW-S-01 increased from historical values (at or near the detection limit) to 164 micrograms per liter (µg/L) on August 8, 2012. The use of the higher PCP concentration in contouring the PCP plume boundary resulted in a slight increase (2.8 acres) in the area of the PCP plume on the eastern edge of the site for 2012. Several factors may have contributed to the increase in concentration at this monitoring well location and slight increase in the area of the PCP plume, including: (1) an epic rain-on-snow event that resulted in ponding of water on site, additional recharge to groundwater caused by ponding, and likely mobilization of PCP in both the unsaturated zone and aquifer (in 2011), (2) injection of LTU retention pond water into groundwater during emergency management of the LTU pond during this same flood (in 2011), and (3) reinjection of treated WTP effluent into the south-side infiltration system.

Rates of injection are set by the plant operator based on operational needs that may be seasonal, and operational adjustments that decrease the flow rate into the south-side infiltration system are being made. Therefore, the increase in the concentration of PCP in monitoring well MW-S-01 noted in 2012 is expected to be temporary, and the area of the plume should decrease in the near future. This situation will continue to be monitored in 2013.

2.4 WATER TREATMENT PLANT SAMPLING RESULTS

Samples of the WTP influent (station IN), effluent (station EFF), and from between the two carbon vessels (station BABB) are collected on a weekly basis and are analyzed for PCP. Effluent from the NHRT and NCRT are sampled monthly and are analyzed for PCP. WTP monitoring stations are shown on Figure 2.2. A summary of the monitoring conducted in 2012 is provided in Table 2.3.

No supplemental monitoring was done in 2012 because there was no construction dewatering at the WWTP.

The concentrations of PCP for WTP samples for the 2001 to 2012 period of record are provided in Table 2.4. Detailed analytical results for 2012 are provided in Appendix A and Appendix B. PCP concentrations have generally decreased over time in the influent samples, ranging from about 130 µg/L to 631 µg/L in 2001, to 35 µg/L to 161 µg/L in 2012. Sampling results throughout 2012 indicate that approximately 96 percent of the contaminant load to the WTP comes from the NHRT and that 4 percent of the contaminant load comes from the NCRT. The concentrations of PCP in WTP effluent samples

(station EFF) were always below the 1 µg/L ROD cleanup level in 2012, except for one sample collected on June 25, 2012 (1.03 µg/L).

This slightly elevated result (1.03 µg/L) was likely related to the partial backwashing of the primary carbon unit on June 21, 2012. The primary carbon unit was partially backwashed by pumping treated water over the inflow side of the bed and out the vent to the LTU. This action was taken because the pressure in the primary carbon vessel was elevated. In some cases in the past, even mild washing of the carbon units results in a temporary increase in the mass of PCP passing through the system. The concentration of plant effluent quickly returned to normal (0.404 µg/L) by the next weekly plant sampling event (July 2, 2012).

The calculated dioxin toxicity equivalence quotient (TEQ) for WTP samples for the 2001 to 2012 period of record are provided on Table 2.5 and Appendix A. Dioxin levels have varied over time, and low levels of dioxins have been detected in WTP effluent samples collected during sampling events each year. Results indicate that not all of the dioxin is removed in the treatment process, but that concentrations of dioxin (TEQ) in WTP effluent have met the ROD cleanup level (10 picograms per liter [pg/L]) since 2001. The concentration of dioxin TEQ in the WTP treated effluent sample collected on August 13, 2012, was 0.44 pg/L.

The concentrations of PAH and chlorophenols in WTP samples collected from four stations (NHRTEFF, NCRTEFF, IN, and EFF) during the August 13, 2012, annual sampling event are provided on Table 2.6 and Appendix A. The WTP station EFF sample was also analyzed for metals and anions (Table 2.6). The concentrations of constituents in the MPTP WTP effluent sample (station EFF) were all below the ROD cleanup levels. There are no ROD cleanup levels for anions, or for stations NHRTEFF, NCRTEFF, and IN.

2.4.1 Floating Product Recovery and Treatment

No measureable floating product (free oil) was observed in the NHRT during 2012. As discussed in Section 4.0, this lack of product continues a trend of zero measureable oil in the NHRT that commenced in February 2009, suggesting that the freely moving light oil phase of contamination is no longer a significant concern at MPTP.

2.5 WATER TREATMENT PLANT IMPROVEMENTS

A power surge on May 14, 2012, set off several system alarms, and the variable speed drive for a pump in the NCRT stopped functioning. Based on an evaluation by Trademark Electric, a new pump drive was ordered and installed on July 9, 2012. Trademark Electric provided an estimate to refurbish the old pump drive in October 2012. This work was approved and the refurbished pump drive was delivered on November 16, 2012. The refurbished unit has a 1-year warranty and will be kept on site as a spare.

3.0 LAND TREATMENT UNIT OPERATIONS

Historical LTU soil management, LTU operation in 2012, and the results of LTU sampling are discussed in the following sections.

3.1 HISTORICAL LTU SOIL MANAGEMENT

Loading of soil into the LTU (Figure 1.1) began in the fall of 1996. By spring 1997, approximately 2 feet of soil from the north-side excavation had been placed on the LTU. During fall 1999, 18 of the 24 inches of treated soils (approximately 24,000 cubic yards) were removed and backfilled on the north side. Six to 8 feet (approximately 132,000 cubic yards) of contaminated soil that had been excavated from the south side were placed on the LTU during the fall of 1999 and summer of 2000. During the fall of 2000, 18 inches of treated soils (approximately 24,000 cubic yards) were removed and used as backfill in the south-side excavation area. During the spring of 2001, contaminated soils from the north-side sewer main replacement project were placed on LTU zones 1 and 2.

In the fall of 2001, 18 to 24 inches of soil (approximately 27,000 cubic yards) were removed from LTU zones 2 to 10 and backfilled into the south-side excavation area. The LTU was tilled monthly during the 2001 treatment season. In response to complaints from residents in the nearby neighborhood regarding odors from the LTU, the tilling frequency was reduced to annually beginning in 2002. The LTU was tilled to a depth of approximately 8 inches in November 2002 and again in October 2003. In 2005, the top 30 inches of LTU soils were determined to have met the treatment standards for PCP and PAH. The top 24 inches of treated soils (approximately 29,000 cubic yards) were offloaded, leaving a 6-inch "buffer" of treated soils in an attempt to minimize odor. The treated soils were backfilled into the south-side excavation areas on site.

The LTU was tilled in October 2005 after the summer offload. In 2007, 32,000 cubic yards of treated soil were offloaded from the LTU and backfilled on the southern portion of the site. The five remaining SSP

piles were dismantled, and 8,000 cubic yards of contaminated soil were moved from the SSPs and placed on the LTU for final treatment. Work in 2009 associated with NHRT modifications and the sewer realignment project added approximately 2,000 cubic yards of excavated soil, which was placed on the western portion of the LTU.

In 2010, the LTU was irrigated through a center pivot unit at regular intervals from April to September to facilitate biologic degradation of the contaminants. The LTU soil was tilled once in April 2010. 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. 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 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. Lastly, 182 linear feet of drill cuttings (approximately 2.3 cubic yards) from five groundwater monitoring well borings were placed on the LTU. The LTU was irrigated on 14 separate days during the second and third quarters of 2011 (2,141,200 gallons were applied). The LTU was not tilled during 2011.

3.2 LTU OPERATIONS IN 2012

The LTU is divided into ten zones, five of which have met the cleanup standards for PAHs and PCP. None of the LTU soils have met the cleanup standard for dioxins. The volume of contaminated soil that remains on the LTU is estimated at 53,000 cubic yards; this estimate includes the sand layer, which is approximately 6 inches thick (approximately 15 percent by volume).

The LTU was tilled during the second quarter of 2012 for the five sampling zones (LTU zones 2, 3, 4, 5, and 10) that had not met the cleanup standard for PCP during the 2011 LTU soil sampling event. There was very little dust and no noticeable odors during these operations.

The LTU was irrigated on eight separate days on an as-needed basis through the summer of 2012 to control fugitive dust when conditions were dry. A total of 1,171,900 gallons of irrigation water (generally a mix of retention pond water and make-up water from treated plant effluent) were applied to the LTU between May 14 and September 5, 2012. The LTU irrigation system was then winterized the week of September 24, 2012, which included turning off the water, draining the system, and turning off power to

the system. No other LTU maintenance activities of any significance occurred after that date. LTU water application data for 2012 are provided in Table 3.1. Historical LTU water application data for the 1999 to 2012 period of record are provided in Table 3.2.

3.3 LTU SOIL SAMPLING AND RESULTS

Soil in the LTU has been sampled on an annual basis starting in 2007. As specified in the Site-Wide Operations and Maintenance Manual (Camp Dresser & McKee [CDM] 2000), soil in the LTU was monitored using composite samples from each of the 10 zones, as shown in Figure 1.1. The most recent soil sampling event was conducted on September 26, 2012, at which time 20 soil samples (two samples from each of the 10 LTU zones — one shallow soil sample [0 to 24 inches] and one deep soil sample [24 to 36 inches]) were collected and analyzed for PCP. Additionally, 10 soil samples (one soil sample from each of the 10 LTU zones – one composite sample [0 to 36 inches]) were collected and analyzed for dioxins. The aliquots from the various depths were homogenized, and representative samples from each depth were analyzed for PCP or dioxins, as appropriate.

Table 3.3 summarizes the analytical data from the 2012 sampling event and also displays historical results from LTU sampling events in October 2007, July 2008, October 2008, July 2009, October 2010, and September 2011. At the direction of DEQ, LTU soils were not analyzed for PAH during the 2012 round of sampling.

The average concentration of PCP in LTU soils in 2012 was 26.7 milligrams per kilogram (mg/kg), which was below the ROD cleanup level (34 mg/kg). The concentrations of PCP exceeded the ROD cleanup level in LTU zones 2, 3, 5, and 6. The maximum concentration (91.7 mg/kg) was detected in zone 3 for a sample collected from the 0- to 24-inch depth interval. The average concentration of PCP for all 10 zones in 2011 was 38.5 mg/kg; comparison of data collected in 2011 and 2012 supports a conclusion that there is a continuing decreasing trend in concentration of PCP in LTU soils over time.

The calculated dioxin TEQ in LTU soils exceeded the ROD cleanup level (0.2 micrograms per kilogram [µg/kg]) in all 10 LTU zones in 2012 (Table 3.3). The maximum concentration (6.0 µg/kg) was detected in the sample collected from the 0- to 36-inch depth interval of zone 7.

Dioxin (TEQ) concentrations for LTU soils were up to an order of magnitude lower in 2011 compared with the reported concentrations for the 2007 through 2010 and the September 2012 sampling events (Table 3.3). Tetra Tech contacted the client services supervisor at Pace Analytical Services, Inc. (Pace), on November 27, 2012, to investigate the anomalously low dioxin concentrations in 2011. Tetra Tech

asked that the laboratory review the 2011 and 2012 analyses and check for possible errors, including but not limited to equipment calibration, unit conversions, and other mathematical errors. After the project had been reviewed for possible sources of error, Scott Unze, the Pace Dioxin project manager, responded to Tetra Tech's November 27, 2012, request via e-mail on December 11, 2012, stating:

> *"I looked at these projects (10170311 and 10206852) and didn't find anything wrong. I spot checked the calculations and those came out fine. Both sets were extracted using the microwave technique, although this was not noted in the discussion of the 2011 report. The moisture contents were generally in the 5-10% range, which should work well for microwave extraction."*

Based on the above information, Tetra Tech concludes there is currently no viable or defensible explanation for the anomalously low dioxin concentrations obtained in 2011. Furthermore, there is no means to re-analyze any of the 2011 dioxin samples collected from the LTU because additional sample material was not archived at the time of sampling. As such, Tetra Tech believes that data collected in years other than 2011 probably best characterize the concentrations of dioxin in LTU soils.

Since dioxins are persistent in the environment and do not easily degrade, it is unlikely that ROD cleanup levels for dioxins in LTU soils will be achieved in the near future. Subsequently, cover soil and institutional controls will be necessary in all areas where treated soils are placed.

LTU soils were not analyzed for PAH in 2012, since all sections of the LTU had previously met the cleanup goal for PAH in two successive sampling efforts.

The next LTU soil sampling event will be conducted in the fall of 2013. The exact date of the sampling event has not yet been scheduled.

3.4 LTU POND SAMPLING AND RESULTS

During the August 13, 2012, annual sampling event, the LTU retention pond water was sampled and analyzed for PCP. The concentration of PCP in retention pond water on this date was 12.5 µg/L.

4.0 SURFACE WATER AND GROUNDWATER MONITORING

Water quality at the MPTP site was monitored on a regular basis from 2001 until August 2010, as specified in the "Site-Wide Operations and Maintenance Manual" (CDM 2000). The MPTP sampling program was revised starting with the November 2010 sampling event as specified in the "Final Groundwater and Surface Water Monitoring, Plan (GWMP), Revision 0" (Tetra Tech 2011). Data

presented in this annual report were collected according to the guidelines provided in the GWMP, Revision 1 (Tetra Tech 2012). The GWMP is currently being updated, and Revision 2 will be finalized in January 2013. GWMP Revision 2 will supersede previous versions of this document. Future revisions to the GWMP, if needed, will continue to be numbered sequentially.

A semi-annual sampling event was conducted during February 2012 and an annual sampling event was conducted in August 2012. Table 2.3 provides a summary of all monitoring conducted in 2012.

4.1 SURFACE WATER MONITORING

As part of routine monitoring for the MPTP site, three surface water locations (SW-05, SS-06A, and SW-09) were sampled in February 2012 (PCP only) and again in August 2012 (for PCP and the extended parameter list of analytes), as outlined in Table 2.3. In addition to PCP (by EPA Method 528), the extended parameter list included PAH (by EPA Method SW8270C), dioxins (by EPA Method SW8290), and chlorophenols (by EPA Method SW8270C). Surface water monitoring locations sampled in 2012 are provided on Figure 4.1 and include:

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

The concentrations of PCP in surface water for the 2001 through 2012 period of record are summarized in Table 4.1, Appendix A, and Appendix B. In 2012, the concentrations of PCP at surface water stations SW-05, SS-06A, and SW-09 were all below the ROD surface water cleanup level (1.0 µg/L).

Over the last 5-year period, the following important observations have been noted:

- 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 very near or below the laboratory detection limit (0.2 µg/L).
- The concentrations of PCP at stations SW-05 and SS-06A have been consistently below the ROD surface water cleanup level for PCP (1 µg/L).

Surface water stations SW-05, SS-06A, and SW-09 were sampled during the annual sampling event on August 13, 2012, and the samples were analyzed for the extended parameter list of analytes. Results are

provided in Table 4.2 (dioxins), Table 4.3 (PAH and chlorophenols), and Appendix A (full database). The concentrations of constituents in surface water in 2012 were all below the ROD surface water cleanup levels (where available).

4.2 GROUNDWATER MONITORING

The locations of all MPTP groundwater monitoring wells are provided on Figure 4.2. Analytical results for PCP in groundwater for seven representative monitoring wells (10-12, BMW-01A, BMW-01B, GW-14R-98, HCA-21, INF-04, and MW-11-04) for the 2000 to 2012 period of record are provided in Table 4.4, Appendix A, and Appendix B. Monitoring wells 10-12, BMW-01A, and BMW-01B are representative downgradient sentinel monitoring wells that document the western extent of the PCP plume; monitoring wells GW-14R-98 and HCA-21 are located along Silver Bow Creek, have the longest period of record, and help document the overall progress of remediation through time; monitoring wells INF-04 and MW-11-04 are located in, or adjacent to onsite PCP plume hotspots and document groundwater conditions in the more heavily contaminated areas of the site north of the interstate highway. Sampling results are discussed further in Section 4.4 below.

In 2012, five monitoring wells (GW-14R-98, INF-04, MW-B-98, MW-V-01, and NWW) were sampled and analyzed for PCP, dioxins, PAH, and chlorophenols as specified in the GWMP Revision 1 (Tetra Tech 2012). Starting in 2013, the seven representative monitoring wells noted above (10-12, BMW-01A, BMW-01B, GW-14R-98, HCA-21, INF-04, and MW-11-04) will be sampled for dioxins, PAH, and chlorophenols instead of the five wells sampled in 2012 (GW-14R-98, INF-04, MW-B-98, MW-V-01, and NWW), per the GWMP Revision 2 (Tetra Tech, in progress). Results of sampling are discussed in Section 4.4 below.

A potentiometric surface map was prepared using static water level data collected on August 6, 2012, from 60 shallow monitoring wells (Figure 4.3); the hydraulic gradient at the MPTP was generally from the southeast to the northwest. The magnitude of the hydraulic gradient was approximately 0.004 foot/foot. These results are consistent with values obtained during historical sampling events since 2005.

Groundwater contours have been influenced by beaver-related activity (beaver dam construction and resulting ponding of water) since the third quarter of 2010. Beaver activity and damming present in August 2012 resulted in localized flooding and groundwater mounding northwest of the NCRT, as exemplified in Figure 4.3. Groundwater mounding in this area assists in facilitating the flow of groundwater south of Silver Bow Creek back toward the NCRT, thus aiding in recovery of dissolved

contaminants. It is expected that groundwater mounding will continue when beaver dams are present and beaver activity persists. However, Butte Priority Soils Operable Unit (BPSOU) staff periodically remove the beaver dams in this area, stating that the dams may harm the remedy in Lower Area One (LAO).

Figure 4.4 provides a more focused analysis of the August 6, 2012, groundwater elevations and interpreted flow directions in the vicinity of the NCRT. Figure 4.4 indicates there is radial flow and hydraulic capture in the shallow aquifer in the vicinity of the NCRT.

Starting on April 20, 2010, and continuing throughout all of 2012, 25 to 30 gpm of treated effluent from the WTP has been continuously diverted to the storm drain at the west end of the NHRT in an effort to influence the hydraulic gradient in this area (Figure 1.1). Groundwater elevation data in 2012 indicate that the water levels in monitoring well A-99 were consistently higher than water levels in wells inside the NHRT, suggesting there may be some effect.

4.3 DISCONTINUATION OF SELECTED METALS AND ANIONS ANALYSES

The ROD does not require that surface water and groundwater samples be analyzed for metals or anions; however, surface water and groundwater samples have historically been analyzed for metals and anions for baseline characterization. Existing data indicate that, for the most part, most metals concentrations are very low or are below the laboratory detection limit values. Exceptions include groundwater samples associated with the LAO operable unit. There are no ROD cleanup levels or DEQ-7 numeric water quality criteria for anions.

Based on a review of existing data, the characterization of baseline concentrations of metals in surface water and groundwater was determined to be complete. Therefore, no further characterization of the concentrations of metals in either surface water or groundwater is required, and these analyses have been discontinued.

The ROD does, however, require that treated discharge to surface water (station EFF) be analyzed for six metals, including arsenic, cadmium, chromium, copper, lead, and zinc (EPA and DEQ 1993). Therefore, the plant effluent sample (station EFF) continues to be analyzed for this suite of metals (by EPA Method 200.8) on an annual basis as specified in the GWMP (Tetra Tech 2012) as previously discussed in Section 2.4.

Other contaminants of interest not specifically called out in the ROD but that have been historically included for analysis for various reasons include the anions bicarbonate, bromide, chloride, fluoride,

phosphate, and nitrate/nitrite. Even though it is not required by the ROD, the plant effluent sample (station EFF) continues to be analyzed for anions (by EPA Method 300.0) on an annual basis to assist in monitoring plant operations.

4.4 PERFORMANCE MONITORING

The concentrations of PCP from the February (semi-annual) and August (annual) groundwater sampling events were evaluated to assess the distribution of PCP in groundwater during 2012. The results of groundwater monitoring and an assessment of compliance with ROD requirements and cleanup levels are presented in the following sections.

4.4.1 2012 Semi-Annual and Annual Groundwater Sampling Events

Samples from 60 shallow monitoring wells, four intermediate wells, and eight deep wells were analyzed for PCP by EPA Method 528 during the 2012 first- and third-quarter sampling events (Table 2.3, Appendix A, and Appendix B). PCP data from shallow wells were plotted and contoured to evaluate trends in concentration and the spatial distribution of PCP contamination. Figure 4.5 and Figure 4.6 provide the distribution of PCP in groundwater on the south side of Silver Bow Creek based on data collected during the February 6, 2012, semi-annual sampling event and the August 13, 2012, annual sampling event.

In general, Figures 4.5 and 4.6 indicate the presence of a plume of PCP approximately 750 feet wide by 1,500 feet long on the south side of Silver Bow Creek oriented along the principal direction of groundwater flow (southeast to northwest). The figures indicate there are several PCP “hot spots” that include:

- Two small areas of contamination (one near monitoring well GW-05, and one near wells PZ-S5-01 and PZ-S3-02) located approximately 600 feet west of the LTU.
- One larger area of contamination (near monitoring wells MW-11-02 and MW-11-04) located adjacent to and underneath the MPTP building, and beneath the interstate highway.
- An area of contamination parallel to the railroad tracks (in the vicinity of monitoring well MW-I-01 [532 µg/L]) north of the NCRT

The concentration of PCP in monitoring well MW-B-96 (1.22 µg/L) on the south side of the LTU was slightly elevated on August 13, 2012, relative to previous recent sampling events (Figure 4.6); the single anomaly does not indicate an upward trend in the concentration of PCP and could be associated with laboratory error. This situation will continue to be monitored.

In addition to analysis for PCP, groundwater samples from four shallow monitoring wells (GW-14R-98, INF-04, MW-B-98, and MW-V-01) and one deep LTU irrigation well (NWW) were analyzed for the extended parameter list of analytes, including dioxins, PAH, and chlorophenols as per the GWMP, Revision 1 (Tetra Tech 2012). Analytical results for dioxins are provided Table 4.5 and Appendix A. Results for PAH and chlorophenols are provided in Table 4.6 and Appendix A. The calculated dioxin TEQ was below the 30 pg/L ROD groundwater cleanup level in all five monitoring wells. The concentrations of PAH and chlorophenols in groundwater were also below ROD cleanup levels for groundwater (where established) in all five wells.

4.4.2 Quality Control

Quality control samples were collected and analyzed in 2012 as per the GWMP Revision 1 (Tetra Tech 2012). Quality control samples consisted of source water blanks and field duplicate samples for liquid matrix samples. Source water blanks (distilled water supplied by the laboratory) were prepared at a frequency of one per 20 samples per sampling event to assess potential external sources of contamination. Field duplicates were also collected at a frequency of one per 20 water samples per sampling event.

Source Water Blanks

A total of 93 source water blank samples were prepared and analyzed in 2012 (Table 4.7). The concentrations of constituents for 91 of 93 source water blanks (98 percent) were below the corresponding detection limit values. Only two of 93 (2 percent) samples exhibited concentrations (chromium [0.7 µg/L] and zinc [2.88 µg/L]) slightly above the detection limit values. These data are interpreted to mean there was no cross contamination for organic constituents in the sampling process for sampling conducted in 2012.

Field Duplicates

A total of 93 field duplicate samples were collected and analyzed in 2012 to evaluate precision. Precision is the degree of mutual agreement between individual measurements of the same property under similar conditions. PCP and extended parameter field duplicate samples were collected at the same time and from the same source at a frequency of one per 20 liquid matrix samples per sampling event. The variance between the samples was then calculated as a relative percent difference (RPD). The formula for RPD is:

$$RPD = \frac{|A-B|}{(A+B)/2} \quad x \quad 100$$

where: A = First duplicate concentration (original sample)
B = Second duplicate concentration (duplicate sample)

The RPD goal for this project is 35 percent (or lower). Eighty-four of 93 duplicate samples (90 percent) met the RPD goal (Table 4.8). The average RPD for all duplicate samples in 2012 was 12.5 percent. Based on these results, the level of precision for sampling conducted in 2012 met the overall project goal.

4.4.3 Data Evaluation and Progress of Remediation

Data from 2012 were evaluated for this annual report by comparing concentrations of site contaminants to ROD cleanup levels, digitizing the area of the PCP plume for various points in time, and performing Mann-Kendall statistical tests for trends in (1) plume size versus time, and (2) PCP concentration versus time. Digitized PCP plumes and plume area calculations are provided in Appendix C. Output from Mann-Kendall statistical testing is provided in Appendix D.

The ROD requires that the WTP effluent, surface water in Silver Bow Creek, and groundwater be monitored to ensure the concentrations of constituents meet established cleanup levels. Eleven stations — one WTP station (station EFF), three surface water stations (stations SW-05, SS-06A, and SW-09), and seven groundwater stations (monitoring wells 10-12, BMW-01A, BMW-01B, GW-14R-98, HCA-21, INF-04, and MW-11-04) — were selected to conduct the data evaluation for this report and assess the progress of remediation at the MPTP site.[1]

The rationales for selecting specific monitoring wells to evaluate the progress of groundwater remediation include:

- Monitoring wells 10-12 (shallow), BMW-01A (deep), and BMW-01B (deepest) were selected because they can be considered downgradient sentinel monitoring wells (shallow and deep well completions) on the south bank of Silver Bow Creek. Data from these wells can be used to evaluate plume capture and the potential for off-site migration of contaminants.

[1] The GWMP Revision 1 (Tetra Tech 2012) is currently undergoing revision to ensure that groundwater samples from WTP station (EFF), three surface water stations (SW-05, SS-06A, and SW-09), five shallow monitoring wells (10-12, GW-14R-98, HCA-21, INF-04, and MW-11-04) and two deep wells (BMW-01A and BMW-01B) are analyzed for PCP, chlorophenols, PAH, and dioxins beginning in 2013. The data evaluation for 2012 is based primarily on the results for PCP, and also for other constituents, where available. Future evaluations and annual monitoring reports will incorporate analytical results for all constituents from the 11 listed monitoring stations.

- Monitoring wells GW-14R-98 (shallow) and HCA-21 (shallow) were selected because they are located on the south bank of Silver Bow Creek within the PCP plume footprint, have a long-term period of record, and can be used to evaluate progress of groundwater remediation over time.

- Monitoring wells INF-04 and MW-11-04 were selected because they are located in or near "hot spots" along the centerline of the PCP plume.

Concentrations of PCP for selected monitoring wells are provided in Table 4.4 and are plotted on Figure 4.5 and Figure 4.6. The extent of the PCP plume in 2012 was previously discussed in Section 4.4.1.

All available dioxin results for groundwater (both historic, and for 2012) are provided in Table 4.5 and Appendix A. In 2012, the calculated dioxin TEQ was below the 30 pg/L ROD groundwater cleanup level for all monitoring wells sampled (Table 4.5).

Analytical results for PAH and chlorophenols are provided in Table 4.6 and Appendix A. The concentrations of PAH and chlorophenols in groundwater (the only exception being PCP) were below ROD groundwater cleanup levels (where established) for all monitoring wells sampled.

Figure 4.7 provides the location of these representative monitoring stations relative to the location of the recent PCP plume boundary (August 13, 2012). To be in compliance, the ROD requires that the following cleanup criteria be met:

1. The WTP effluent (station EFF) must meet the 1 µg/L discharge to surface water cleanup level for PCP (and specified cleanup levels for other contaminants listed in the ROD).

2. Surface water in Silver Bow Creek (stations SW-05, SS-06A, and SW-09) must meet the 1 µg/L surface water cleanup level for PCP (and specified cleanup levels for other contaminants listed in the ROD).

3. The PCP plume must remain on site. For this analysis, this criterion is assumed to be met if the concentration of PCP in groundwater in downgradient sentinel monitoring wells (stations BMW-01A, BMW-01B, and 10-12) continue to meet the ROD groundwater cleanup level for PCP (1 µg/L).

4. The concentrations of PCP in groundwater from representative monitoring wells along the south bank of Silver Bow Creek within the plume footprint (stations GW-14R-98, and HCA-21) must indicate that the trend in PCP concentration over time is decreasing, suggesting that groundwater quality will eventually meet the 1 µg/L groundwater cleanup level for PCP.

5. The concentrations of dioxins, PAH, and chlorophenols in groundwater at representative monitoring wells along Silver Bow Creek must meet the specified cleanup levels listed in the ROD.

6. The overall PCP plume area must be stable or shrinking, showing that ongoing remedial action is effectively preventing the spread of contamination (short-term trend for the previous 5 years).

7. The overall PCP plume area must be stable or shrinking, showing that ongoing remedial action is effectively preventing the spread of contamination (long-term trend, since the ROD was signed [21 years]).

The data collected in 2012 were used to evaluate whether the above seven criteria were met. Results are summarized in Table 4.9; this table indicates all seven ROD requirements listed above were satisfied in 2012, with two minor exceptions:

- The concentration of PCP in one of 52 WTP effluent samples (station EFF) (1.03 µg/L) exceeded the 1 µg/L ROD cleanup level on June 25, 2012.
- There was a minor (and likely temporary) increase in the area of the PCP plume driven by a temporary increase in concentration of PCP in one monitoring well (MW-S-01). The resulting short-term trend (previous 5 years) in the total area of the PCP plume appeared to be increasing in 2012. However, the increase was minor (2.8 acres) and is also expected to be temporary.

The long-term trend in the area of the PCP plume indicates ongoing remedial activities have significantly reduced the area of the PCP plume. Specifically, over the past 21 years (since the ROD was signed), the total area of the PCP plume on the south side of Silver Bow Creek (based on the 1 µg/L isocontour line) has decreased from 41.7 acres in 1993 to 24.2 acres in August 2012. This decrease represents a 42 percent reduction in the area of the PCP plume (17.5 acres). The long-term plume area comparison is provided in Figure 4.8.

Continued groundwater monitoring and statistical analysis of the area of the PCP plume will be conducted in future annual reports to further evaluate the short-term trend in plume area and make operational adjustments, if necessary. Compliance with ROD cleanup levels will also be evaluated on an annual basis.

4.4.4 Light Non-Aqueous Phase Liquids

LNAPL was not detected in any well during any sampling conducted in calendar year 2012. It is likely that this lack of LNAPL indicates that all recoverable LNAPL has been removed from the area. The historical volume of LNAPL recovered for the 2000 through 2012 period of record is provided in Table 4.10.

5.0 RESIDENTIAL WELL MONITORING

The historical concentrations of PCP in groundwater collected from residential wells have been below the ROD cleanup level for several years leading up to 2010; therefore, no residential wells were sampled in 2012. The results of residential well sampling for the 2001 to 2012 period of record are provided in Table 5.1.

6.0 ADDITIONAL ACTIVITIES

The additional activities that took place at the MPTP site in 2012 are described in the following sections.

6.1 POLE REMOVAL ACTIVITIES

A design and bid package for removal of three power poles and associated soil believed to be a continuing source of PCP contamination to groundwater north of MPTP was prepared in the fourth quarter of 2011. Beginning in December 2011, new power poles were installed and Jordan Contracting, Inc., excavated and transported approximately 5,100 cubic yards of contaminated mine waste material to the BSB County Mine Waste Repository. All but the revegetation of the removal area was completed by January 2012. The area was reseeded by Big Sky Reclamation, Inc., on April 18 to 20, 2012 (see Appendix E). The remaining NorthWestern Energy power pole ends were removed from the site and relocated to the NorthWestern Energy yard on May 21, 2012, by the MPTP plant operator.

6.2 WEED SPRAYING

Spraying for weeds by Full Armor, LLC (Butte, Montana), was first conducted during the second quarter, on June 19 and 20, 2012. A second pass was conducted during the third quarter on September 5 and 6, 2012. A third pass was originally scheduled but was deemed unnecessary based on the efficacy of the first two passes.

6.3 PUMPING OF STORAGE TANK

On October 3, 2012, the hazardous waste transporter, Clean Harbors Environmental, Inc., pumped approximately 1,150 gallons of LNAPL (classified as F032 and K001 hazardous waste) from the MPTP site storage tank. The liquid was then transported to the Clean Harbors Aragonite Incineration Facility (EPA identification number: UTD981552177) located in Grantsville, Utah, and was incinerated sometime in October 2012. A copy of the hazardous waste manifest (Manifest Number 005287662FLE) and related documentation is provided in Appendix F. Approximately 50 to 75 gallons of unpumpable solids or

sludge remain in the tank bottom. This material will be properly disposed of when the tank is decommissioned.

6.4 TREATABILITY STUDY WORK PLAN

Initial logistical progress was made related to scheduling appropriate Tetra Tech personnel to revise the outdated treatability study work plan (Tetra Tech 2009) during the fourth quarter of 2012. Cleanup technologies will be identified in this revised work plan, and the feasibility of each technology will be evaluated in regard to its ability to remove PCP source contamination held in residual saturation in the aquifer matrix and vadose zone, specifically under the interstate highway. Cleanup of source material could ultimately lead to termination of the pump and treat system in a reasonable timeframe. The revised treatability study work plan will likely be completed in 2013.

6.5 COMMUNITY INVOLVEMENT PLAN

A kick-off meeting between DEQ and Tetra Tech personnel was held on December 17, 2012, to prepare a community involvement plan (CIP) for the MPTP site. The purpose of the plan is to guide communication with stakeholders and the general public regarding the remaining MPTP cleanup activities. DEQ is working with EPA and community residents to revise the CIP, which may be completed in 2013.

7.0 DATABASE MANAGEMENT

The following database-related activities were completed in 2012:

- Uploaded all electronic data deliverables (EDD) received from the MBMG and Pace Analytical laboratories to the MPTP Microsoft Accesss2010 database
- Performed quality control (QC) of all chains of custody (COC), Montana Bureau of Mines and Geology (MBMG) laboratory EDDs, MBMG sample delivery groups (SDG), and MBMG laboratory Microsoft Excel spreadsheets
- Added 1,497 records to the existing database; at the end of 2012 there were 4,519 individual data records in the database for the 2010 to 2012 period of record
- Corrected selected records in the MPTP database to address any QC issues uncovered during the QC review process
- Maintained an SDG versus COC “lookup table” to easily match SDGs to COCs for future reference.

REFERENCES

Camp Dresser & McKee, Inc. (CDM). 2000. Site-Wide Operations and Maintenance Manual, Montana Pole and Treatment Plant Site. December.

Tetra Tech, Inc. (Tetra Tech). 2009. Final Treatability Study Work Plan, Montana Pole and Treating Plant Site – Phase 5, Butte, Montana. March.

Tetra Tech. 2011. Final Groundwater and Surface Water Monitoring Plan, Revision 0. July.

Tetra Tech. 2012. Final Groundwater and Surface Water Monitoring Plan, Revision 1. January.

U.S. Environmental Protection Agency and Montana Department of Environmental Quality (EPA and DEQ). 1993. *Record of Decision, Montana Pole and Treating Plant National Priorities List Site.*

TABLES

TABLE 2.1
2013 WATER TREATMENT PLANT DISCHARGE RATES

Date	Weekly Discharge Rate [a] (gpm)
1/7/2013	340
1/14/2013	340
1/21/2013	340
1/28/2013	340
2/4/2013	340
2/11/2013	340
2/18/2013	340
2/25/2013	340
3/4/2013	340
3/11/2013	340
3/18/2013	340
3/25/2013	340
4/1/2013	340
4/8/2013	340
4/15/2013	340
4/22/2013	340
4/29/2013	340
5/6/2013	340
5/13/2013	340
5/20/2013	417
5/28/2013	424
6/3/2013	408
6/10/2013	335
6/17/2013	340
6/24/2013	340
7/1/2013	340
7/8/2013	340
7/15/2013	340
7/22/2013	340
7/29/2013	340
8/5/2013	340
8/12/2013	340
8/19/2013	340
8/26/2013	340
9/3/2013	337
9/9/2013	335
9/16/2013	340
9/23/2013	340
9/30/2013	340
10/7/2013	325
10/14/2013	321
10/21/2013	315
10/28/2013	315
11/4/2013	305
11/11/2013	305
11/18/2013	305
11/25/2013	305
12/2/2013	305
12/9/2013	304
12/16/2013	303
12/23/2013	321
12/30/2013	295
Annual Average	**337**

Notes:
a Approximate weekly discharge rate; daily fluctuations are possible
gpm Gallons per minute

TABLE 2.2
APPROXIMATE VOLUME OF WATER TREATED

Dates	Approximate Volume of Water Treated (gallons)
1993 through 1996	231,920,640
1996 through 1997	51,321,600
1998	96,832,800
1999	119,730,240
2000	113,904,000
2001	114,681,600
2002	184,464,000
2003	189,734,400
2004	163,857,600
2005	150,710,400
2006	216,360,000
2007	233,892,000
2008	181,332,000
2009	177,645,600
2010	176,076,000
2011	196,574,400
2012	179,193,600
2013	177,612,500
Total	**2,955,843,380**

TABLE 2.3
HISTORICAL CONCENTRATIONS OF PCP FOR WTP SAMPLES

Date	Laboratory	EPA Method	NCRT Effluent (µg/L)	NHRT Effluent (µg/L)	WTP Influent (µg/L)	WTP BABB (µg/L)	WTP Treated Effluent (µg/L)	ROD Cleanup Level[a] (µg/L)
2001 Range	MBMG	528	6.76 - 55.2	476 - 1185	130 - 631	--	0.1U - **1.12**	1.0
2002 Range	MBMG	528	11.5 - 24	272 - 842	143 - 463	--	0.1U - **7.08**	1.0
2003 Range	MBMG	528	4.3 - 8.8	140 - 304	47 - 262	17.0	0.04U - **1.7**	1.0
2004 Range	MBMG	528	2.4 - 6.7	97 - 192	33 - 82	0.11 - 4.1	0.056 - 0.39	1.0
2005 Range	MBMG	528	1.1 - 5.8	60 - 149	25.7 - 73.7	0.04 - 1.2	0.1U - 0.4	1.0
2006 Range	MBMG	528	1.56 - 6.06	98 - 180	4.21 - 98.8	0.062 - 9.83	0.1U - **3.35**	1.0
2007 Range	MBMG	528	2.69 - 3.92	63.2 - 286	19.3 - 310	0.126 - 1.05	0.06 - 0.483	1.0
2008 Range	MBMG	528	2.98 - 7.81	84.5 - 306	16.9 - 296	0.11 - 17.2	0.089 - **2.58**	1.0
2009 Range	MBMG	528	1.03 - 4.84	36.4 - 306	17.8 - 153	0.2U - 18.7	0.082 - **7.13**	1.0
2010 Range	MBMG	528	1.70 - 7.38	31.1 - 233	10.8 - 84.6	0.2U - 4.3	0.207 - **1.46**	1.0
2011 Range	MBMG	528	3.18 - 11.5	84.2 - 333	9.14 - 137	0.267 - 39.4	0.208 - **15.7**	1.0
2012 Range	MBMG	528	0.785 - 49.4	232 -379	35.5 - 161	0.456 - 14.6	0.23 - **1.03**	1.0
2013 Range	MBMG	528	2.54 - 8.71	126 - 345	0.852 -176	0.2U - 31.1	0.2U - **11.1**	1.0
1/7/2013	MBMG	528	4.05	317	68.5	0.503	0.306	1.0
1/14/2013	MBMG	528	--	--	67.8	0.467	0.332	1.0
1/21/2013	MBMG	528	--	--	91.2	0.677	0.347	1.0
1/28/2013	MBMG	528	--	--	108	3.29	0.702	1.0
2/4/2013	MBMG	528	6.42	204	176	1.22	0.532	1.0
2/11/2013	MBMG	528	--	--	101	0.653	0.408	1.0
2/18/2013	MBMG	528	--	--	93	4.79	0.449	1.0
2/25/2013	MBMG	528	--	--	76.5	0.577	0.33	1.0
3/4/2013	MBMG	528	6.23	345	97.9	0.72	0.394	1.0
3/11/2013	MBMG	528	--	--	72.8	0.677	0.371	1.0
3/18/2013	MBMG	528	--	--	128	0.879	0.472	1.0
3/25/2013	MBMG	528	--	--	94.5	0.576	0.318	1.0
4/1/2013	MBMG	528	5.32	294	100	0.656	0.306	1.0
4/8/2013	MBMG	528	--	--	84.9	0.564	0.332	1.0
4/15/2013	MBMG	528	--	--	95.8	0.918	0.318	1.0
4/22/2013	MBMG	528	--	--	81.2	0.545	0.328	1.0
4/29/2013	MBMG	528	--	--	81.1	0.646	0.32	1.0
5/6/2013	MBMG	528	4.92	238	96.5	0.644	0.333	1.0
5/13/2013	MBMG	528	--	--	85.4	0.837	0.362	1.0
5/20/2013	MBMG	528	--	--	58.2	0.526	0.384	1.0
5/28/2013	MBMG	528	--	--	53.4	0.574	0.36	1.0
6/3/2013	MBMG	528	2.54	174	40.2	0.715	0.52	1.0
6/10/2013	MBMG	528	--	--	47.6	0.945	0.367	1.0
6/17/2013	MBMG	528	--	--	50.8	0.515	0.274	1.0
6/24/2013	MBMG	528	--	--	56.9	0.676	0.268	1.0
7/1/2013	MBMG	528	4.3	156	46.4	0.63	0.32	1.0
7/8/2013	MBMG	528	--	--	49.7	0.702	0.328	1.0
7/15/2013	MBMG	528	--	--	50.6	0.583	0.344	1.0
7/22/2013	MBMG	528	--	--	60.6	1.13	0.29	1.0
7/29/2013	MBMG	528	--	--	34.4	0.549	0.359	1.0
8/5/2013	MBMG	528	--	--	56.3	0.77	0.327	1.0
8/12/2013	MBMG	528	6.08	169	63.8	0.704	0.448	1.0
8/19/2013	MBMG	528	--	--	0.852	0.2U	0.2U	1.0
8/26/2013	MBMG	528	--	--	50.2	0.2U	0.2U	1.0
9/3/2013	MBMG	528	6.53	149	49.8	0.2U	0.2U	1.0
9/9/2013	MBMG	528	--	--	62.7	1.47	0.69	1.0
9/16/2013	MBMG	528	--	--	61.1	22.8	**11.1**	1.0
9/23/2013	MBMG	528	--	--	89.1	31.1	**10.2**	1.0
9/30/2013	MBMG	528	--	--	80.7	22.2	**5.1**	1.0
10/7/2013	MBMG	528	8.71	180	83.8	30	**3.79**	1.0
10/14/2013	MBMG	528	--	--	71.7	9.74	0.299	1.0
10/21/2013	MBMG	528	--	--	71.6	14.6	0.23	1.0
10/28/2013	MBMG	528	--	--	38.9	0.398	0.291	1.0
11/4/2013	MBMG	528	7.21	159	66.3	20.3	0.21	1.0
11/11/2013	MBMG	528	--	--	59.7	20.3	0.2U	1.0
11/18/2013	MBMG	528	--	--	57.1	7.2	0.2U	1.0
11/25/2013	MBMG	528	--	--	37.8	0.325	0.2U	1.0
12/2/2013	MBMG	528	6.34	126	53.8	0.2U	0.2U	1.0
12/9/2013	MBMG	528	--	--	34.7	0.2U	0.2U	1.0
12/16/2013	MBMG	528	--	--	7.2	0.2U	0.2U	1.0
12/23/2013	MBMG	528	--	--	61.5	0.213	0.2U	1.0
12/30/2013	MBMG	528	--	--	59.0	0.254	0.2U	1.0

Notes:

--	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	Analyte not detected
WTP	MPTP water treatment plant

TABLE 2.4
ANALYSES OF SPLIT SAMPLES

STATION ID	DATE SAMPLED	SAMPLE ID	SAMPLE TYPE	DUPLICATE ID	[ORIGINAL SAMPLE] PCP CONCENTRATION MBMG (µg/L)	EPA Method (MBMG)	[SPLIT SAMPLE] PCP CONCENTRATION Pace (µg/L)	EPA Method (Pace)	RPD (Percent)
IN	10/07/13	IN100713	Field		83.8	528	68	515.3	20.8
BABB	10/07/13	BABB100713	Field		30	528	57	515.3	**62.1**
EFF	10/07/13	EFF100713	Field		3.79	528	3.3	515.3	13.8
NCRTEFF	10/07/13	NCRTEFF100713	Field		8.71	528	7.6	515.3	13.6
NHRTEFF	10/07/13	NHRTEFF100713	Field		180	528	178	515.3	1.1
OPOQVS	09/30/13	OPOQVS093013	FD	EFF093013	5.01	528	5.0	515.3	0.2
WTPVS	10/07/13	WTPVS100713	FB		<0.2	528	ND	515.3	0.0
IN	10/14/13	IN101413	Field		71.7	528	61.3	515.3	15.6
BABB	10/14/13	BABB101413	Field		9.74	528	21.6	515.3	**75.7**
EFF	10/14/13	EFF101413	Field		0.299	528	0.4	515.3	28.9
OPOQVS	10/14/13	OPOQVS101413	FB		<0.2	528	ND	515.3	0.0
BABB	10/14/13	WTPVS101413	FD	BABB101413	11.8	528	22.6	515.3	**62.8**
								Average RPD:	24.6

Notes

	The within-laboratory RPD for the MBMG labortory data is 19.1 percent
	The within-laboratory RPD for the Pace laboratory data is 4.5 percent

<	Less than
Bold	Exceeds the 35 percent (or lower) RPD project goal
µg/L	Micrograms per liter
EPA	U.S. Environmental Protection Agency
FB	Field blank
FD	Field duplicate
Field	MPTP WTP station
ID	Identification
MBMG	Montana Bureau of Mines and Geology
ND	Not detected
Pace	Pace Aanlytical
PCP	Pentachlorophenol
RPD	Relative percent difference
WTP	Water treatment plant

TABLE 2.5

SUMMARY OF MONITORING EVENTS

Monitoring Event[a]	Location	Number of Samples to be Collected and Analyzed[b]	Analytical Parameters of Interest	Method Number for Analysis
Weekly Sampling Event[a] (3)	Plant Water	Influent Water (1) Effluent Water (1) BABB Water (1)	PCP	EPA Method 528
Monthly Sampling Event[a] (5)	Plant Water	Influent Water (1) Effluent Water (1) BABB Water (1) NCRT/NHRT effluent (2)	PCP	EPA Method 528
Semi-Annual Sampling Event[a] (80)	Plant Water	Influent Water (1) Effluent Water (1) BABB Water (1) NCRT/NHRT effluent (2)	PCP	EPA Method 528
	Groundwater	Shallow Monitoring Wells (60)[c] Intermediate Monitoring Wells (4) Deep Monitoring Wells (8)	PCP	EPA Method 528
	Surface Water	Surface Water Stations (3)	PCP	EPA Method 528
Annual Sampling Event[a]	Plant Water	BABB Water (1)	PCP	EPA Method 528
	Plant Water	Influent Water (1) Effluent Water (1) NCRT/NHRT effluent (2)	PCP Metals (EFF only)[d] PAHs Dioxins and furans Chlorophenols Anions (EFF only)[d]	EPA Method 528 EPA Method 200.8 EPA Method SW8270C EPA Method SW8290 EPA Method SW8270C EPA Method 300.0
	Groundwater	Shallow Monitoring Wells (60)[c] Intermediate Monitoring Wells (4) Deep Monitoring Wells (8)	PCP	EPA Method 528

TABLE 2.5 (Cont.)

SUMMARY OF MONITORING EVENTS

Monitoring Event[a]	Location	Number of Samples to be Collected and Analyzed[b]	Analytical Parameters of Interest	Method Number for Analysis
(Continued) **Annual Sampling Event[a] (87)**	Groundwater	Shallow Monitoring Wells (5) Deep Monitoring Wells (2)	PCP PAHs Dioxins and furans Chlorophenols	EPA Method 528 EPA Method SW8270C EPA Method SW8290 EPA Method SW8270C
	Surface Water	Surface Water Stations (3)	PCP PAHs Dioxins and furans Chlorophenols	EPA Method 528 EPA Method SW8270C EPA Method SW8290 EPA Method SW8270C
Supplemental Measurement Event[e] (0)[a]	Groundwater	Shallow Monitoring Wells (21)[f] Intermediate Monitoring Wells (2)[f] Deep Monitoring Wells (9)[f]	Depth to groundwater measurement, only	Not Applicable

Notes:

a The number in parenthesis is the total number of samples that were collected per monitoring event.
b The number in parenthesis is the total number of samples that were collected per station.
c Depths to groundwater were also recorded for each shallow monitoring well.
d Analysis for metals included arsenic, cadmium, chromium, copper, lead, and zinc; analysis for anions included bicarbonate, bromide, chloride, fluoride, nitrate/nitrite and phosphate.
e Supplemental monitoring of water levels was conducted from May 22 to June 4, 2013 during maintenance dewatering at the WWTP.
f Depths to groundwater were measured, but no groundwater quality samples were collected.

BABB BABB station is located between the primary and secondary carbon units in the WTP.
EFF WTP effluent station (EFF)
EPA U.S. Environmental Protection Agency
MPTP Montana Pole and Treating Plant
NCRT Near creek recovery trench
NCRT/NHRT Refers to the NCRT effluent sample (NCRTEFF) and the NHRT effluent sample (NHRTEFF)
NHRT Near highway recovery trench
PAH Polycyclic aromatic hydrocarbon
PCP Pentachlorophenol
Plant Water MPTP water treatment plant process water
WTP MPTP water treatment plant

TABLE 2.6
HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR WTP SAMPLES

(µg/L)

Sample Date	NHRT Effluent (µg/L)	NCRT Effluent (µg/L)	WTP Influent (µg/L)	WTP Treated Effluent (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

HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR WTP SAMPLES

(pg/L)

Sample Date	NHRT Effluent (pg/L)	NCRT Effluent (pg/L)	WTP Influent (pg/L)	WTP Treated Effluent (pg/L)	ROD Cleanup Level[a] (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

Notes:

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

µg/L	Micrograms per liter
a	Cleanup level applies to the WTP effluent sample, only.
b	Data for this date appear to be anomalously low.
Bold	Concentration exceeds ROD discharge to surface watercleanup level (10 pg/L).
MPTP	Montana Pole and Treating Plant
NCRT	Near creek recovery trench
NHRT	Near highway recovery trench
pg/L	Picograms per liter
ROD	Record of Decision
TEF	Toxicity equivalence factor
TEQ	Toxicity equivalent
WTP	MPTP water treatment plant

TABLE 2.7
CONCENTRATIONS OF METALS, PAH, CHLOROPHENOLS, AND ANIONS FOR WTP SAMPLES

Sample ID:	NHRTEFF	NCRTEFF	IN	EFF	ROD
Sample Date:	August 12, 2013	August 12, 2013	August 12, 2013	August 12, 2013	Cleanup Level[b]
Units[a]:	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
ANALYTES					
METALS (EPA Method 200.8)					
ARSENIC	7.53	2.57	16.75	2.54	48
CADMIUM	0.25U	0.25U	0.25U	0.25U	1.1 (0.8) [c]
CHROMIUM	0.62	0.76	0.6	0.59	11
COPPER	1.96	2.13	1.54	1.16	12
LEAD	0.52	0.35	0.15U	0.15U	3.2
ZINC	10.39	16.61	9.31	17.07	110
PAH (EPA Method SW8270C)					
ACENAPHTHENE	1U	1U	1U	1U	-
ACENAPHTHYLENE	1U	1U	1U	1U	-
ANTHRACENE	1U	1U	1U	1U	-
BENZO(A)ANTHRACENE	1U	1U	1U	1U	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	1U	1U	1U	1U	1
BENZO(K)FLUORANTHENE	1U	1U	1U	1U	1
CHRYSENE	1U	1U	1U	1U	1
DIBENZO(A,H)ANTHRACENE	0.2U	0.2U	0.2U	0.2U	0.2
FLUORANTHENE	1U	1U	1U	1U	-
FLUORENE	1U	1U	1U	1U	-
INDENO(1,2,3-CD)PYRENE	1U	1U	1U	1U	1
NAPHTHALENE	1.4	1U	1U	1U	-
PHENANTHRENE	1U	1U	1U	1U	-
PYRENE	1U	1U	1U	1U	-
TOTAL D PAHs	1.4	1U	1U	1U	360
CHLOROPHENOLS (EPA Method SW8270C)					
2,3,4,6-TETRACHLOROPHENOL	5.5	1U	1.9	1U	-
2,3,5,6-TETRACHLOROPHENOL	1U	1U	1U	1U	267
2,4,6-TRICHLOROPHENOL	1U	1U	1U	1U	45
2,4-DICHLOROPHENOL	1U	1U	1U	1U	27
2-CHLOROPHENOL	1U	1U	1U	1U	6.5
PENTACHLOROPHENOL	169	6.08	63.8	0.448	1
ANIONS[a] (EPA Method 300)					
BICARBONATE ALKALINITY	293.1	262.88	273.16	271.75	-
BROMIDE	246	234	237	239	-
CHLORIDE	56.24	54.27	54.68	55.28	-
FLUORIDE	0.36	0.51	0.45	0.45	-
ORTHOPHOSPHATE	0.02U	0.03	0.02	0.02	-
NITRATE	2.09	6.28	4.66	4.72	-
NITRITE	0.09	0.01U	0.08	0.01U	-

Notes:
- No cleanup level specified in the ROD
a Concentration unit for anion constituents is 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 COCs.
The hardness-adjusted DEQ-7 Aquatic Life Standard for the chronic standard for cadmium is 0.8 ug/L.
The DEQ-7 standard for benzo(a)pyrene is 0.05 ug/L

Bold Concentration exceeds the ROD discharge to surface water cleanup level
DEQ Montana Department of Environmental Quality
EFF WTP treated effluent station (EFF)
EPA U.S. Environmental Protection Agency
ID Identification
IN WTP influent station (IN)
mg/L Milligrams per liter
MPTP Montana Pole and Treating Plant
NCRTEFF Near Creek Recovery Trench effluent
NHRTEFF Near Highway Recovery Trench effluent
PAH Polycyclic aromatic hydrocarbons
ROD Record of Decision
ug/L Micrograms per liter
U Analyte not detected
WTP MPTP water treatment plant

TABLE 3.1
LTU WATER APPLICATION FOR 2013

Date	Meter (Before)	Meter (After)	LTU Water Application (gallons)	Comments
7/2/2013	50338700	50412900	74,200	-
7/9/2013	50412900	50533300	120,400	-
7/11/2013	50533300	50591500	58,200	-
7/22/2013	50591500	50735300	143,800	-
7/25/2013	50735300	50914800	179,500	-
8/13/2013	50914800	51097700	182,900	-
8/20/2013	51097700	51223400	125,700	-
Total volume applied to LTU in 2013 (gallons):			**884,700**	**-**

Notes:

-	No comment for this date
LTU	Land treatment unit

TABLE 3.2
HISTORICAL LTU WATER APPLICATION

Year	LTU Water Application (gallons)
1999	710,700
2000	425,250
2001	3,188,700
2002	2,321,700
2003	7,395,500
2004	5,034,300
2005	1,921,600
2006	7,007,600
2007	3,042,800
2008	5,784,800
2009	3,758,000
2010	3,169,400
2011	2,141,200
2012	1,171,900
2013	884,700
Total Volume Applied:	**47,958,150**

Note:
LTU Land treatment unit

TABLE 3.3
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	Dioxin TEQ	PCP	Dioxin TEQ	PCP	Dioxin TEQ	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	(0.2 µg/kg)	34 mg/kg	(0.2 µg/kg)	34 mg/kg	(0.2 µg/kg)	(0.2 µg/kg)
Units	mg/kg	µg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	mg/kg	µg/kg	mg/kg	µg/kg	µg/kg
Laboratory	MBMG	TAL	MBMG	MBMG	MBMG	MBMG	MBMG	Pace	MBMG	Pace	MBMG	Pace	Pace
Method	8270	8290	8270	8270	8270	8270	8270	8290	8270	8290	8270	8290	8290
Extraction	NA	MAE	NA	NA	NA	NA	NA	MAE	NA	MAE	NA	MAE	SOX
LTUZ01 0-18"	20.7	--	**82.10**	**61.9**	**42**	22.2	18.6	--	13.9	--	--	--	--
Duplicate of LTUZ01 0-18"	--	--	--	--	--	20.9	--	--	--	--	--	--	--
LTUZ01 18-30"	17.5	--	**69.10**	**52.2**	**41.2**	20.8	10.3	--	1.3	--	--	--	--
LTUZ01 Comp	--	**1.9**		--	--	--	--	**0.3**	--	**3.6**	--	**0.4**	**2.5**
LTUZ02 0-18"	28.4	--	**109**	**75.7**	**81.1**	**67.3**	**34.9**	--	32.6	--	20.3	--	--
LTUZ02 18-30"	**87.6**	--	**124**	**160**	**162**	**64.4**	**47.6**	--	**36.2**	--	18.6	--	--
Duplicate LTUZ02 18-30"	--	--	--	--	--	--	**56.7**	**0.2**	--	--	--	--	--
LTUZ02 Comp	--	**9.1**		--	--		--	**0.3**	--	**2.8**	--	**0.2**	**4.2**
LTUZ03 0-18"	**55.9**	--	**187**	**79.5**	21.5	14.5	**97.9**	--	**91.7**	--	**39.1**	--	--
Duplicate LTUZ03 0-18'	--	--		**183**	--	--	--	--	--	--	--	--	--
LTUZ03 18-30"	**153**	--	**343**	--	**149**	16.6	**96.1**	--	**77.7**	--	**39.3**	--	--
Duplicate LTUZ03 18-30"	--	--	--	--	--	--	--	--	**55.2**	--	--	--	--
LTUZ03 Comp	--	**2.6**		--	--	--	--	**1.0**	--	**1.8**	--	0.1	**2.3**
Duplicate LTUZ03 Comp	--	--		--	--	--	--	--	--	**1.3**	--	--	--
LTUZ04 0-18"	15.9	--	**156**	**36.2**	**46.9**	14.6	**49.9**	--	12.2	--	**45.7**	--	--
LTUZ04 18-30"	13.4	--	**246**	**256**	**37.2**	14.5	**50.9**	--	13.1	--	**40.9**	--	--
LTUZ04 Comp	--	**1.6**		--	--	--	--	**0.6**	--	**2.8**	--	**0.3**	**1.9**
Duplicate LTUZ04 Comp	--	--	--	--	--	--	--	--	--	--	--	0.1	**2.9**
LTUZ05 0-18"	18.3	--	**49.1**	**63.3**	**42.6**	**34.0**	**51.8**	--	**37.2**	--	13.9	--	--
LTUZ05 18-30"	15.5	--	**64.2**	**147**	**50.1**	**50.7**	**41.9**	--	**34.2**	--	12.2	--	--
LTUZ05 Comp	--	**1.2**		--	--	--	--	**0.4**	--	**3.7**	--	0.2	**1.0**
LTUZ06 0-18"	21.8	--	**40.6**	**50.5**	**63.9**	28.5	33.4	--	**41.3**	--	19.3	--	--
LTUZ06 18-30"	16.7	--	32.1	**93.3**	**79**	31.6	32.8	--	**46.2**	--	19.1	--	--
LTUZ06 Comp	--	**1.9**		--	--	--	--	**0.4**	--	**2.5**	--	**0.5**	**2.7**
LTUZ07 0-18"	18.9	--	3.6	--	--	--	20.2	--	20.1	--	--	--	--
Duplicate LTUZ07 0-18"	--	--	--	--	--	--	--	--	--	--	--	--	--
LTUZ07 18-30"	13.0	--	32.6	--	--	--	20.3	--	22.4	--	--	--	--
LTUZ07 Comp	--	**1.1**	--	--	--	--	--	**0.3**	--	**6.0**	--	**0.3**	**3.7**
LTUZ08 0-18"	13.1	--	1.9	--	--	--	27.6	--	18.6	--	--	--	--
LTUZ08 18-30"	33.7	--	4.7	--	--	--	28.2	--	15.7	--	--	--	--
LTUZ08 Comp	--	**1.3**	--	--	--	--	--	**0.6**	--	**1.9**	--	**0.3**	**3.2**
LTUZ09 0-18"	9.26	--	2.74	--	--	--	16.3	--	6.2	--	--	--	--
LTUZ09 18-30"	32.0	--	2.3	--	--	--	22.8	--	5.8	--	--	--	--
LTUZ09 Comp	--	**1.1**	--	--	--	--	--	0.1	--	**1.0**	--	**0.5**	**2.0**
LTUZ10 0-18"	15.4	--	4.1	--	--	--	32.0	--	1.4	--	--	--	--
LTUZ10 18-30"	15.0	--	4.1	--	--	--	**35.8**	--	6.5	--	--	--	--
Duplicate LTUZ10 18-30"	10.4	--	--	--	--	--	--	--	--	--	--	--	--
LTUZ10 Comp	--	**0.9**	--	--	--	--	--	0.1	--	**1.6**	--	0.1	**2.2**
Duplicate LTUZ10 Comp	--	**1.3**	--	--	--	--	--	--	--	--	--	--	--

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.

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

TABLE 4.1
HISTORICAL CONCENTRATIONS OF PCP IN SURFACE WATER

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:	8041A/528[a]	8041A/528[a]	8041A/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
February 6, 2012 (semi-annual sampling event)	0.670	0.2U	0.2U	1.0
August 13, 2012 (annual sampling event)	0.2U	0.2U	0.2U	1.0

Notes:

a	EPA Method 528 was used for analysis starting in 2012
--	Not sampled
µg/L	Micrograms per liter
Bold	Bolded values exceed the ROD surface water cleanup level
EPA	U.S. Environmental Protection Agency
MBMG	Montana Bureau of Mines and Geology laboratory
PCP	Pentachlorophenol
ROD	Record of Decision
Semi-annual	February 2012 semi-annual sampling event
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 4.2

HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR SURFACE WATER SAMPLES

(µg/L)

Sample Date	SW-05 (µg/L)	SS-06A (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	8.10E-08	1.09E-07	1.70E-08	1.00E-05
8/13/2012	3.47E-07	4.10E-08	3.40E-08	1.00E-05

HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR SURFACE WATER SAMPLES

(pg/L)

Sample Date	SW-05 (pg/L)	SS-06A (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	0.08	0.11	0.02	10.00
8/13/2012	0.35	0.04	0.03	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
Bold	Concentration exceeds the ROD surface water cleanup leve
ROD	Record of Decision
TEQ	Toxicity equivalent quotient

TABLE 4.3
CONCENTRATIONS OF PAH AND CHLOROPHENOLS FOR SURFACE WATER SAMPLES

Surface Water Station:	**SW-05**	**SS-06A**	**SW-09**	**ROD Cleanup Level (µg/L)**
Sample Date:	**8/12/2013**	**8/12/2013**	**8/12/2013**	
Laboratory:	**MBMG**	**MBMG**	**MBMG**	
Units:	**(µg/L)**	**(µg/L)**	**(µg/L)**	
ANALYTES				
PAH (EPA Method 8270)				
ACENAPHTHENE	1U	1U	1U	-
ACENAPHTHYLENE	1U	1U	1U	-
ANTHRACENE	1U	1U	1U	-
BENZO(A)ANTHRACENE	1U	1U	1U	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	1U	1U	1U	1
BENZO(K)FLUORANTHENE	1U	1U	1U	1
CHRYSENE	1U	1U	1U	1
DIBENZO(A,H)ANTHRACENE	0.2U	0.31	0.2U	0.2
FLUORANTHENE	1U	1U	1U	-
FLUORENE	1U	1U	1U	-
INDENO(1,2,3-CD)PYRENE	1U	1U	1U	1
NAPHTHALENE	1U	1U	1U	-
PHENANTHRENE	1U	1U	1U	-
PYRENE	1U	1U	1U	-
Total D PAH	1U	1U	1U	360
CHLOROPHENOLS (EPA Method 8270)				
2,3,4,6-TETRACHLOROPHENOL	1U	1U	1U	-
2,3,5,6-TETRACHLOROPHENOL	1U	1U	1U	267
2,4,6-TRICHLOROPHENOL	1U	1U	1U	7
2,4-DICHLOROPHENOL	1U	1U	1U	27
2-CHLOROPHENOL	1U	1U	1U	45
PENTACHLOROPHENOL (EPA Method 528)	0.2U	0.2U	0.2U	1.00

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 COC. The DEQ-7 standard for benzo(a)pyrene is 0.05 ug/L
Bold Concentration exceeds the ROD surface water cleanup level
EPA U.S. Environmental Protection Agency
MBMG Montana Bureau of Mines and Geology
PAH Polycyclic aromatic hydrocarbons
ROD Record of Decision
U Undetected

TABLE 4.4
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**	--	--	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
February 2012 (semi-annual sampling event)	0.2U	--	--	Frozen	**9.35**	**1.6**	**1,450**	1.0
August 2012 (annual sampling event)	0.351	0.2U	0.2U	**1.05**	**1.16**	**67.7**	**1,440**	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
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.
PCP	Pentachlorophenol
ROD	Record of Decision
U	Analyzed for but not detected above the method detection limit

TABLE 4.5
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[a] (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

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[a] (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

Notes:

a	There was insufficient water in monitoring well MW-11-04 to fully bail well prior to collecting sample on 8/12/2013; concentration is likely biased high
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
µg/L	Micrograms per liter
Bold	Concentration exceeds the ROD groundwater cleanup level
pg/L	Picograms per liter
ROD	Record of Decision
TEQ	Toxicity equivalent quotient

TABLE 4.6
CONCENTRATIONS OF PAH AND CHLOROPHENOLS FOR 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)
Sample Date:	8/12/2013	8/12/2013	8/12/2013	8/12/2013	8/12/2013	8/12/2013	8/12/2013	
Laboratory:	MBMG	MBMG	MBMG	MBMG	MBMG	MBMG	MBMG	
Units:	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	
ANALYTE								
PAH (EPA Method 8270)								
ACENAPHTHENE	1U	1U	1U	1U	1U	1U	6.4S	-
ACENAPHTHYLENE	1U	1U	1U	1U	1U	1U	2.1S	-
ANTHRACENE	1U	1U	1U	1U	1U	1U	1US	-
BENZO(A)ANTHRACENE	1U	1U	1U	1U	1U	1U	1US	1
BENZO(A)PYRENE	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1US	0.2/0.05[a]
BENZO(B)FLUORANTHENE	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2US	0.2
BENZO(G,H,I)PERYLENE	1U	1U	1U	1U	1U	1U	1US	1
BENZO(K)FLUORANTHENE	1U	1U	1U	1U	1U	1U	1US	1
CHRYSENE	1U	1U	1U	1U	1U	1U	1US	1
DIBENZO(A,H)ANTHRACENE	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2US	0.2
FLUORANTHENE	1U	1U	1U	1U	1U	1U	1US	-
FLUORENE	1U	1U	1US	1U	1US	1U	2.4	-
INDENO(1,2,3-CD)PYRENE	1U	1U	1U	1U	1U	1U	1US	1
NAPHTHALENE	1U	1U	1U	1U	1U	1U	17.1S	-
PHENANTHRENE	1U	1U	1U	1U	1U	1U	4.4S	-
PYRENE	1U	1U	1U	1U	1U	1U	1US	-
Total D PAH	1U	1U	1U	1U	1U	1U	32.4	360
CHLOROPHENOLS (EPA Method 8270)								
2,3,4,6-TETRACHLOROPHENOL	1U	1U	1U	1U	1U	1.5	21.1D	-
2,3,5,6-TETRACHLOROPHENOL	1U	1U	1U	1U	1U	1U	2	267
2,4,6-TRICHLOROPHENOL	1U	1U	1U	1U	1U	1U	1.5	6.5
2,4-DICHLOROPHENOL	1U	1U	1U	1U	1U	1U	6.6	27
2-CHLOROPHENOL	1U	1U	1U	1U	1U	1U	7	45
PENTACHLOROPHENOL (EPA Method 528)	0.213	0.2U	0.2U	0.297	0.49	**43.2**	**7,400**[b]	1

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 COC. The DEQ-7 standard for benzo(a)pyrene is 0.05 ug/L
b Insufficient water to fully bail well prior to collecting sample; concentration is likely biased high
Bold Concentration exceeds ROD groundwater cleanup level
D Result obtained from analysis of diluted sample
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
S Peak saturated
U Analyte not detected

TABLE 4.7
QUALITY CONTROL - SOURCE WATER BLANKS

Date Sampled	Sample ID	Analyte	EPA Method	Concentration	Q	Units
PENTACHLOROPHENOL (EPA Method 528)						
1/9/2012	WTPVS010912	PENTACHLOROPHENOL	528	0.2	U	µg/L
1/23/2012	WTPVS012312	PENTACHLOROPHENOL	528	0.2	U	µg/L
2/6/2012	MW-E-98020612	PENTACHLOROPHENOL	528	0.2	U	µg/L
2/6/2012	MW-20020612	PENTACHLOROPHENOL	528	0.2	U	µg/L
2/7/2012	MW-21020712	PENTACHLOROPHENOL	528	0.2	U	µg/L
2/8/2012	MW-G-98020812	PENTACHLOROPHENOL	528	0.2	U	µg/L
2/13/2012	WTPVS021312	PENTACHLOROPHENOL	528	0.2	U	µg/L
2/27/2012	OPOQVS022712	PENTACHLOROPHENOL	528	0.2	U	µg/L
3/19/2012	WTPVS031912	PENTACHLOROPHENOL	528	0.2	U	µg/L
3/26/2012	OPOQVS032612	PENTACHLOROPHENOL	528	0.2	U	µg/L
4/9/2012	OPOQVS040912	PENTACHLOROPHENOL	528	0.2	U	µg/L
4/30/2012	WTPVS043012	PENTACHLOROPHENOL	528	0.2	U	µg/L
5/14/2012	WTPVS051412	PENTACHLOROPHENOL	528	0.2	U	µg/L
5/21/2012	WTPVS052112	PENTACHLOROPHENOL	528	0.2	U	µg/L
6/4/2012	OPOQVS060412	PENTACHLOROPHENOL	528	0.2	U	µg/L
6/25/2012	WTPVS062512	PENTACHLOROPHENOL	528	0.2	U	µg/L
7/9/2012	WTPVS070912	PENTACHLOROPHENOL	528	0.2	U	µg/L
7/16/2012	OPOQVS071612	PENTACHLOROPHENOL	528	0.2	U	µg/L
8/6/2012	WTPVS080612	PENTACHLOROPHENOL	528	0.2	U	µg/L
8/7/2012	MW-18080712	PENTACHLOROPHENOL	528	0.2	U	µg/L
8/8/2012	MW-21080812	PENTACHLOROPHENOL	528	0.2	U	µg/L
8/9/2012	MW-19080912	PENTACHLOROPHENOL	528	0.2	U	µg/L
8/13/2012	MW-20081312	PENTACHLOROPHENOL	528	0.2	U	µg/L
8/20/2012	OPOQVS082012	PENTACHLOROPHENOL	528	0.2	U	µg/L
9/10/2012	WTPVS091012	PENTACHLOROPHENOL	528	0.2	U	µg/L
9/17/2012	OPOQVS091712	PENTACHLOROPHENOL	528	0.2	U	µg/L
10/8/2012	WTPVS100812	PENTACHLOROPHENOL	528	0.2	U	µg/L
10/15/2012	OPOQVS101512	PENTACHLOROPHENOL	528	0.2	U	µg/L
11/5/2012	WTPVS110512	PENTACHLOROPHENOL	528	0.2	U	µg/L
11/12/2012	OPOQVS111212	PENTACHLOROPHENOL	528	0.2	U	µg/L
11/26/2012	OPOQVS112612	PENTACHLOROPHENOL	528	0.2	U	µg/L
12/17/2012	WTPVS121712	PENTACHLOROPHENOL	528	0.2	U	µg/L
12/24/2012	OPOQVS122412	PENTACHLOROPHENOL	528	0.2	U	µg/L
SVOC (EPA Method 8270)						
7/9/2012	WTPVS070912	2,3,4,6-TETRACHLOROPHENOL	8270	1	U	µg/L
8/13/2012	MW-20081312	2,3,4,6-TETRACHLOROPHENOL	8270	1	U	µg/L
7/9/2012	WTPVS070912	2,3,5,6-TETRACHLOROPHENOL	8270	1	U	µg/L
8/13/2012	MW-20081312	2,3,5,6-TETRACHLOROPHENOL	8270	1	U	µg/L
7/9/2012	WTPVS070912	2,4,5-TRICHLOROPHENOL	8270	1	U	µg/L
8/13/2012	MW-20081312	2,4,5-TRICHLOROPHENOL	8270	1	U	µg/L
7/9/2012	WTPVS070912	2,4,6-TRICHLOROPHENOL	8270	1	U	µg/L
8/13/2012	MW-20081312	2,4,6-TRICHLOROPHENOL	8270	1	U	µg/L
7/9/2012	WTPVS070912	2,4-DICHLOROPHENOL	8270	1	U	µg/L
8/13/2012	MW-20081312	2,4-DICHLOROPHENOL	8270	1	U	µg/L
7/9/2012	WTPVS070912	2-CHLOROPHENOL	8270	1	U	µg/L
8/13/2012	MW-20081312	2-CHLOROPHENOL	8270	1	U	µg/L
7/9/2012	WTPVS070912	4-CHLORO-3-METHYLPHENOL	8270	1	U	µg/L
8/13/2012	MW-20081312	4-CHLORO-3-METHYLPHENOL	8270	1	U	µg/L
PAH (EPA Method 8270)						
8/13/2012	MW-20081312	ACENAPHTHENE	8270	1	U	µg/L
8/13/2012	MW-20081312	ACENAPHTHYLENE	8270	1	U	µg/L
8/13/2012	MW-20081312	ANTHRACENE	8270	1	U	µg/L
8/13/2012	MW-20081312	BENZO(A)ANTHRACENE	8270	1	U	µg/L
8/13/2012	MW-20081312	BENZO(A)PYRENE	8270	0.1	U	µg/L
8/13/2012	MW-20081312	BENZO(B)FLUORANTHENE	8270	0.2	U	µg/L
8/13/2012	MW-20081312	BENZO(G,H,I)PERYLENE	8270	1	U	µg/L
8/13/2012	MW-20081312	BENZO(K)FLUORANTHENE	8270	1	U	µg/L
8/13/2012	MW-20081312	CHRYSENE	8270	1	U	µg/L
8/13/2012	MW-20081312	DIBENZO(A,H)ANTHRACENE	8270	0.2	U	µg/L
8/13/2012	MW-20081312	FLUORANTHENE	8270	1	U	µg/L

TABLE 4.7
QUALITY CONTROL - SOURCE WATER BLANKS

Date Sampled	Sample ID	Analyte	EPA Method	Concentration	Q	Units
8/13/2012	MW-20081312	FLUORENE	8270	1	U	µg/L
8/13/2012	MW-20081312	INDENO(1,2,3-CD)PYRENE	8270	1	U	µg/L
8/13/2012	MW-20081312	NAPHTHALENE	8270	1	U	µg/L
8/13/2012	MW-20081312	PHENANTHRENE	8270	1	U	µg/L
8/13/2012	MW-20081312	PYRENE	8270	1	U	µg/L
DIOXIN (TEQ) (EPA Method 8290)						
8/13/2012	MW-20081312	2,3,7,8-TCDF	8290	0.67	U	pg/L
8/13/2012	MW-20081312	2,3,7,8-TCDD	8290	0.87	U	pg/L
8/13/2012	MW-20081312	1,2,3,7,8-PeCDF	8290	0.89	U	pg/L
8/13/2012	MW-20081312	2,3,4,7,8-PeCDF	8290	0.62	U	pg/L
8/13/2012	MW-20081312	1,2,3,7,8-PeCDD	8290	0.84	U	pg/L
8/13/2012	MW-20081312	1,2,3,4,7,8-HxCDF	8290	0.49	U	pg/L
8/13/2012	MW-20081312	1,2,3,6,7,8-HxCDF	8290	0.48	U	pg/L
8/13/2012	MW-20081312	2,3,4,6,7,8-HxCDF	8290	0.5	U	pg/L
8/13/2012	MW-20081312	1,2,3,7,8,9-HxCDF	8290	0.6	U	pg/L
8/13/2012	MW-20081312	1,2,3,4,7,8-HxCDD	8290	0.61	U	pg/L
8/13/2012	MW-20081312	1,2,3,6,7,8-HxCDD	8290	0.62	U	pg/L
8/13/2012	MW-20081312	1,2,3,7,8,9-HxCDD	8290	0.63	U	pg/L
8/13/2012	MW-20081312	1,2,3,4,6,7,8-HpCDF	8290	0.71	U	pg/L
8/13/2012	MW-20081312	1,2,3,4,7,8,9-HpCDF	8290	0.99	U	pg/L
8/13/2012	MW-20081312	1,2,3,4,6,7,8-HpCDD	8290	1.1	U	pg/L
8/13/2012	MW-20081312	OCDF	8290	1.7	U	pg/L
8/13/2012	MW-20081312	OCDD	8290	2.2	U	pg/L
8/13/2012	MW-20081312	Total TCDF	8290	0.67	U	pg/L
8/13/2012	MW-20081312	Total TCDD	8290	0.87	U	pg/L
8/13/2012	MW-20081312	Total PeCDF	8290	0.76	U	pg/L
8/13/2012	MW-20081312	Total PeCDD	8290	0.84	U	pg/L
8/13/2012	MW-20081312	Total HxCDF	8290	0.52	U	pg/L
8/13/2012	MW-20081312	Total HxCDD	8290	0.62	U	pg/L
8/13/2012	MW-20081312	Total HpCDF	8290	0.85	U	pg/L
METALS - TOTAL (EPA Method 200.8)						
8/13/2012	MW-20081312	ARSENIC	200.8	0.5	U	µg/L
8/13/2012	MW-20081312	CADMIUM	200.8	0.08	U	µg/L
8/13/2012	MW-20081312	CHROMIUM	200.8	**0.7**		µg/L
8/13/2012	MW-20081312	COPPER	200.8	0.5	U	µg/L
8/13/2012	MW-20081312	LEAD	200.8	0.5	U	µg/L
8/13/2012	MW-20081312	ZINC	200.8	**2.88**		µg/L

Notes

µg/L	Micrograms per liter
Bold	Analyte detected in source water blank
Dioxin	Polychlorinated dibenzo-p-dioxins
EPA	U.S. Environmental Protection Agency
ID	Identification
PAH	Polycyclic aromatic hydrocarbon
pg/L	Picograms per liter
Q	Laboratory data qualifier
SVOC	Semi-volatile organic compound
U	Analyzed for but not detected above the method detection limit

TABLE 4.8
QUALITY CONTROL - FIELD DUPLICATES

Original Sample ID	Sample Date	Analyte	Original Concentration	Q	Original Sample RL	Duplicate Sample ID	Duplicate Concentration	Q	Duplicate Sample RL	Units	RPD[a]
PENTACHLOROPHENOL (EPA Method 528)											
EFF010912	1/9/2012	PENTACHLOROPHENOL	0.574		0.2	OPOQVS010912	0.462		0.2	µg/L	21.6
BABB011612	1/16/2012	PENTACHLOROPHENOL	0.704		0.2	OPOQVS011612	0.575		0.2	µg/L	20.2
SW-05020612	2/6/2012	PENTACHLOROPHENOL	0.67		0.2	SW-07020612	0.265		0.2	µg/L	**86.6**
GS-34S020612	2/6/2012	PENTACHLOROPHENOL	14.5		0.2	MW-18020612	14		0.2	µg/L	3.5
MW-C-01020712	2/7/2012	PENTACHLOROPHENOL	0.349		0.2	MW-C-99020712	0.432		0.2	µg/L	21.3
MW-11-05021312	2/13/2012	PENTACHLOROPHENOL	342	D	0.2	OPOQVS021312	368	D	0.2	µg/L	7.3
NHRTEFF030512	3/5/2012	PENTACHLOROPHENOL	287	D	0.2	WTPVS030512	282	D	0.2	µg/L	1.8
EFF031212	3/12/2012	PENTACHLOROPHENOL	0.407		0.2	OPOQVS031212	0.409		0.2	µg/L	0.5
BABB040212	4/2/2012	PENTACHLOROPHENOL	0.905		0.2	WTPVS040212	0.867		0.2	µg/L	4.3
IN041612	4/16/2012	PENTACHLOROPHENOL	120	D	0.2	WTPVS041612	121	D	0.2	µg/L	0.8
BABB042312	4/23/2012	PENTACHLOROPHENOL	0.742		0.2	OPOQVS042312	0.515		0.2	µg/L	**36.1**
EFF051412	5/14/2012	PENTACHLOROPHENOL	0.429		0.2	OPOQVS051412	0.348		0.2	µg/L	20.8
EFF052112	5/21/2012	PENTACHLOROPHENOL	0.406		0.2	OPOQVS052112	0.45		0.2	µg/L	10.3
BABB061112	6/11/2012	PENTACHLOROPHENOL	0.65		0.2	WTPVS061112	0.615		0.2	µg/L	5.5
IN061812	6/18/2012	PENTACHLOROPHENOL	125	D	0.2	OPOQVS061812	132	D	0.2	µg/L	5.4
NCRTEFF070212	7/2/2012	PENTACHLOROPHENOL	3.53		1	OPOQVS070212	4.86		1	µg/L	31.7
EFF072312	7/23/2012	PENTACHLOROPHENOL	0.344		0.2	WTPVS072312	0.351		0.2	µg/L	2.0
MW-11-01080612	8/6/2012	PENTACHLOROPHENOL	249	D	0.2	OPOQVS080612	241	D	0.2	µg/L	3.3
BMW-9B080712	8/7/2012	PENTACHLOROPHENOL	4.86		0.2	MW-E-98080712	4.86		0.2	µg/L	0.0
MW-H-01080812	8/8/2012	PENTACHLOROPHENOL	26.5		0.2	MW-C-99080812	26.4		0.2	µg/L	0.4
INF-08080912	8/9/2012	PENTACHLOROPHENOL	257	D	0.2	MW-G-98080912	241	D	0.2	µg/L	6.4
EFF081312	8/13/2012	PENTACHLOROPHENOL	0.52		1	SW-07081312	0.517		1	µg/L	0.6
BABB082712	8/27/2012	PENTACHLOROPHENOL	0.587		0.2	WTPVS082712	0.553		0.2	µg/L	6.0
NHRTEFF090412	9/4/2012	PENTACHLOROPHENOL	338	D	0.2	OPOQVS090412	329	D	0.2	µg/L	2.7
EFF092412	9/24/2012	PENTACHLOROPHENOL	0.363		0.2	WTPVS092412	0.352		0.2	µg/L	3.1
NCRTEFF100112	10/1/2012	PENTACHLOROPHENOL	2.81		0.2	OPOQVS100112	4.52		0.2	µg/L	**46.7**
IN102212	10/22/2012	PENTACHLOROPHENOL	107	D	0.2	WTPVS102212	109	D	0.2	µg/L	1.9
BABB102912	10/29/2012	PENTACHLOROPHENOL	0.869		0.2	OPOQVS102912	0.697		0.2	µg/L	22.0
EFF111912	11/19/2012	PENTACHLOROPHENOL	0.318		0.2	WTPVS111912	0.305		0.2	µg/L	4.2
NHRTEFF120312	12/3/2012	PENTACHLOROPHENOL	365	D	0.2	WTPVS120312	388	D	0.2	µg/L	6.1
IN121012	12/10/2012	PENTACHLOROPHENOL	94.6	D	0.2	OPOQVS121012	95.9	D	0.2	µg/L	1.4
EFF123112	12/31/2012	PENTACHLOROPHENOL	0.293		0.2	WTPVS123112	0.242		0.2	µg/L	19.1
SVOC (EPA Method 8270)											
NCRTEFF070212	7/2/2012	2,3,4,6-TETRACHLOROPHENOL	1	U	1	OPOQVS070212	1	U	1	µg/L	0.0
NCRTEFF070212	7/2/2012	2,3,5,6-TETRACHLOROPHENOL	1	U	1	OPOQVS070212	1	U	1	µg/L	0.0
NCRTEFF070212	7/2/2012	2,4,5-TRICHLOROPHENOL	1	U	1	OPOQVS070212	1	U	1	µg/L	0.0
NCRTEFF070212	7/2/2012	2,4,6-TRICHLOROPHENOL	1	U	1	OPOQVS070212	1	U	1	µg/L	0.0
NCRTEFF070212	7/2/2012	2,4-DICHLOROPHENOL	1	U	1	OPOQVS070212	1	U	1	µg/L	0.0
NCRTEFF070212	7/2/2012	2-CHLOROPHENOL	1	U	1	OPOQVS070212	1	U	1	µg/L	0.0
NCRTEFF070212	7/2/2012	4-CHLORO-3-METHYLPHENOL	1	U	1	OPOQVS070212	1	U	1	µg/L	0.0
EFF081312	8/13/2012	2,3,4,6-TETRACHLOROPHENOL	1	U	1	SW-07081312	1	U	1	µg/L	0.0
EFF081312	8/13/2012	2,3,5,6-TETRACHLOROPHENOL	1	U	1	SW-07081312	1	U	1	µg/L	0.0
EFF081312	8/13/2012	2,4,5-TRICHLOROPHENOL	1	U	1	SW-07081312	1	U	1	µg/L	0.0
EFF081312	8/13/2012	2,4,6-TRICHLOROPHENOL	1	U	1	SW-07081312	1	U	1	µg/L	0.0
EFF081312	8/13/2012	2,4-DICHLOROPHENOL	1	U	1	SW-07081312	1	U	1	µg/L	0.0
EFF081312	8/13/2012	2-CHLOROPHENOL	1	U	1	SW-07081312	1	U	1	µg/L	0.0
EFF081312	8/13/2012	4-CHLORO-3-METHYLPHENOL	1	U	1	SW-07081312	1	U	1	µg/L	0.0
PAH (EPA Method 8270)											
EFF081312	8/13/2012	ACENAPHTHENE	1	U	1	SW-07081312	1	U	1	µg/L	0.0
EFF081312	8/13/2012	ACENAPHTHYLENE	1	U	1	SW-07081312	1	U	1	µg/L	0.0
EFF081312	8/13/2012	ANTHRACENE	1	U	1	SW-07081312	1	U	1	µg/L	0.0
EFF081312	8/13/2012	BENZO(A)ANTHRACENE	1	U	1	SW-07081312	1	U	1	µg/L	0.0
EFF081312	8/13/2012	BENZO(A)PYRENE	0.1	U	0.1	SW-07081312	0.1	U	0.1	µg/L	0.0
EFF081312	8/13/2012	BENZO(B)FLUORANTHENE	0.2	U	0.2	SW-07081312	0.2	U	0.2	µg/L	0.0
EFF081312	8/13/2012	BENZO(G,H,I)PERYLENE	1	U	1	SW-07081312	1	U	1	µg/L	0.0
EFF081312	8/13/2012	BENZO(K)FLUORANTHENE	1	U	1	SW-07081312	1	U	1	µg/L	0.0
EFF081312	8/13/2012	CHRYSENE	1	U	1	SW-07081312	1	U	1	µg/L	0.0
EFF081312	8/13/2012	DIBENZO(A,H)ANTHRACENE	0.2	U	0.2	SW-07081312	0.2	U	0.2	µg/L	0.0
EFF081312	8/13/2012	FLUORANTHENE	1	U	1	SW-07081312	1	U	1	µg/L	0.0
EFF081312	8/13/2012	FLUORENE	1	U	1	SW-07081312	1	U	1	µg/L	0.0
EFF081312	8/13/2012	INDENO(1,2,3-CD)PYRENE	1	U	1	SW-07081312	1	U	1	µg/L	0.0
EFF081312	8/13/2012	NAPHTHALENE	1	U	1	SW-07081312	1	U	1	µg/L	0.0
EFF081312	8/13/2012	PHENANTHRENE	1	U	1	SW-07081312	1	U	1	µg/L	0.0
EFF081312	8/13/2012	PYRENE	1	U	1	SW-07081312	1	U	1	µg/L	0.0

TABLE 4.8
QUALITY CONTROL - FIELD DUPLICATES

DIOXINS (EPA Method 8290)											
EFF081312	8/13/2012	1,2,3,4,6,7,8-HpCDD	20	J	1.2	SW-07081312	18	J	1.2	pg/L	10.5
EFF081312	8/13/2012	1,2,3,4,6,7,8-HpCDF	0	U	0.92	SW-07081312	3.7	J	0.99	pg/L	**120.3**
EFF081312	8/13/2012	1,2,3,4,7,8,9-HpCDF	0	U	1.1	SW-07081312	0	U	1	pg/L	9.5
EFF081312	8/13/2012	1,2,3,4,7,8-HxCDD	0	U	0.64	SW-07081312	0	U	0.59	pg/L	8.1
EFF081312	8/13/2012	1,2,3,4,7,8-HxCDF	0	U	0.61	SW-07081312	0	U	0.8	pg/L	27.0
EFF081312	8/13/2012	1,2,3,6,7,8-HxCDD	0	U	0.59	SW-07081312	1	J	0.6	pg/L	**51.6**
EFF081312	8/13/2012	1,2,3,6,7,8-HxCDF	0	U	0.42	SW-07081312	0	U	0.75	pg/L	**56.4**
EFF081312	8/13/2012	1,2,3,7,8,9-HxCDD	0	U	0.69	SW-07081312	0	U	0.59	pg/L	15.6
EFF081312	8/13/2012	1,2,3,7,8,9-HxCDF	0	U	0.68	SW-07081312	0	U	0.86	pg/L	23.4
EFF081312	8/13/2012	1,2,3,7,8-PeCDD	0	U	0.68	SW-07081312	0	U	0.62	pg/L	9.2
EFF081312	8/13/2012	1,2,3,7,8-PeCDF	0	U	0.73	SW-07081312	0	U	0.89	pg/L	19.8
EFF081312	8/13/2012	2,3,4,6,7,8-HxCDF	0	U	0.54	SW-07081312	0	U	0.64	pg/L	16.9
EFF081312	8/13/2012	2,3,4,7,8-PeCDF	0	U	0.65	SW-07081312	0	U	0.65	pg/L	0.0
EFF081312	8/13/2012	2,3,7,8-TCDD	0	U	0.72	SW-07081312	0	U	0.81	pg/L	11.8
EFF081312	8/13/2012	2,3,7,8-TCDF	0	U	0.56	SW-07081312	0	U	0.47	pg/L	17.5
EFF081312	8/13/2012	OCDD	230		1.6	SW-07081312	210		1.5	pg/L	9.1
EFF081312	8/13/2012	OCDF	14	J	2.2	SW-07081312	11	J	1.6	pg/L	24.0
EFF081312	8/13/2012	Total HpCDD	32		1.2	SW-07081312	33		1.2	pg/L	3.1
EFF081312	8/13/2012	Total HpCDF	11		1	SW-07081312	15		1	pg/L	30.8
EFF081312	8/13/2012	Total HxCDD	0	U	0.64	SW-07081312	2		0.59	pg/L	**103.0**
EFF081312	8/13/2012	Total HxCDF	2	B	0.56	SW-07081312	4.4	B	0.76	pg/L	**75.0**
EFF081312	8/13/2012	Total PeCDD	0	U	0.68	SW-07081312	0	U	0.62	pg/L	9.2
EFF081312	8/13/2012	Total PeCDF	0	U	0.69	SW-07081312	0	U	0.77	pg/L	11.0
EFF081312	8/13/2012	Total TCDD	0	U	0.72	SW-07081312	0	U	0.81	pg/L	11.8
EFF081312	8/13/2012	Total TCDF	0.68		0.56	SW-07081312	0	U	0.47	pg/L	**36.5**
METALS - TOTAL (EPA Method 200.8)											
EFF081312	8/13/2012	ARSENIC	0.5	U	0.5	SW-07081312	0.5	U	0.5	µg/L	0.0
EFF081312	8/13/2012	CADMIUM	0.08	U	0.08	SW-07081312	0.08	U	0.08	µg/L	0.0
EFF081312	8/13/2012	CHROMIUM	0.64		0.5	SW-07081312	0.73		0.5	µg/L	13.1
EFF081312	8/13/2012	COPPER	6.36		0.5	SW-07081312	5.5		0.5	µg/L	14.5
EFF081312	8/13/2012	LEAD	0.5	U	0.5	SW-07081312	0.5	U	0.5	µg/L	0.0
EFF081312	8/13/2012	ZINC	9.01		0.5	SW-07081312	7.44		0.5	µg/L	19.1
										Average RPD:	12.5

Notes:

µg/L	Micrograms per liter
a	If one concentration is "U" and the other is detected, then the RL is used as the value for the "U" result.
Bold	RPD exceeds the 35% project goal for precision.
D	Dilution
ID	Identification
Q	Laboratory qualifier
RL	Laboratory reporting limit
RPD	Relative percent difference
U	Undetected
pg/L	Picograms per liter
EPA	U.S. Environmental Protection Agency
J	Estimated value
B	Less than 10 times higher than method blank level

TABLE 4.9
DATA EVALUATION AND PROGRESS OF REMEDIATION

Criterion Number	Criterion	Type of Analysis	Results from Analysis	Documentation of Results (refer to)	Comments	ROD Compliance Criterion Met?
1	The WTP effluent (station EFF) must meet the 1 µg/L discharge to surface water cleanup level for PCP (and specified cleanup levels for other contaminants listed in the ROD).	Comparisons of the concentrations of constituents at WTP station EFF to the ROD discharge to surface water cleanup levels.	Results from 51 of 52 weekly PCP analyses were below the 1.0 µg/L cleanup level except for a sample collected on June 25, 2012 (1.03 µg/L). The concentrations of dioxins, PAH, and chlorophenols were below the cleanup levels.	Table 2.4 (PCP) Table 2.5 (dioxins) Table 2.6 (PAH and chlorophenols) Appendix A (Database) Appendix B (Data Tables)	The slightly elevated PCP result (1.03 µg/L) was likely related to the partial backwashing of the primary carbon unit at the WTP.	**Yes (almost always)**
2	Surface water in Silver Bow Creek (stations SW-05, SS-06A, and SW-09) must meet the 1 µg/L surface water cleanup level for PCP (and specified cleanup levels for other contaminants listed in the ROD).	Comparisons of the concentrations of constituents at surface water stations SW-05, SS-06A, and SW-09 to the ROD surface water cleanup levels.	The concentrations of PCP, dioxins, PAH, and chlorophenols were below the cleanup levels.	Table 4.1 (PCP) Table 4.2 (dioxins) Table 4.3 (PAH and chlorophenols) Appendix A (Database)	-	**Yes**
3	The concentrations of PCP in groundwater at downgradient sentinel monitoring wells (stations BMW-01A, BMW-01B, and 10-12) must meet the 1 µg/L groundwater cleanup level for PCP (and specified cleanup levels for other contaminants listed in the ROD).	Comparisons of the concentrations of constituents at groundwater stations BMW-01A, BMW-01B, 10-12 to the ROD groundwater cleanup levels.	The concentrations of PCP were below the cleanup levels.	Table 4.4 (PCP) Appendix A (Database)	-	**Yes**
4	The concentrations of PCP in groundwater from representative monitoring wells along the south bank of Silver Bow Creek within the plume footprint (stations GW-14R-98, and HCA-21) must indicate that the trend in the concentration of PCP over time is decreasing, suggesting that groundwater quality will eventually meet the 1 µg/L groundwater cleanup level for PCP.	Mann-Kendall Statistical Test for Trends (90 percent confidence interval)	The trends in the concentration of PCP over time in monitoring wells GW-14R-98 and HCA-21 are decreasing at the 90 percent confidence level. In 2012, the concentration of PCP in monitoring wells HCA-21 (5.26 µg/L) and GW-14R-98 (1.05 µg/L) was either approaching or nearly 1 µg/L, suggesting that groundwater quality will eventually meet the 1 µg/L groundwater cleanup level for PCP.	Appendix B (Data Tables) Appendix D (MK Tests)	-	**Yes**
5	The concentrations of dioxins, PAH, and chlorophenols in groundwater at representative monitoring wells along Silver Bow Creek (stations BMW-01A, BMW-01B, 10-12, GW-14R-98, and HCA-21) must meet the specified cleanup levels listed in the ROD).	Comparisons of the concentrations of constituents at groundwater stations BMW-01A, BMW-01B, 10-12, GW-14R-98, and HCA-21 to the ROD groundwater cleanup levels.	The concentrations of dioxins, PAH, and chlorophenols were below the cleanup levels for monitoring wells where data were available.	Table 4.5 (dioxins) Table 4.6 (PAH and chlorophenols) Appendix B (Data Tables)	-	**Yes**
6	The overall PCP plume area must be stable or shrinking, showing that ongoing remedial action is effectively preventing the spread of contamination (short-term trend - previous 5 years).	Mann-Kendall Statistical Test for Trends (90 percent confidence interval)	Over the past 5 years, the trend in the total area of the PCP plume on the south side of Silver Bow Creek (based on the 1 µg/L isocontour line) has increased at the 90 percent confidence level. The increase in the size of the plume from 2008 to 2012 is relatively small (2.8 acres). This impact is believed to be temporary.	Appendix C (Plume Areas) Appendix D (MK Tests)	A variety of factors may have contributed to the relatively small increase (2.8 acres) in the PCP plume area over the past 5 years. These factors could include, but are not limited to: (1) an epic rain-on-snow event that resulted in ponding of water on site, additional recharge to groundwater caused by ponding, and likely mobilization of PCP in the vadose zone and aquifer (in 2011), (2) injection of LTU retention pond water into groundwater during emergency management of the LTU pond during this same flood (in 2011), and (3) reinjection of treated WTP effluent into the south-side infiltration system (in 2012). In the future, continued groundwater monitoring and statistical analysis of the area of the PCP plume will be conducted to further evaluate the short-term trend in plume area and make operational adjustments as necessary.	**No[a]**
7	The overall PCP plume area must be stable or shrinking, showing that ongoing remedial action is effectively preventing the spread of contamination (long-term trend - since ROD was singed [20 years]).	Direct comparison of PCP plume area after the ROD was signed (1993) to the current area of the PCP plume (2012).	Over the past 20 years, the total area of the PCP plume on the south side of Silver Bow Creek (based on the 1 µg/L isocontour line) has decreased from 41.7 acres in 1993 to 24.2 acres in 2012. This decrease represents a 42 percent reduction in the area of the PCP plume (17.5 acres).	Appendix C (Plume Areas) Figure 4.8	-	**Yes**

Notes:

-	No comment
µg/L	Micrograms per liter
a	Continued statistical analysis is required in the future to confirm the trend in the PCP plume area.
Data	2012 sampling results provided in Appendix B
Dioxins	Polychlorinated dibenzo-p-dioxins
EFF	WTP effluent station EFF
MPTP	Montana Pole and Treating Plant
MK Tests	Mann-Kendall statistical tests for trends
PAH	Polycyclic aromatic hydrocarbons
PCP	Pentachlorophenol
ROD	Record of Decision
WTP	MPTP water treatment plant

TABLE 4.10
HISTORICAL VOLUME OF NAPL RECOVERED

Year	NAPL Recovered (gallons)
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
Total	6,558

Note:
NAPL Non-aqueous phase liquid

TABLE 5.1

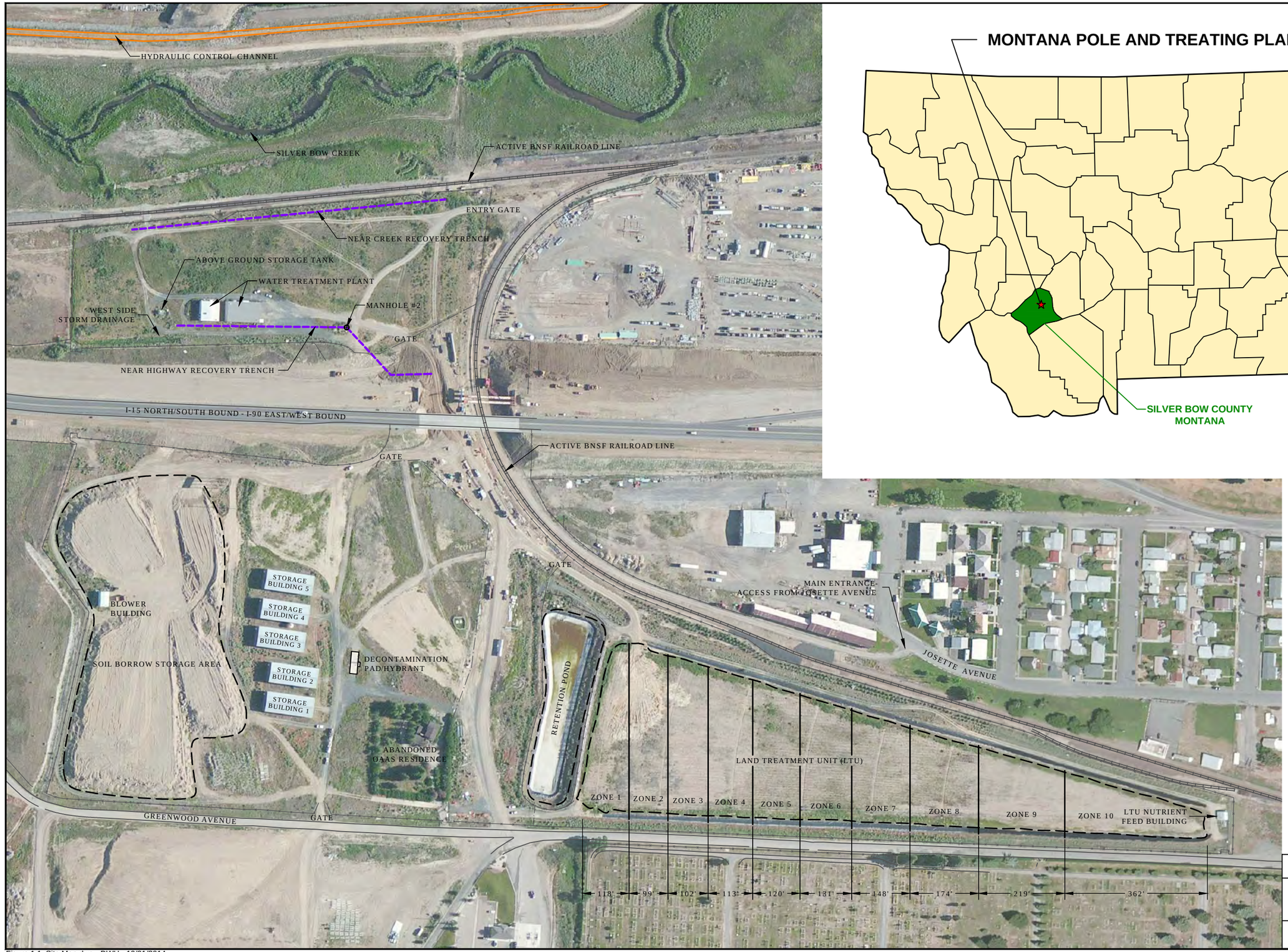
HISTORICAL CONCENTRATIONS OF PCP FOR RESIDENTIAL WELL SAMPLES

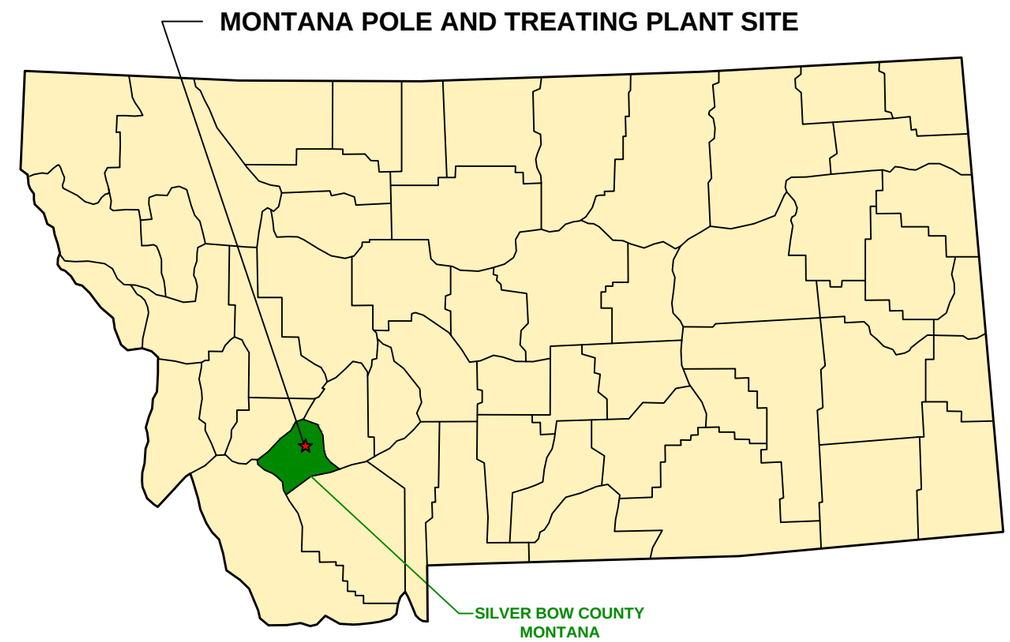
		Domestic Well Name:	Wayrynen	Town Pump #1	Bowler	Hendrickson	Dixon (Rongstad)	ROD Cleanup Level (µg/L)
		Location:	Upgradient Business Well - South of Contaminant Plume	Upgradient Business Well - East of Land Treatment Unit	Domestic Irrigation Well - North of Contaminant Plume	Domestic Potable Water well - South East of Contaminant Plume	Domestic Irrigation Well - North of Land Treatment Unit	
		Analyte:	PCP	PCP	PCP	PCP	PCP	
		Units:	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	
Year	**Laboratory**	**EPA Method**						
2001	Energy	8151A	0.13	0.14	0.12	0.11	0.1	1.0
2002	Energy	E515.1	0.2U	0.2U	0.2U	0.2U	0.2U	1.0
2002	Energy	E515.1	0.1U	0.1U	0.1U	0.1U	0.1U	1.0
2003	Energy	E515.1	0.040U	0.040U	0.040U	0.040U	0.071	1.0
2004	Energy	E515.1	0.040U	0.040U	0.040U	0.040U	0.040U	1.0
2005	Energy	E515.1	0.040U	0.040U	0.040U	0.040U	0.040U	1.0
2006	MBMG	8041A	0.1U	0.1U	0.1U	0.1U	0.1U	1.0
2007	MBMG	8041A	0.101	0.057	0.467	0.056	0.096	1.0
2008	MBMG	8041A	0.131	0.073	0.083	0.102	0.115	1.0
2009	MBMG	8041A	--	--	0.2	--	--	1.0
2010	MBMG	528	--	--	--	--	--	1.0
2011	MBMG	528	--	--	--	--	--	1.0
2012	MBMG	528	--	--	--	--	--	1.0
2013	MBMG	528	--	--	--	--	--	1.0

Notes:

--	Not sampled
µg/L	Micrograms per liter
Bold	Concentration exceeds ROD groundwater cleanup level
Energy	Energy Laboratories Inc.
EPA	U.S. Environmental Protection Agency
MBMG	Montana Bureau of Mines and Geology
PCP	Pentachlorophenol
ROD	Record of Decision
U	Analyte not detected

FIGURES





AERIAL PHOTO SOURCE: ESRI/BING MAPS (2010)

N

120 0 120 240

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 1.1
SITE MAP

TETRA TECH

Figure 1.1_Site Map.dwg - DWH - 10/01/2014

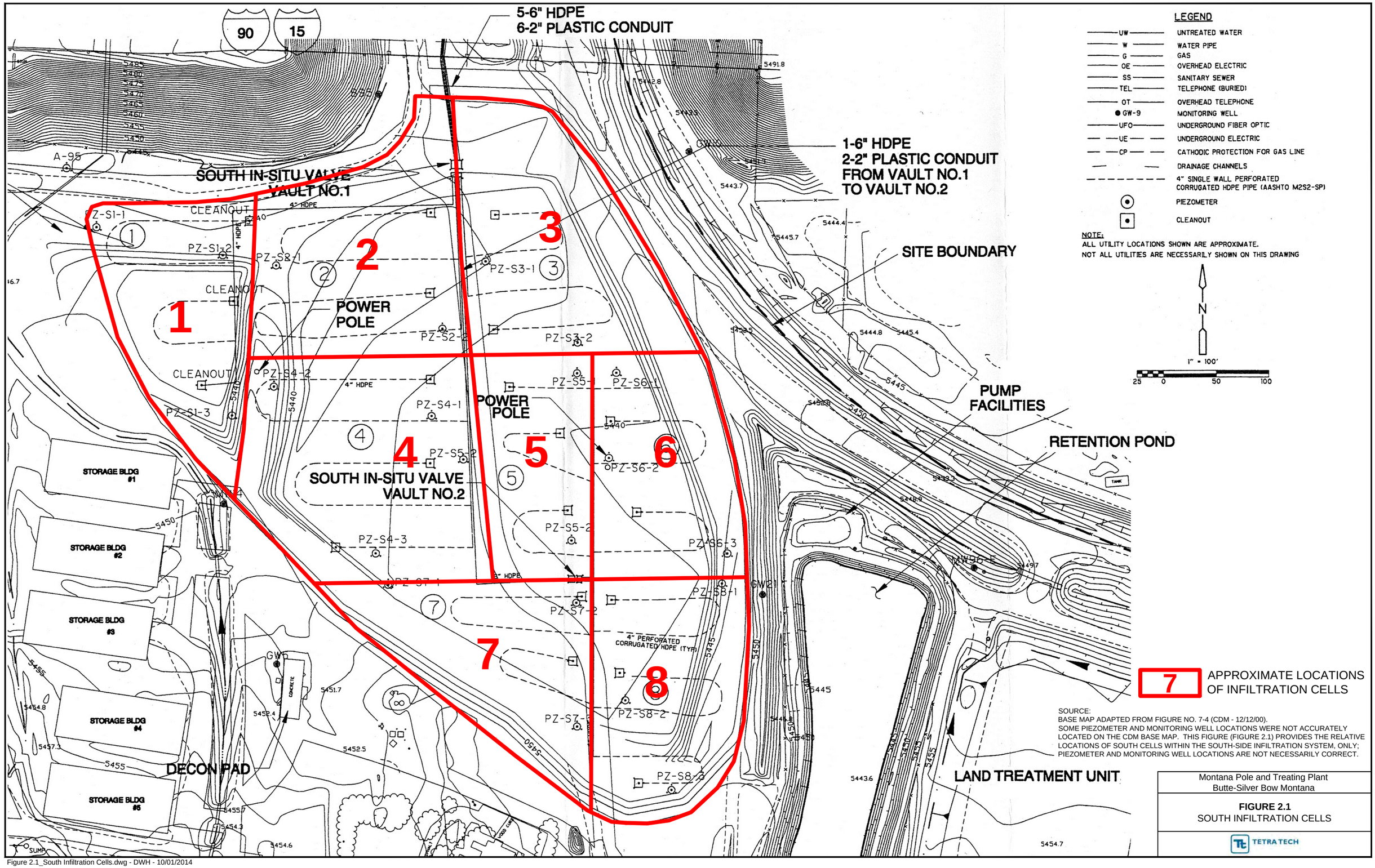
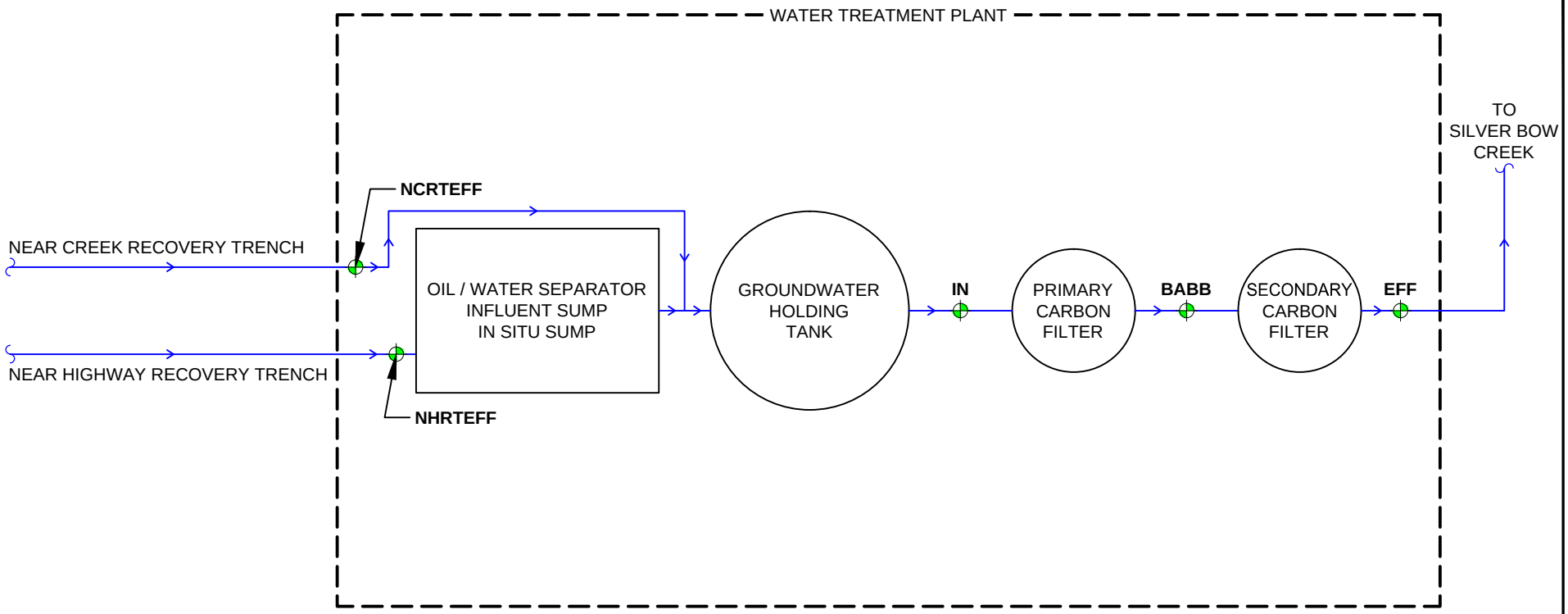


Figure 2.1_South Infiltration Cells.dwg - DWH - 10/01/2014



LEGEND

MPTP WATER TREATMENT PLANT SAMPLE STATION

PIPING

MPTP MONTANA POLE AND TREATING PLANT

NO SCALE

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 2.2
LOCATION OF
MPTP WATER TREATMENT PLANT
SAMPLE STATIONS

TETRA TECH

Figure 2.2_Plant Sample Stations.dwg - DWH - 10/01/2014

LEGEND

SURFACE WATER STATION

HYDRAULIC CONTROL CHANNEL

AERIAL PHOTO SOURCE: ESRI/BING MAPS (2010)

N

150 0 150 300

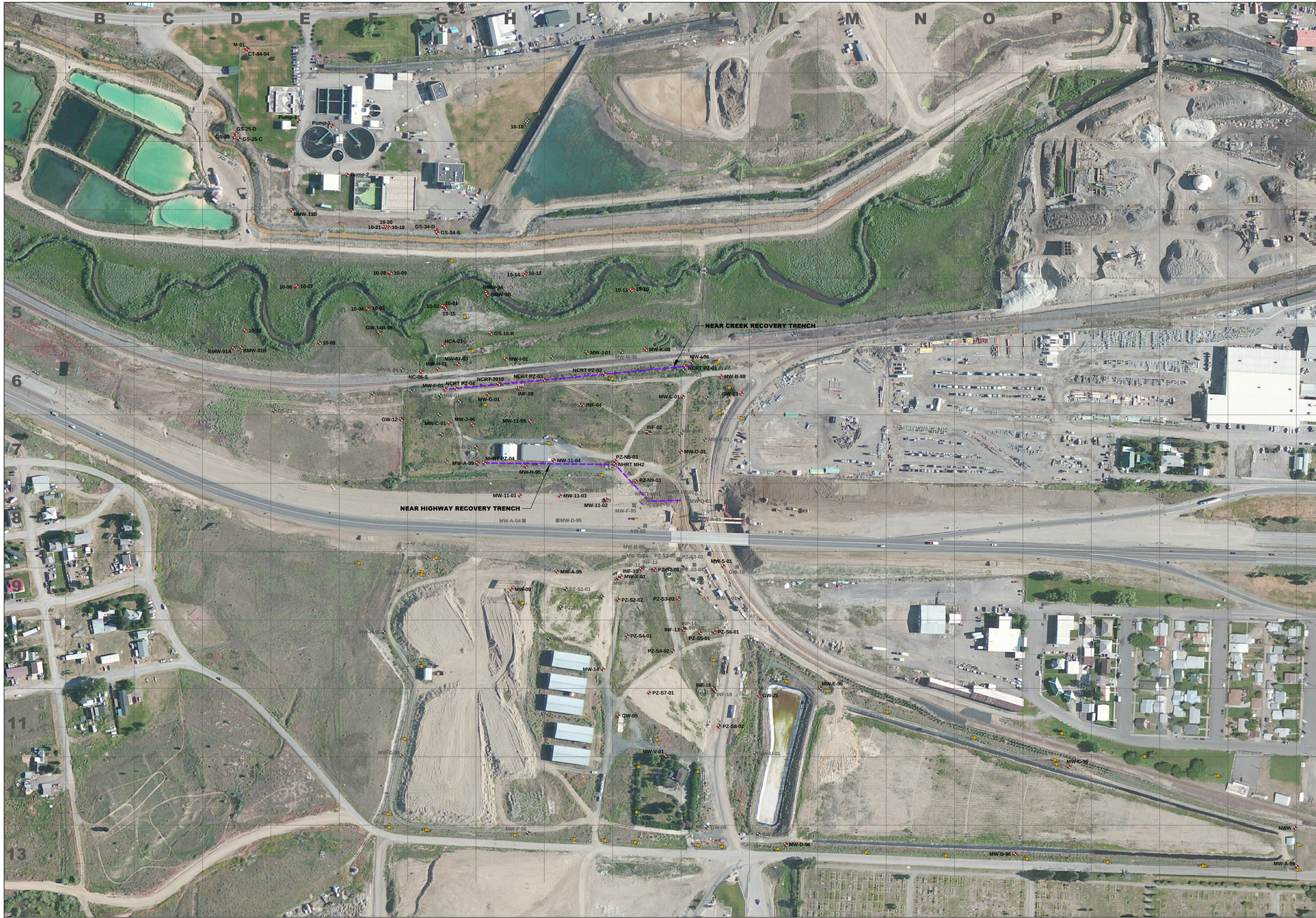
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.1
LOCATION OF SURFACE WATER STATIONS

TETRA TECH

Figure 4.1_Surface Water Stations.dwg - DWH - 10/01/2014



MONITORING WELL	APPROXIMATE SCREENED INTERVAL	CURRENT STATUS	MAP GRID
10-01	Deep	Existing	5G
10-02	Shallow	Existing	5G
10-03	Deep	Existing	5F
10-04	Shallow	Existing	5F
10-05	Shallow	Existing	5E
10-06	Deep	Existing	5E
10-07	Shallow	Existing	5E
10-08	Deep	Existing	4F
10-09	Shallow	Existing	4F
10-10	Deep	Existing	5J
10-11	Shallow	Existing	5J
10-12	Shallow	Existing	5D
10-13	Deep	Existing	4H
10-14	Shallow	Existing	4H
10-15	Intermediate	Existing	5G
10-16	Deep	Existing	2H
10-17	Intermediate	Existing	2H
10-18	Shallow	Existing	2H
10-19	Deep	Existing	4F
10-20	Intermediate	Existing	4F
10-21	Shallow	Existing	4F
AW-02	Shallow	Abandoned	8J
BMW-01A	Deep	Existing	6D
BMW-01B	Deep	Existing	6D
BMW-13B	Deep	Existing (ARCO)	3E
BMW-9A	Shallow	Existing (ARCO)	5H
BMW-9B	Deep	Existing (ARCO)	5H
CT-84-04	Shallow	Existing (ARCO)	1D
GS-18-R	Deep	Existing	3H
GS-22	Shallow	Existing	6E
GS-25	Shallow	Existing (ARCO)	2D
GS-25-C	Deep	Existing (ARCO)	2D
GS-25-D	Deep	Existing (ARCO)	2D
GS-34-D	Deep	Existing (ARCO)	4G
GS-34-S	Shallow	Existing (ARCO)	4G
GW-05	Shallow	Existing	11J
GW-08	Deep	Existing	13K
GW-09	Shallow	Existing	9G
GW-10	Shallow	Destroyed	9K
GW-12	Deep	Existing	7F
GW-13	Deep	Existing	6K
GW-14R-98	Shallow	Existing	5F
GW-17	Shallow	Existing	5L
GW-21	Shallow	Existing	11L
GW-22R-98	Shallow	Existing	13L
HCA-21	Shallow	Existing	5G
INF-01	Intermediate	Existing	7J
INF-02	Shallow	Existing	7J
INF-03	Deep	Existing	7J
INF-04	Shallow	Existing	6I
INF-05	Intermediate	Existing	6I
INF-06	Deep	Existing	6I
INF-07	Deep	Existing	6H
INF-08	Intermediate	Existing	6H
INF-09	Shallow	Existing	6H
INF-10	Shallow	Existing	9J
INF-11	Intermediate	Existing	9J
INF-12	Deep	Existing	9J
INF-13	Shallow	Existing	10K
INF-14	Intermediate	Existing	10K
INF-15	Deep	Existing	10K
INF-16	Shallow	Existing	10K
INF-17	Intermediate	Existing	11K
INF-18	Deep	Existing	11K
M-01	Shallow	Existing (ARCO)	1D
MF-04 (MF-14)	Deep	Existing	6G
MW-01	Shallow	Existing	6G
MW-03	Shallow	Existing	6K
MW-09	Shallow	Existing	9H
MW-11-01	Shallow	Existing	8H
MW-11-02	Shallow	Existing	8I
MW-11-03	Shallow	Existing	8I
MW-11-04	Shallow	Existing	7I
MW-11-05	Shallow	Existing	7H
MW-14	Shallow	Existing	1B
MW-87-03	Shallow	Existing	6G
MW-A-01	Shallow	Existing	7G
MW-A-04	Shallow	Abandoned	8H
MW-A-95	Shallow	Existing	9I
MW-A-96	Shallow	Existing	13T
MW-A-98	Shallow	Existing	6F
MW-A-99	Shallow	Existing	7H
MW-B-01	Shallow	Existing	7G
MW-B-04	Shallow	Abandoned	8I
MW-B-95	Shallow	Abandoned	8J
MW-B-96	Shallow	Existing	13O
MW-B-98	Shallow	Existing	6K
MW-B-99	Shallow	Existing	7G
MW-C-01	Shallow	Existing	7G
MW-C-04	Shallow	Abandoned	9J
MW-C-96	Shallow	Existing	12P
MW-D-01	Shallow	Existing	6G
MW-D-95	Shallow	Abandoned	8I
MW-D-96	Shallow	Existing	13L
MW-E-01	Shallow	Existing	6G
MW-E-96	Shallow	Existing	10M
MW-F-01	Shallow	Existing	6G
MW-F-95	Shallow	Abandoned	8J
MW-F-96	Shallow	Existing	13H
MW-G-01	Shallow	Existing	6H
MW-G-96	Shallow	Existing	11F
MW-H-01	Shallow	Existing	6G
MW-H-95	Shallow	Existing	7H
MW-H-96	Shallow	Existing	10F
MW-I-01	Shallow	Existing	6H
MW-I-96	Shallowintermediate	Existing	6K
MW-J-01	Shallow	Existing	6I
MW-J-96	Intermediate/Deep	Existing	7G
MW-K-01	Shallow	Existing	6J
MW-K-96	Deep	Existing	6F
MW-L-01	Shallow	Existing	6K
MW-L-96	Deep	Existing	6I
MW-M-01	Shallow	Existing	6K
MW-M-96	Deep	Existing	6J
MW-N-01	Shallow	Existing	7J
MW-O-01	Shallow	Existing	7J
MW-P-01	Shallow	Existing	7K
MW-Q-01	Shallow	Abandoned	8K
MW-R-01	Shallow	Abandoned	8K
MW-S-01	Shallow	Existing	9K
MW-T-01	Shallow	Existing	9K
MW-U-01	Shallow	Existing	11L
MW-V-01	Shallow	Existing	11J
MW-W-01	Shallow	Existing	10J
MW-X-01	Shallow	Existing	9J
MW-Y-01	Shallow	Existing	9J
NC-06-S	Shallow	Existing	6G
NCRT PZ-01	In Trench	Existing	6K
NCRT PZ-02	In Trench	Existing	6I
NCRT PZ-03	Shallow	Existing	6H
NCRT PZ-04	In Trench	Existing	6G
NCRT-2010	Shallow	Existing	6H
NHRT MH1	In Trench	Abandoned	8J
NHRT MH2	In Trench	Existing	7J
NHRT PZ-01	Shallow	Abandoned	8J
NHRT PZ-04	In Trench	Existing	7H
NWW	Deep	Existing	13S
Pump-1	Manhole	WWTP	2E
Pump-2	Manhole	WWTP	3F
Pump-3	West Sump	WWTP	2E
PZ-N5-03	Shallow	Existing	7J
PZ-N5-2	Shallow	Existing	7I
PZ-N9-03	Shallow	Existing	7J
PZ-S1-01	Shallow	Existing	9I
PZ-S1-02	Shallow	Existing	9I
PZ-S1-04	Shallow	Existing	9I
PZ-S2-01	Shallow	Existing	9J
PZ-S2-02	Shallow	Existing	9J
PZ-S3-01	Shallow	Abandoned	9J
PZ-S3-02	Shallow	Existing	9J
PZ-S3-04	Shallow	Abandoned	9K
PZ-S3-05	Shallow	Abandoned	9J
PZ-S4-01	Shallow	Existing	10J
PZ-S4-02	Shallow	Existing	10J
PZ-S5-01	Shallow	Existing	10K
PZ-S6-01	Shallow	Existing	10K
PZ-S7-01	Shallow	Existing	11J
PZ-S8-02	Shallow	Existing	11K

AERIAL PHOTO SOURCE: ESRI/BING MAPS (2010)

LEGEND

- GROUNDWATER MONITORING WELL (TO BE RETAINED FOR SAMPLING)
- GROUNDWATER MONITORING WELL (NOT TO BE SAMPLED)
- GROUNDWATER MONITORING WELL (ABANDONED OR DESTROYED)
- UTILITY POLE

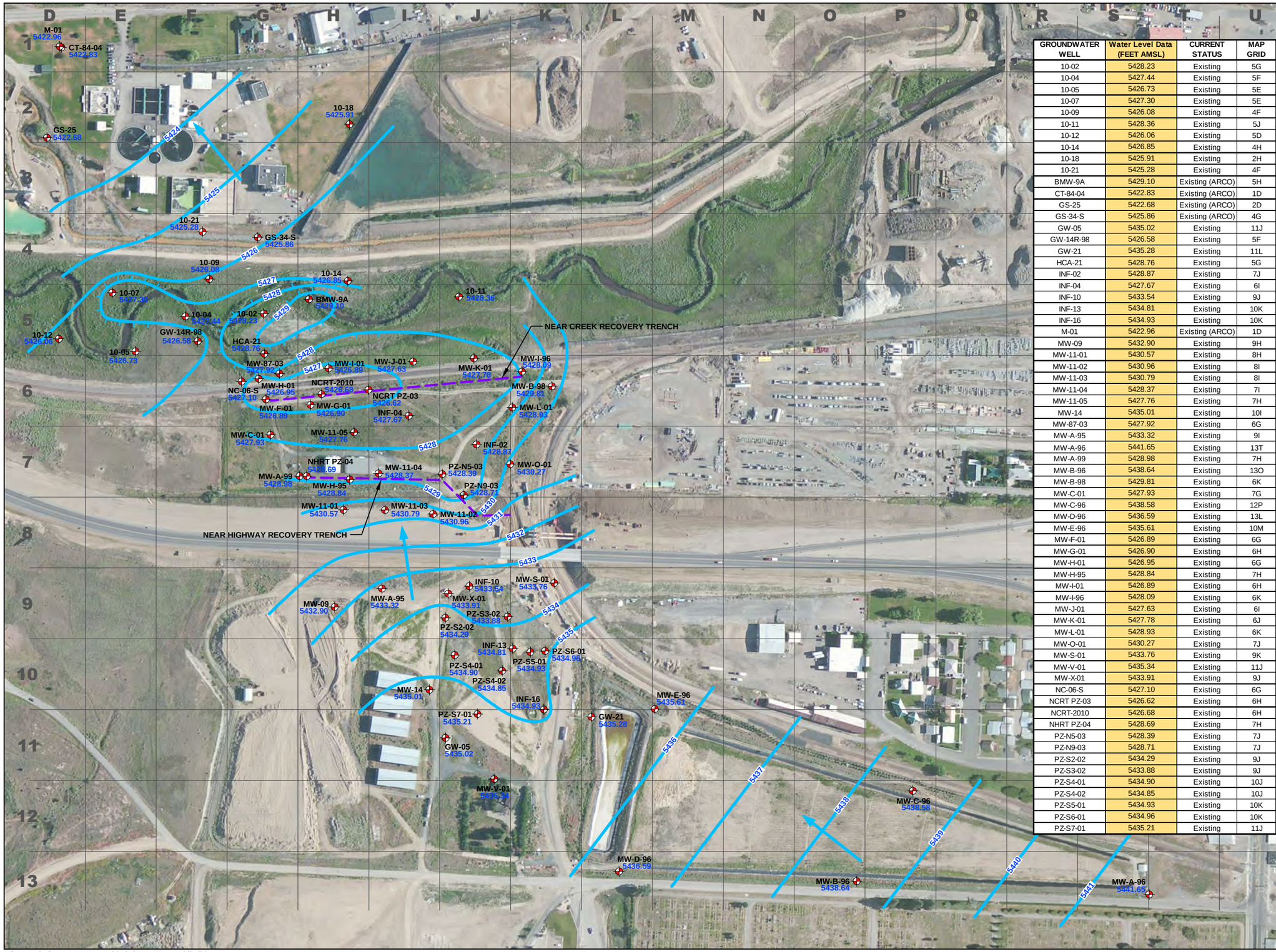
Figure 4.2_Location of All MPTP Monitoring Wells.dwg - DWH - 10/02/2014

N

70 0 70 140
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana
FIGURE 4.2
LOCATION OF ALL
MONTANA POLE AND TREATING PLANT
MONITORING WELLS

TETRA TECH



GROUNDWATER WELL	Water Level Data (FEET AMSL)	CURRENT STATUS	MAP GRID
10-02	5428.23	Existing	5G
10-04	5427.44	Existing	5F
10-05	5426.73	Existing	5E
10-07	5427.30	Existing	5E
10-09	5426.08	Existing	4F
10-11	5428.36	Existing	5J
10-12	5426.06	Existing	5D
10-14	5426.85	Existing	4H
10-18	5425.91	Existing	2H
10-21	5425.28	Existing	4F
BMW-9A	5429.10	Existing (ARCO)	5H
CT-84-04	5422.83	Existing (ARCO)	1D
GS-25	5422.68	Existing (ARCO)	2D
GS-34-S	5425.86	Existing (ARCO)	4G
GW-05	5435.02	Existing	11J
GW-14R-98	5426.58	Existing	5F
GW-21	5435.28	Existing	11L
HCA-21	5428.76	Existing	5G
INF-02	5428.87	Existing	7J
INF-04	5427.67	Existing	6I
INF-10	5433.54	Existing	9J
INF-13	5434.81	Existing	10K
INF-16	5434.93	Existing	10K
M-01	5422.96	Existing (ARCO)	1D
MW-09	5432.90	Existing	9H
MW-11-01	5430.57	Existing	8H
MW-11-02	5430.96	Existing	8I
MW-11-03	5430.79	Existing	8I
MW-11-04	5428.37	Existing	7I
MW-11-05	5427.76	Existing	7H
MW-14	5435.01	Existing	10I
MW-87-03	5427.92	Existing	6G
MW-A-95	5433.32	Existing	9I
MW-A-96	5441.65	Existing	13T
MW-A-99	5428.98	Existing	7H
MW-B-96	5438.64	Existing	13O
MW-B-98	5429.81	Existing	6K
MW-C-01	5427.93	Existing	7G
MW-C-96	5438.58	Existing	12P
MW-D-96	5436.59	Existing	13L
MW-E-96	5435.61	Existing	10M
MW-F-01	5426.89	Existing	6G
MW-G-01	5426.90	Existing	6H
MW-H-01	5426.95	Existing	6G
MW-H-95	5428.84	Existing	7H
MW-I-01	5426.89	Existing	6H
MW-I-96	5428.09	Existing	6K
MW-J-01	5427.63	Existing	6I
MW-K-01	5427.78	Existing	6J
MW-L-01	5428.93	Existing	6K
MW-O-01	5430.27	Existing	7J
MW-S-01	5433.76	Existing	9K
MW-V-01	5435.34	Existing	11J
MW-X-01	5433.91	Existing	9J
NC-06-S	5427.10	Existing	6G
NCRT PZ-03	5426.62	Existing	6H
NCRT-2010	5426.68	Existing	6H
NHRT PZ-04	5428.69	Existing	7H
PZ-N5-03	5428.39	Existing	7J
PZ-N9-03	5428.71	Existing	7J
PZ-S2-02	5434.29	Existing	9J
PZ-S3-02	5433.88	Existing	9J
PZ-S4-01	5434.90	Existing	10J
PZ-S4-02	5434.85	Existing	10J
PZ-S5-01	5434.93	Existing	10K
PZ-S6-01	5434.96	Existing	10K
PZ-S7-01	5435.21	Existing	11J

TABLE LEGEND

AMSL ABOVE MEAN SEA LEVEL

LEGEND

- MONITORING WELL
- GROUNDWATER CONTOUR - 1' INTERVAL
- GROUNDWATER MOUND
- 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

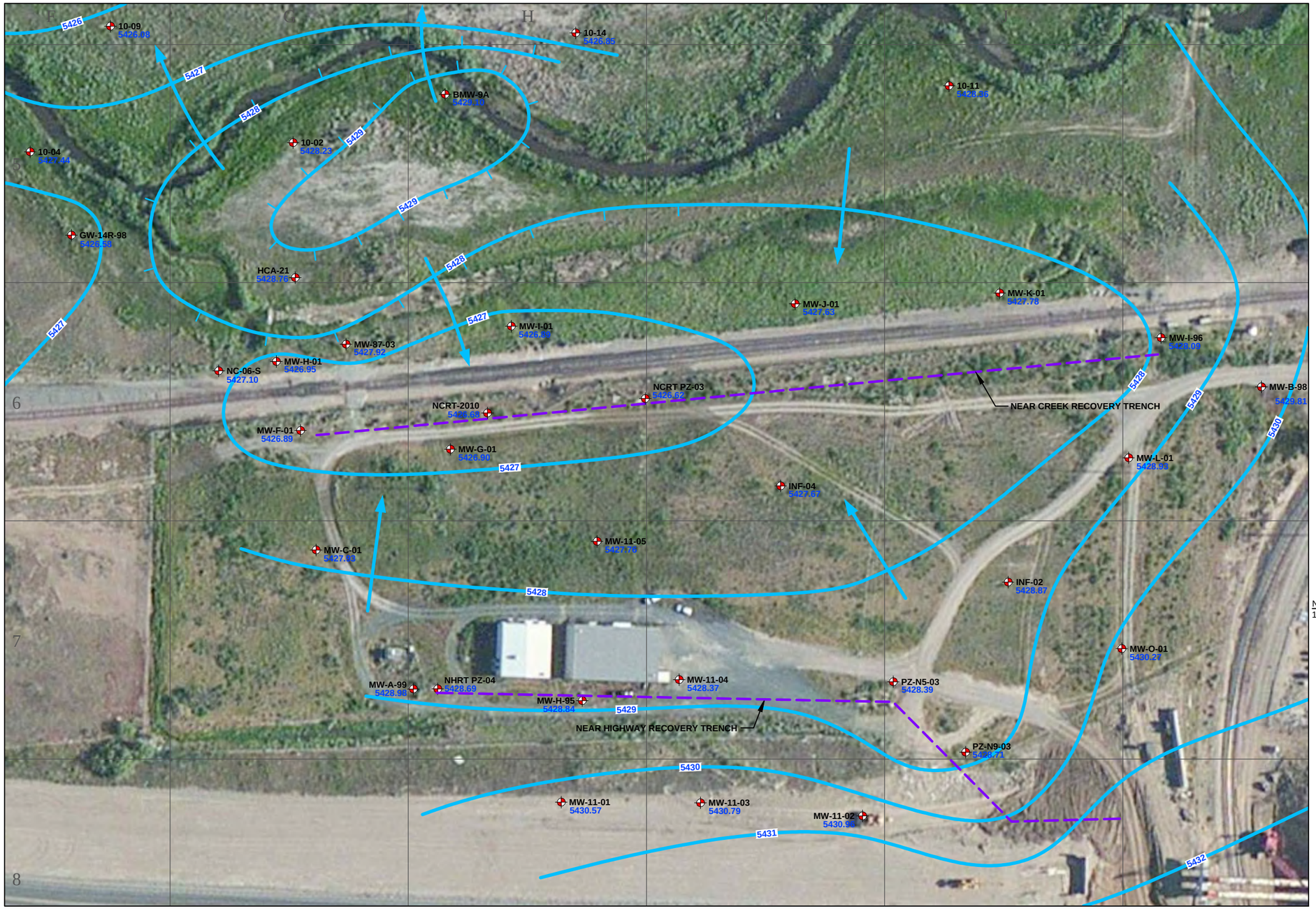
SCALE IN FEET

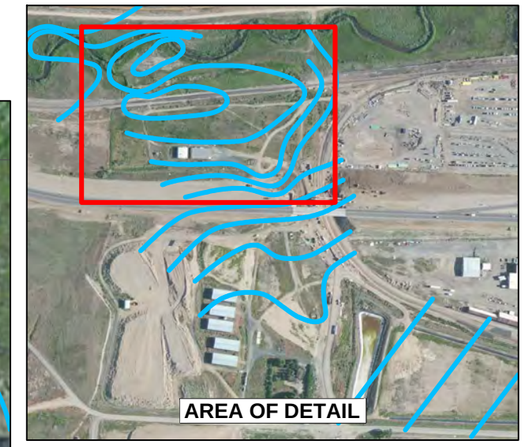
Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.3
GROUNDWATER LEVEL DATA - AUGUST 6, 2012

TETRA TECH

Figure 4.3_GW Data_August 2012.dwg - DWH - 10/01/2014





LEGEND

- MONITORING WELL
- GROUNDWATER CONTOUR - 1' INTERVAL
- GROUNDWATER MOUND
- 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

100 0 50 100

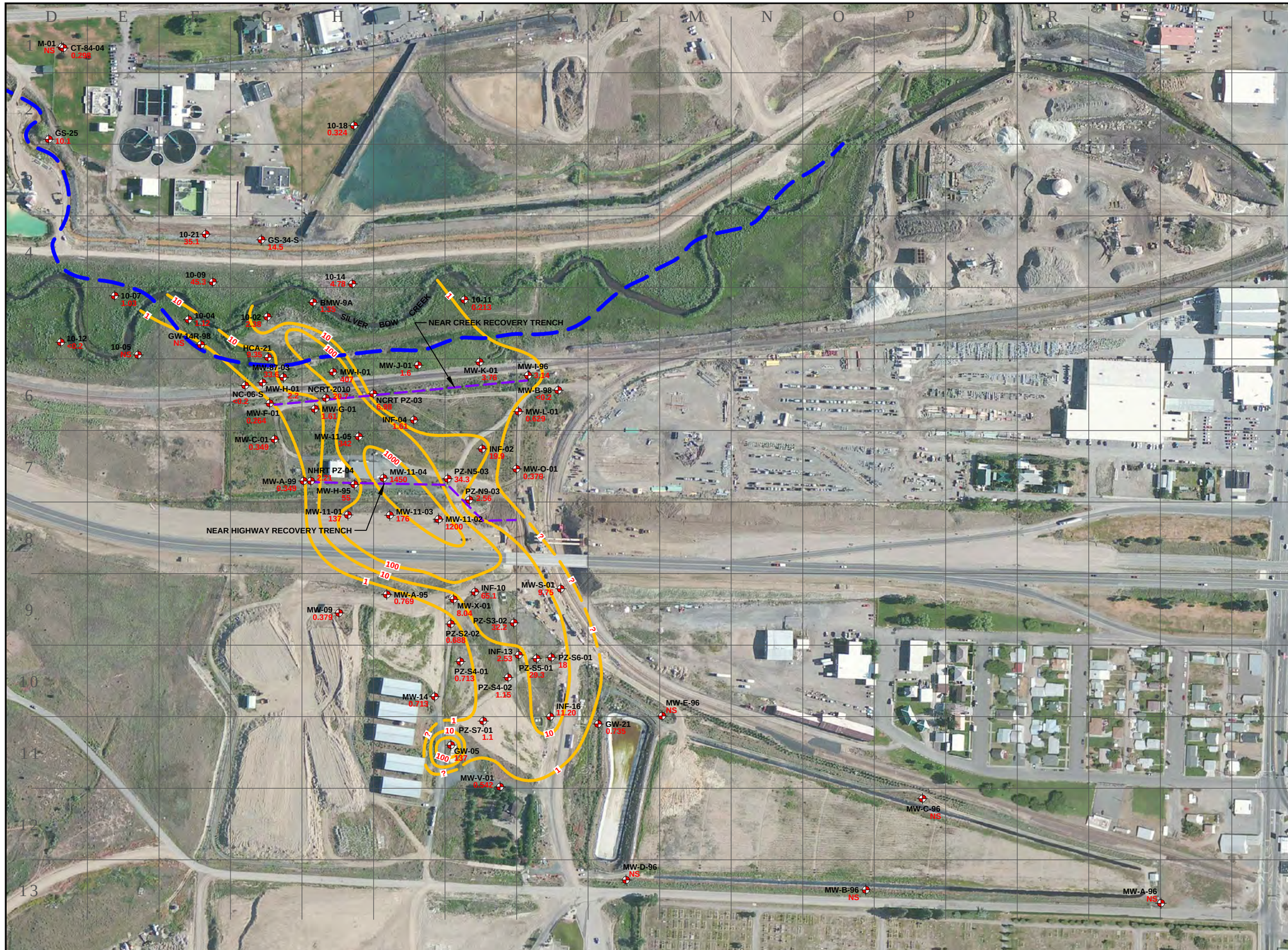
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.4
ON-SITE GROUNDWATER LEVEL DATA - AUGUST 6, 2012

TETRA TECH

Figure 4.4_On-Site GW Data_August 2012.dwg - DWH - 10/01/2014



LEGEND

- MONITORING WELL
- PCP ISOCONTOUR - DASHED WHERE INFERRED ? WHERE UNKNOWN (µg/L)
- HISTORICAL SILVER BOW CREEK (1993)

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 HISTORIC SILVER BOW CREEK CHANNEL IS INTERPRETED TO BE MIGRATING TOWARD THE NCRT.

AERIAL PHOTO SOURCE: ESRI/BING MAPS (2010)

N

150 0 150 300

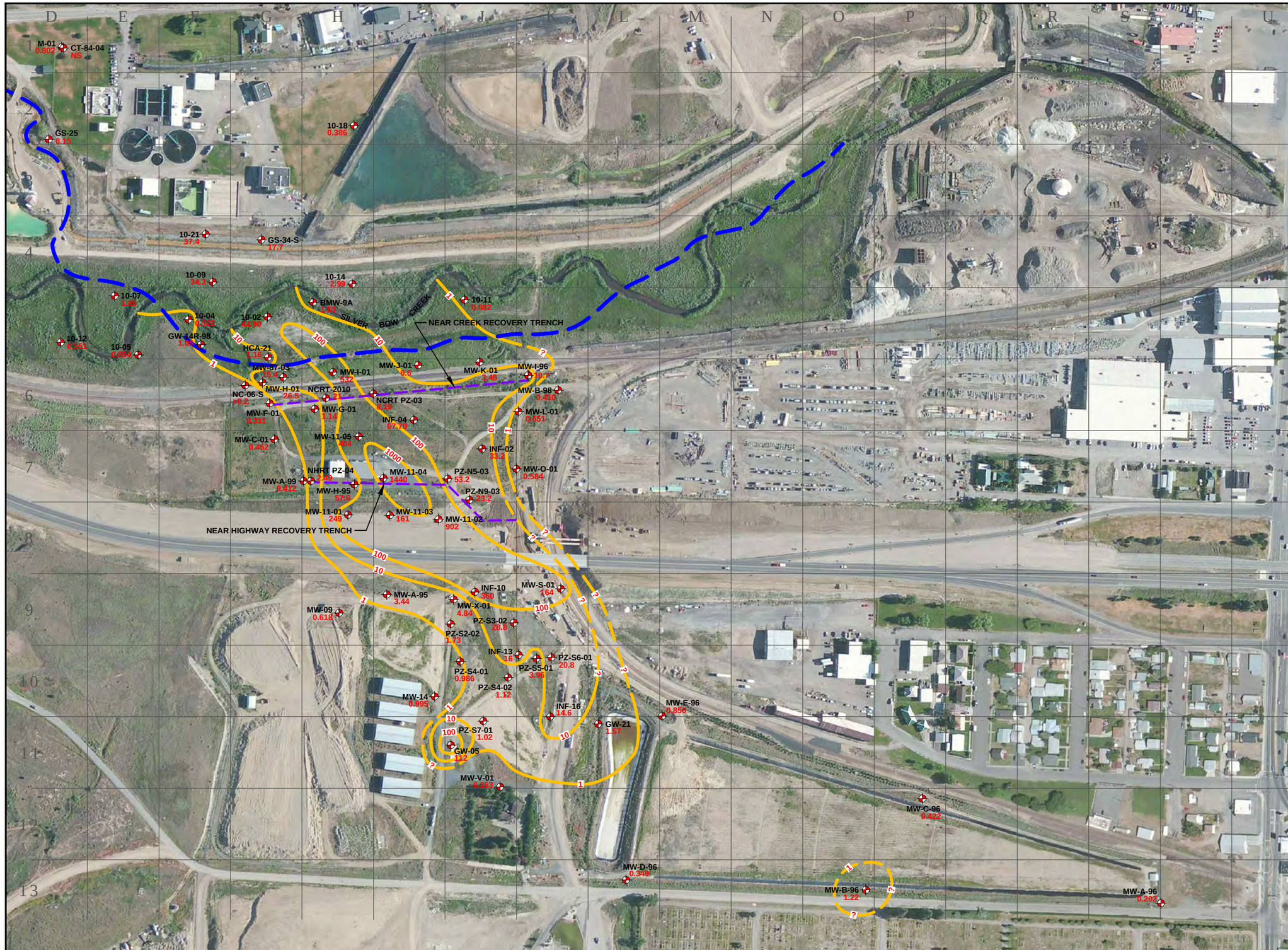
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.5
PCP DATA - FEBRUARY 2012

TETRA TECH

Figure 4.5_PCP Data_February 2012.dwg - DWH - 10/01/2014



LEGEND

- MONITORING WELL
- PCP ISOCONTOUR - DASHED WHERE INFERRED ? WHERE UNKNOWN (Ğg/L)
- HISTORICAL SILVER BOW CREEK (1993)

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 HISTORIC SILVER BOW CREEK CHANNEL IS INTERPRETED TO BE MIGRATING TOWARD THE NCRT.

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 4.6
PCP DATA - AUGUST 2012

TETRA TECH

Figure 4.6_PCP Data_August 2012.dwg - DWH - 10/01/2014

LEGEND

- GROUNDWATER MONITORING WELL
- SURFACE WATER STATION
- WATER TREATMENT PLANT SAMPLE STATION
- APPROXIMATE AREA OF PLUME DEFINED BY 1 µg/L PCP ISOCONTOUR - DASHED WHERE INFERRED, ? WHERE UNKNOWN
- Ğg/L MICROGAMS PER LITER
- PCP PENTACHLOROPHENOL

NOTES:
1) PCP PLUME BOUNDARY IS INTERPRETED; OTHER INTERPRETATIONS ARE POSSIBLE.
2) PLUME OUTLINE INTERPRETED BASED ON AUGUST 2012 CONDITIONS.

AERIAL PHOTO SOURCE: ESRI/BING MAPS (2010)

N

150 0 150 300

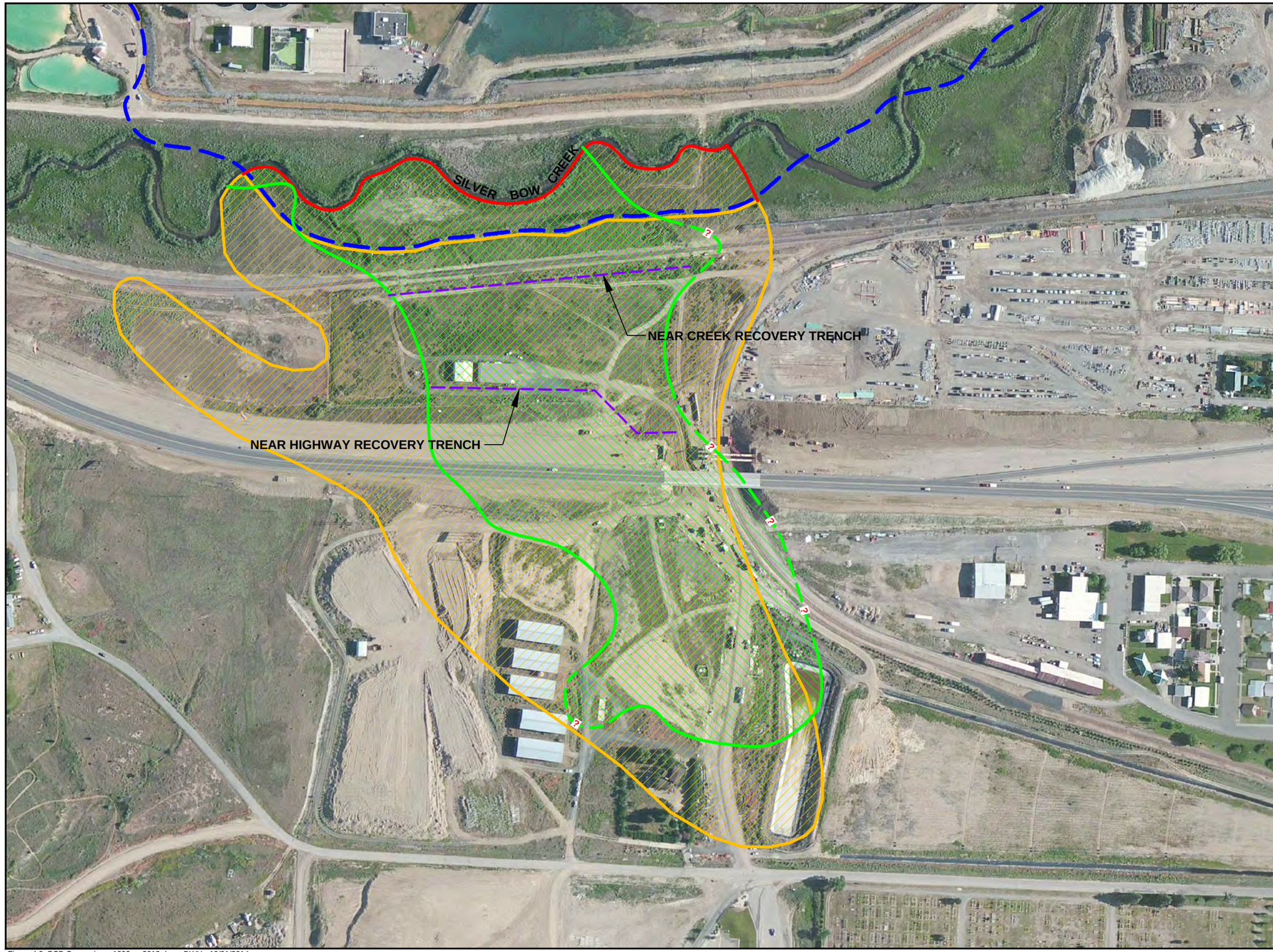
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.7
LOCATIONS OF
SELECTED MONITORING STATIONS

TETRA TECH

Figure 4.7_Selected Monitoring Stations Locations.dwg - DWH - 10/01/2014



LEGEND

- HISTORICAL SILVER BOW CREEK (1993)
- 2012 PCP PLUME CONTOUR (1Õg/L) DASHED WHERE INFERRED ? WHERE UNKNOWN
- 1993 PCP PLUME CONTOUR (1Õg/L) FROM ROD
- EXTENSION OF 1993 PLUME CONTOUR (1Õg/L) TO CURRENT LOCATION OF SILVER BOW CREEK
- 2012 PCP PLUME AREA (24.21 acres)
- 1993 PCP PLUME AREA (41.70 acres) (INCLUDES AREA BETWEEN HISTORIC SILVER BOW CREEK (1993) AND CURRENT LOCATION OF SILVER BOW CREEK (2012))

PCP PENTACHLOROPHENOL

ROD RECORD OF DECISION

Õg/L MICROGRAMS PER LITER

NOTES:

1) 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 HISTORIC SILVER BOW CREEK CHANNEL IS INTERPRETED TO BE MIGRATING TOWARD THE NCRT.

AERIAL PHOTO SOURCE: ESRI/BING MAPS (2010)

N

125 0 125 250

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.8
COMPARISON OF PLUME AREAS
1993 VERSUS 2012

TETRA TECH

Figure 4.8_PCP Comparison_1993 vs 2012.dwg - DWH - 10/01/2014

APPENDIX A
Microsoft Access Database

(Separate CD)

APPENDIX B

2012 SAMPLING RESULTS

APPENDIX B-1

Water Treatment Plant

Pentachlorophenol (PCP) Results

MONTANA POLE TREATMENT PLANT RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
1/2/2012	Plant	BABB	BABB010212	0.481			
1/9/2012	Plant	BABB	BABB010912	0.456			
1/16/2012	Plant	BABB	BABB011612	0.704		0.575	
1/23/2012	Plant	BABB	BABB012312	0.832			
1/30/2012	Plant	BABB	BABB013012	0.845			
2/6/2012	Plant	BABB	BABB020612	14.6			
2/13/2012	Plant	BABB	BABB021312	0.592			
2/20/2012	Plant	BABB	BABB022012	0.905			
2/27/2012	Plant	BABB	BABB022712	0.585			
3/5/2012	Plant	BABB	BABB030512	0.698			
3/12/2012	Plant	BABB	BABB031212	0.589			
3/19/2012	Plant	BABB	BABB031912	0.553			
3/26/2012	Plant	BABB	BABB032612	0.601			
1/2/2012	Plant	EFF	EFF010212	0.337			
1/9/2012	Plant	EFF	EFF010912	0.574		0.462	
1/16/2012	Plant	EFF	EFF011612	0.44			
1/23/2012	Plant	EFF	EFF012312	0.848			
1/30/2012	Plant	EFF	EFF013012	0.417			
2/6/2012	Plant	EFF	EFF020612	0.406			
2/13/2012	Plant	EFF	EFF021312	0.374			
2/20/2012	Plant	EFF	EFF022012	0.324			
2/27/2012	Plant	EFF	EFF022712	0.23			
3/5/2012	Plant	EFF	EFF030512	0.857			
3/12/2012	Plant	EFF	EFF031212	0.407		0.409	
3/19/2012	Plant	EFF	EFF031912	0.461			
3/26/2012	Plant	EFF	EFF032612	0.45			
1/2/2012	Plant	IN	IN010212	52.2	D		
1/9/2012	Plant	IN	IN010912	97.5	D		
1/16/2012	Plant	IN	IN011612	75.6	D		
1/23/2012	Plant	IN	IN012312	130	D		
1/30/2012	Plant	IN	IN013012	117	D		
2/6/2012	Plant	IN	IN020612	109	D		
2/13/2012	Plant	IN	IN021312	61.7	D		
2/20/2012	Plant	IN	IN022012	35.5	DS		
2/27/2012	Plant	IN	IN022712	115	D		
3/5/2012	Plant	IN	IN030512	126	D		
3/12/2012	Plant	IN	IN031212	94.5	D		
3/19/2012	Plant	IN	IN031912	89.4	D		

MONTANA POLE TREATMENT PLANT RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
3/26/2012	Plant	IN	IN032612	112	D		
1/2/2012	Plant	NCRTEFF	NCRTEFF010212	7.69			
2/6/2012	Plant	NCRTEFF	NCRTEFF020612	8.71			
3/5/2012	Plant	NCRTEFF	NCRTEFF030512	5.34			
1/2/2012	Plant	NHRTEFF	NHRTEFF010212	232	D		
2/6/2012	Plant	NHRTEFF	NHRTEFF020612	276	D		
3/5/2012	Plant	NHRTEFF	NHRTEFF030512	287	D	282	D
2/27/2012	QC-Field blank	OPOQVS	OPOQVS022712	0.2	U		
3/26/2012	QC-Field blank	OPOQVS	OPOQVS032612	0.2	U		
1/9/2012	QC-Field blank	WTPVS	WTPVS010912	0.2	U		
1/23/2012	QC-Field blank	WTPVS	WTPVS012312	0.2	U		
2/13/2012	QC-Field blank	WTPVS	WTPVS021312	0.2	U		
3/19/2012	QC-Field blank	WTPVS	WTPVS031912	0.2	U		

Notes:

Effluent concentration bolded if greater than Record of Decision (ROD) cleanup level of 1 ug/L

Units reported as micrograms per liter (ug/L)

QC	Quality Control
PCP	Pentachlorophenol
Plant	Water Treatment Plant

QUALIFIERS:

J	Detected above method detection limit (MDL) but less than method reporting limit (MRL)
U	Analyzed for but not detected above MDL
B	Compound found in sample and blank
D	Post extraction dilution
N	Duplicate out of compliance (±20%)
M	Matrix Spike recovery out of compliance (40-150%)
S	Surrogate recovery out of compliance (50-130%)
C	Calibration check out of compliance (70-130%)
CS	Surrogate Calibration Check out of Compliance

MONTANA POLE TREATMENT PLANT RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
4/2/2012	Plant	BABB	BABB040212	0.905		0.867	
4/9/2012	Plant	BABB	BABB040912	0.79			
4/16/2012	Plant	BABB	BABB041612	0.773			
4/23/2012	Plant	BABB	BABB042312	0.742		0.515	
4/30/2012	Plant	BABB	BABB043012	0.568			
5/7/2012	Plant	BABB	BABB050712	0.498			
5/14/2012	Plant	BABB	BABB051412	0.543			
5/21/2012	Plant	BABB	BABB052112	0.612			
5/29/2012	Plant	BABB	BABB052912	8.23			
6/4/2012	Plant	BABB	BABB060412	0.625			
6/11/2012	Plant	BABB	BABB061112	0.65		0.615	
6/18/2012	Plant	BABB	BABB061812	0.816			
6/25/2012	Plant	BABB	BABB062512	2.47			
4/2/2012	Plant	EFF	EFF040212	0.581			
4/9/2012	Plant	EFF	EFF040912	0.505			
4/16/2012	Plant	EFF	EFF041612	0.469			
4/23/2012	Plant	EFF	EFF042312	0.388			
4/30/2012	Plant	EFF	EFF043012	0.539			
5/7/2012	Plant	EFF	EFF050712	0.473			
5/14/2012	Plant	EFF	EFF051412	0.429		0.348	
5/21/2012	Plant	EFF	EFF052112	0.406		0.45	
5/29/2012	Plant	EFF	EFF052912	0.369			
6/4/2012	Plant	EFF	EFF060412	0.388			
6/11/2012	Plant	EFF	EFF061112	0.373			
6/18/2012	Plant	EFF	EFF061812	0.772			
6/25/2012	Plant	EFF	EFF062512	**1.03**			
4/2/2012	Plant	IN	IN040212	151	D		
4/9/2012	Plant	IN	IN040912	143	D		
4/16/2012	Plant	IN	IN041612	120	D	121	D
4/23/2012	Plant	IN	IN042312	95.8	D		
4/30/2012	Plant	IN	IN043012	124	D		
5/7/2012	Plant	IN	IN050712	112	D		
5/14/2012	Plant	IN	IN051412	117	D		
5/21/2012	Plant	IN	IN052112	110	D		
5/29/2012	Plant	IN	IN052912	140	D		
6/4/2012	Plant	IN	IN060412	122	D		
6/11/2012	Plant	IN	IN061112	133	D		
6/18/2012	Plant	IN	IN061812	125	D	132	D

MONTANA POLE TREATMENT PLANT RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
6/25/2012	Plant	IN	IN062512	126	D		
4/2/2012	Plant	NCRTEFF	NCRTEFF040212	6.12			
5/7/2012	Plant	NCRTEFF	NCRTEFF050712	0.785			
6/4/2012	Plant	NCRTEFF	NCRTEFF060412	1.63			
4/2/2012	Plant	NHRTEFF	NHRTEFF040212	379	D		
5/7/2012	Plant	NHRTEFF	NHRTEFF050712	265	D		
6/4/2012	Plant	NHRTEFF	NHRTEFF060412	300	D		
4/9/2012	QC-Field blank	OPOQVS	OPOQVS040912	0.2	U		
6/4/2012	QC-Field blank	OPOQVS	OPOQVS060412	0.2	U		
4/30/2012	QC-Field blank	WTPVS	WTPVS043012	0.2	U		
5/14/2012	QC-Field blank	WTPVS	WTPVS051412	0.2	U		
5/21/2012	QC-Field blank	WTPVS	WTPVS052112	0.2	U		
6/25/2012	QC-Field blank	WTPVS	WTPVS062512	0.2	U		

Notes:

Effluent concentration bolded if greater than Record of Decision (ROD) cleanup level of 1 ug/L

Units reported as micrograms per liter (ug/L)

QC	Quality Control
PCP	Pentachlorophenol
Plant	Water Treatment Plant

QUALIFIERS:

J	Detected above method detection limit (MDL) but less than method reporting limit (MRL)
U	Analyzed for but not detected above MDL
B	Compound found in sample and blank
D	Post extraction dilution
N	Duplicate out of compliance (±20%)
M	Matrix Spike recovery out of compliance (40-150%)
S	Surrogate recovery out of compliance (50-130%)
C	Calibration check out of compliance (70-130%)
CS	Surrogate Calibration Check out of Compliance

MONTANA POLE TREATMENT PLANT RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
7/2/2012	Plant	BABB	BABB070212	0.566			
7/9/2012	Plant	BABB	BABB070912	0.596			
7/16/2012	Plant	BABB	BABB071612	0.827			
7/23/2012	Plant	BABB	BABB072312	8.39			
7/30/2012	Plant	BABB	BABB073012	0.857			
8/6/2012	Plant	BABB	BABB080612	0.844			
8/13/2012	Plant	BABB	BABB081312	0.65			
8/20/2012	Plant	BABB	BABB082012	0.543			
8/27/2012	Plant	BABB	BABB082712	0.587		0.553	
9/4/2012	Plant	BABB	BABB090412	0.539			
9/10/2012	Plant	BABB	BABB091012	0.772			
9/17/2012	Plant	BABB	BABB091712	0.746			
9/24/2012	Plant	BABB	BABB092412	0.657			
7/2/2012	Plant	EFF	EFF070212	0.404			
7/9/2012	Plant	EFF	EFF070912	0.392			
7/16/2012	Plant	EFF	EFF071612	0.398			
7/23/2012	Plant	EFF	EFF072312	0.344		0.351	
7/30/2012	Plant	EFF	EFF073012	0.62			
8/6/2012	Plant	EFF	EFF080612	0.535			
8/13/2012	Plant	EFF	EFF081312	0.52		0.517	
8/20/2012	Plant	EFF	EFF082012	0.443			
8/27/2012	Plant	EFF	EFF082712	0.36			
9/4/2012	Plant	EFF	EFF090412	0.44			
9/10/2012	Plant	EFF	EFF091012	0.647			
9/17/2012	Plant	EFF	EFF091712	0.43			
9/24/2012	Plant	EFF	EFF092412	0.363		0.352	
7/2/2012	Plant	IN	IN070212	119	D		
7/9/2012	Plant	IN	IN070912	131	D		
7/16/2012	Plant	IN	IN071612	144	D		
7/23/2012	Plant	IN	IN072312	161	D		
7/30/2012	Plant	IN	IN073012	152	D		
8/6/2012	Plant	IN	IN080612	155.9	D		
8/13/2012	Plant	IN	IN081312	159	D		
8/20/2012	Plant	IN	IN082012	115	D		
8/27/2012	Plant	IN	IN082712	129	D		
9/4/2012	Plant	IN	IN090412	114	D		
9/10/2012	Plant	IN	IN091012	153	D		
9/17/2012	Plant	IN	IN091712	152	D		

MONTANA POLE TREATMENT PLANT RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
9/24/2012	Plant	IN	IN092412	111	D		
8/13/2012	Plant	LTUDIS	LTUDIS081312	25.6	D		
7/2/2012	Plant	NCRTEFF	NCRTEFF070212	3.53		4.86	
8/13/2012	Plant	NCRTEFF	NCRTEFF081312	7.05			
9/4/2012	Plant	NCRTEFF	NCRTEFF090412	5.68			
7/2/2012	Plant	NHRTEFF	NHRTEFF070212	356	D		
8/13/2012	Plant	NHRTEFF	NHRTEFF081312	342	D		
9/4/2012	Plant	NHRTEFF	NHRTEFF090412	338	D	329	D
8/13/2012	Surface Water	RETPOND	RETPOND081312	12.5	D		
7/16/2012	QC-Field blank	OPOQVS	OPOQVS071612	0.2	U		
8/20/2012	QC-Field blank	OPOQVS	OPOQVS082012	0.2	U		
9/17/2012	QC-Field blank	OPOQVS	OPOQVS091712	0.2	U		
7/9/2012	QC-Field blank	WTPVS	WTPVS070912	0.2	U		
8/6/2012	QC-Field blank	WTPVS	WTPVS080612	0.2	U		
9/10/2012	QC-Field blank	WTPVS	WTPVS091012	0.2	U		

Notes:

Effluent concentration bolded if greater than Record of Decision (ROD) cleanup level of 1 ug/L

Units reported as micrograms per liter (ug/L)

BABB	Between two activated carbon tanks
EFF	Effluent
IN	Influent
NCRT	Near Creek Recovery Trench
NHRT	Near Highway Recovery Trench
LTUDIS	Land Treatment Unit (LTU) Discharge water into the LTU Retention Pond
RETPOND	Retention Pond at LTU
QC	Quality Control
OPOQVC	Placeholder name only for QC Sample
WRPVS	Placeholder name only for QC Sample
PCP	Pentachlorophenol
Plant	Water Treatment Plant

QUALIFIERS:

J	Detected above method detection limit (MDL) but less than method reporting limit (MRL)
U	Analyzed for but not detected above MDL
B	Compound found in sample and blank
D	Post extraction dilution
N	Duplicate out of compliance (±20%)
M	Matrix Spike recovery out of compliance (40-150%)
S	Surrogate recovery out of compliance (50-130%)
C	Calibration check out of compliance (70-130%)
CS	Surrogate Calibration Check out of Compliance

MONTANA POLE TREATMENT PLANT RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
10/1/2012	Plant	BABB	BABB100112	0.697			
10/8/2012	Plant	BABB	BABB100812	0.802			
10/15/2012	Plant	BABB	BABB101512	0.751			
10/22/2012	Plant	BABB	BABB102212	0.727			
10/29/2012	Plant	BABB	BABB102912	0.869		0.697	
11/5/2012	Plant	BABB	BABB110512	1.01			
11/12/2012	Plant	BABB	BABB111212	0.597			
11/19/2012	Plant	BABB	BABB111912	0.833			
11/26/2012	Plant	BABB	BABB112612	0.52			
12/3/2012	Plant	BABB	BABB120312	0.646			
12/10/2012	Plant	BABB	BABB121012	0.55			
12/17/2012	Plant	BABB	BABB121712	0.636			
12/24/2012	Plant	BABB	BABB122412	0.586			
12/31/2012	Plant	BABB	BABB123112	0.48			
10/1/2012	Plant	EFF	EFF100112	0.41			
10/8/2012	Plant	EFF	EFF100812	0.426			
10/15/2012	Plant	EFF	EFF101512	0.41			
10/22/2012	Plant	EFF	EFF102212	0.362			
10/29/2012	Plant	EFF	EFF102912	0.434			
11/5/2012	Plant	EFF	EFF110512	0.38			
11/12/2012	Plant	EFF	EFF111212	0.315			
11/19/2012	Plant	EFF	EFF111912	0.318		0.305	
11/26/2012	Plant	EFF	EFF112612	0.482			
12/3/2012	Plant	EFF	EFF120312	0.364			
12/10/2012	Plant	EFF	EFF121012	0.303			
12/17/2012	Plant	EFF	EFF121712	0.482			
12/24/2012	Plant	EFF	EFF122412	0.296			
12/31/2012	Plant	EFF	EFF123112	0.293		0.242	
10/1/2012	Plant	IN	IN100112	57.7	D		
10/8/2012	Plant	IN	IN100812	112	D		
10/15/2012	Plant	IN	IN101512	93.5	D		
10/22/2012	Plant	IN	IN102212	107	D	109	D
10/29/2012	Plant	IN	IN102912	71.1	D		
11/5/2012	Plant	IN	IN110512	118	D		
11/12/2012	Plant	IN	IN111212	107.6	D		
11/19/2012	Plant	IN	IN111912	120	D		
11/26/2012	Plant	IN	IN112612	83.7	D		
12/3/2012	Plant	IN	IN120312	108	D		

MONTANA POLE TREATMENT PLANT RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
12/10/2012	Plant	IN	IN121012	94.6	D	95.9	D
12/17/2012	Plant	IN	IN121712	89.8	D		
12/24/2012	Plant	IN	IN122412	68.5	D		
12/31/2012	Plant	IN	IN123112	97	D		
10/1/2012	Plant	NCRTEFF	NCRTEFF100112	2.81		4.52	
11/5/2012	Plant	NCRTEFF	NCRTEFF110512	7.07			
12/3/2012	Plant	NCRTEFF	NCRTEFF120312	49.4	D		
10/1/2012	Plant	NHRTEFF	NHRTEFF100112	312	D		
11/5/2012	Plant	NHRTEFF	NHRTEFF110512	363	D		
12/3/2012	Plant	NHRTEFF	NHRTEFF120312	365	D	388	D
10/15/2012	QC-Field blank	OPOQVS	OPOQVS101512	0.2	U		
11/12/2012	QC-Field blank	OPOQVS	OPOQVS111212	0.2	U		
11/26/2012	QC-Field blank	OPOQVS	OPOQVS112612	0.2	U		
12/24/2012	QC-Field blank	OPOQVS	OPOQVS122412	0.2	U		
10/8/2012	QC-Field blank	WTPVS	WTPVS100812	0.2	U		
11/5/2012	QC-Field blank	WTPVS	WTPVS110512	0.2	U		
12/17/2012	QC-Field blank	WTPVS	WTPVS121712	0.2	U		

MONTANA POLE TREATMENT PLANT RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier

Notes:

Effluent concentration bolded if greater than Record of Decision (ROD) cleanup level of 1 ug/L

Units reported as micrograms per liter (ug/L)

BABB	Between two activated carbon tanks
EFF	Effluent
IN	Influent
NCRT	Near Creek Recovery Trench
NHRT	Near Highway Recovery Trench
LTUDIS	Land Treatment Unit (LTU) Discharge water into the LTU Retention Pond
RETPOND	Retention Pond at LTU
QC	Quality Control
OPOQVC	Placeholder name only for QC Sample
WRPVS	Placeholder name only for QC Sample
PCP	Pentachlorophenol
Plant	Water Treatment Plant

QUALIFIERS:

J	Detected above method detection limit (MDL) but less than method reporting limit (MRL)
U	Analyzed for but not detected above MDL
B	Compound found in sample and blank
D	Post extraction dilution
N	Duplicate out of compliance (±20%)
M	Matrix Spike recovery out of compliance (40-150%)
S	Surrogate recovery out of compliance (50-130%)
C	Calibration check out of compliance (70-130%)
CS	Surrogate Calibration Check out of Compliance

APPENDIX B-2

Groundwater and Surface Water

Pentachlorophenol (PCP) Results

MPTP 2012Q1 SAMPLE RESULTS FOR GROUNDWATER AND SURFACE WATER

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration[a]	Qualifier	Duplicate Result	Duplicate Qualifier	Units
2/6/2012	Groundwater	10-01	10-01020612	3.18				µg/L
2/6/2012	Groundwater	10-02	10-02020612	2.38				µg/L
2/6/2012	Groundwater	10-04	10-04020612	1.12				µg/L
2/6/2012	Groundwater	10-07	10-07020612	1.03				µg/L
2/6/2012	Groundwater	10-09	10-09020612	45.3	D			µg/L
2/7/2012	Groundwater	10-11	10-11020712	0.213				µg/L
2/7/2012	Groundwater	10-12	10-12020712	0.2	U			µg/L
2/6/2012	Groundwater	10-13	10-13020612	4.77				µg/L
2/6/2012	Groundwater	10-14	10-14020612	4.78				µg/L
2/6/2012	Groundwater	10-15	10-15020612	48.3	D			µg/L
2/6/2012	Groundwater	10-18	10-18020612	0.324				µg/L
2/6/2012	Groundwater	10-19	10-19020612	23.7				µg/L
2/6/2012	Groundwater	10-20	10-20020612	35.5	D			µg/L
2/6/2012	Groundwater	10-21	10-21020612	35.1	D			µg/L
2/6/2012	Groundwater	BMW-13B	BMW-13B020612	27.4				µg/L
2/6/2012	Groundwater	BMW-9A	BMW-9A020612	1.35				µg/L
2/6/2012	Groundwater	BMW-9B	BMW-9B020612	4.31				µg/L
2/6/2012	Groundwater	GS-18-R	GS-18-R020612	32.6				µg/L
2/6/2012	Groundwater	GS-25	GS-25020612	10.1				µg/L
2/6/2012	Groundwater	GS-34-D	GS-34D020612	0.991				µg/L
2/6/2012	Groundwater	GS-34-S	GS-34S020612	14.5		14		µg/L
2/8/2012	Groundwater	GW-05	GW-05020812	137	D			µg/L
2/7/2012	Groundwater	GW-21	GW-21020712	0.735				µg/L
2/6/2012	Groundwater	HCA-21	HCA-21020612	9.35				µg/L
2/8/2012	Groundwater	INF-02	INF-02020812	19.9				µg/L
2/8/2012	Groundwater	INF-04	INF-04020812	1.61				µg/L
2/8/2012	Groundwater	INF-08	INF-08020812	176	D			µg/L
2/8/2012	Groundwater	INF-10	INF-10020812	65.1	D			µg/L
2/8/2012	Groundwater	INF-13	INF-13020812	2.53				µg/L
2/8/2012	Groundwater	INF-16	INF-16020812	11.2				µg/L
2/6/2012	Groundwater	M-01	M-01020612	0.298				µg/L
2/7/2012	Groundwater	MW-09	MW-09020712	0.379				µg/L
2/13/2012	Groundwater	MW-11-01	MW-11-01021312	137	D			µg/L
2/13/2012	Groundwater	MW-11-02	MW-11-02021312	1200	D			µg/L
2/13/2012	Groundwater	MW-11-03	MW-11-03021312	176	D			µg/L
2/13/2012	Groundwater	MW-11-04	MW-11-04021312	1450	D			µg/L
2/13/2012	Groundwater	MW-11-05	MW-11-05021312	342	D	368	D	µg/L
2/7/2012	Groundwater	MW-14	MW-14020712	0.713				µg/L

MPTP 2012Q1 SAMPLE RESULTS FOR GROUNDWATER AND SURFACE WATER

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration[a]	Qualifier	Duplicate Result	Duplicate Qualifier	Units
2/6/2012	Groundwater	MW-87-03	MW-87-03020612	33.6				µg/L
2/7/2012	Groundwater	MW-A-95	MW-A-95020712	0.769				µg/L
2/7/2012	Groundwater	MW-A-99	MW-A-99020712	0.349				µg/L
2/7/2012	Groundwater	MW-B-98	MW-B-98020712	0.2	U			µg/L
2/7/2012	Groundwater	MW-C-01	MW-C-01020712	0.349		0.432		µg/L
2/7/2012	Groundwater	MW-F-01	MW-F-01020712	0.264				µg/L
2/8/2012	Groundwater	MW-G-01	MW-G-01020812	1.61				µg/L
2/6/2012	Groundwater	MW-H-01	MW-H-01020612	2.15				µg/L
2/8/2012	Groundwater	MW-H-95	MW-H-95020812	55	D			µg/L
2/6/2012	Groundwater	MW-I-01	MW-I-01020612	407	D			µg/L
2/8/2012	Groundwater	MW-I-96	MW-I-96020812	3.14				µg/L
2/6/2012	Groundwater	MW-J-01	MW-J-01020612	1.6				µg/L
2/7/2012	Groundwater	MW-J-96	MW-J-96020712	1.79				µg/L
2/6/2012	Groundwater	MW-K-01	MW-K-01020612	3.76				µg/L
2/7/2012	Groundwater	MW-L-01	MW-L-01020712	0.629				µg/L
2/7/2012	Groundwater	MW-O-01	MW-O-01020712	0.379				µg/L
2/7/2012	Groundwater	MW-S-01	MW-S-01020712	9.75				µg/L
2/7/2012	Groundwater	MW-V-01	MW-V-01020712	0.542				µg/L
2/8/2012	Groundwater	MW-X-01	MW-X-01020812	8.04				µg/L
2/7/2012	Groundwater	NC-06-S	NC-06-S020712	0.2	U			µg/L
2/8/2012	Groundwater	NCRT PZ-03	NCRTPZ-03020812	6.98				µg/L
2/8/2012	Groundwater	NCRT-2010	NCRT-2010020812	20.7				µg/L
2/8/2012	Groundwater	NHRT PZ-04	NHRTPZ-04020812	2.21				µg/L
2/8/2012	Groundwater	PZ-N5-03	PZ-N5-03020812	34.3				µg/L
2/8/2012	Groundwater	PZ-N9-03	PZ-N9-03020812	2.56				µg/L
2/7/2012	Groundwater	PZ-S2-02	PZ-S2-02020712	0.688				µg/L
2/8/2012	Groundwater	PZ-S3-02	PZ-S3-02020812	32.2				µg/L
2/7/2012	Groundwater	PZ-S4-01	PZ-S4-01020712	0.713				µg/L
2/8/2012	Groundwater	PZ-S4-02	PZ-S4-02020812	1.15				µg/L
2/8/2012	Groundwater	PZ-S5-01	PZ-S5-01020812	29.3				µg/L
2/8/2012	Groundwater	PZ-S6-01	PZ-S6-01020812	18				µg/L
2/7/2012	Groundwater	PZ-S7-01	PZ-S7-01020712	1.1				µg/L

MPTP 2012Q1 SAMPLE RESULTS FOR GROUNDWATER AND SURFACE WATER

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration[a]	Qualifier	Duplicate Result	Duplicate Qualifier	Units
2/6/2012	Surface Water	SS-06A	SS-06A020612	0.2	U			µg/L
2/6/2012	Surface Water	SW-03	SW-03020612	0.441				µg/L
2/6/2012	Surface Water	SW-05	SW-05020612	0.67		0.265		µg/L
2/6/2012	Surface Water	SW-06	SW-06020612	0.321				µg/L
2/6/2012	Surface Water	SW-09	SW-09020612	0.2	U			µg/L

MPTP 2012Q1 SAMPLE RESULTS FOR GROUNDWATER AND SURFACE WATER

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration [a]	Qualifier	Duplicate Result	Duplicate Qualifier	Units
2/6/2012	QC-Field blank	MW-20	MW-20020612	0.2	U			µg/L
2/7/2012	QC-Field blank	MW-21	MW-21020712	0.2	U			µg/L
2/6/2012	QC-Field blank	MW-E-98	MW-E-98020612	0.2	U			µg/L
2/8/2012	QC-Field blank	MW-G-98	MW-G-98020812	0.2	U			µg/L

Notes:

a	Cleanup concentration for PCP in groundwater is 1 µg/L (ppb)
J	Detected above MDL but less than MRL
U	Analyzed for but not detected above MDL
D	Post extraction dilution
e	Extraction holding time for sample was exceeded (internal qualifier)
a	Analysis holding time for sample was exceeded (internal qualifier)
---	No sample collected at that time
n/a	QA/QC sample, not applicable for previous sampling event
SW	surface water
GW	groundwater
All	samples analyzed by Method 528

MPTP 2012Q3 SAMPLE RESULTS FOR GROUNDWATER

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration [a]	Qualifier	Duplicate Result	Duplicate Qualifier	Units
8/7/2012	Groundwater	10-01	10-01080712	**19.1**				µg/L
8/7/2012	Groundwater	10-02	10-02080712	**44.9**	D			µg/L
8/8/2012	Groundwater	10-04	10-0402080812	0.522				µg/L
8/8/2012	Groundwater	10-05	10-05080812	0.854				µg/L
8/7/2012	Groundwater	10-07	10-07080712	**1.83**				µg/L
8/7/2012	Groundwater	10-09	10-09080712	**34.3**				µg/L
8/8/2012	Groundwater	10-11	10-11080812	0.882				µg/L
8/8/2012	Groundwater	10-12	10-12080812	0.351				µg/L
8/7/2012	Groundwater	10-13	10-13080712	**4.11**				µg/L
8/7/2012	Groundwater	10-14	10-14080712	**2.99**				µg/L
8/7/2012	Groundwater	10-15	10-15080712	**75**	D			µg/L
8/7/2012	Groundwater	10-18	10-18080712	0.386				µg/L
8/7/2012	Groundwater	10-19	10-19080712	**22.7**				µg/L
8/7/2012	Groundwater	10-20	10-20080712	**23.2**				µg/L
8/7/2012	Groundwater	10-21	10-21080712	**37.4**	D			µg/L
8/7/2012	Groundwater	BMW-13B	BMW-13B080712	**33.2**	D			µg/L
8/7/2012	Groundwater	BMW-9A	BMW-9A080712	**1.53**				µg/L
8/7/2012	Groundwater	BMW-9B	BMW-9B080712	**4.86**		4.86		µg/L
8/7/2012	Groundwater	GS-18-R	GS-18-R080712	**36**	D			µg/L
8/7/2012	Groundwater	GS-25	GS-25080712	**8.15**				µg/L
8/7/2012	Groundwater	GS-34-D	GS-34D080712	**2.52**				µg/L
8/7/2012	Groundwater	GS-34-S	GS-34S080712	**17.7**				µg/L
8/9/2012	Groundwater	GW-05	GW-05080912	**112**	D			µg/L
8/13/2012	Groundwater	GW-14R-98	GW-14R-98081312	**1.05**				µg/L
8/8/2012	Groundwater	GW-21	GW-21080812	**1.57**				µg/L
8/7/2012	Groundwater	HCA-21	HCA-21080712	**1.16**				µg/L
8/9/2012	Groundwater	INF-02	INF-02080912	**33.2**	D			µg/L
8/13/2012	Groundwater	INF-04	INF-04081312	**67.7**	D			µg/L
8/9/2012	Groundwater	INF-08	INF-08080912	**257**	D	241	D	µg/L
8/9/2012	Groundwater	INF-10	INF-10080912	**360**	D			µg/L
8/9/2012	Groundwater	INF-13	INF-13080912	**16**				µg/L
8/9/2012	Groundwater	INF-16	INF-16080912	**14.6**				µg/L
8/7/2012	Groundwater	M-01	M-01080712	0.802				µg/L
8/8/2012	Groundwater	MW-09	MW-09080812	0.618				µg/L
8/6/2012	Groundwater	MW-11-01	MW-11-01080612	**249**	D	241	D	µg/L
8/6/2012	Groundwater	MW-11-02	MW-11-02080612	**902**	D			µg/L
8/6/2012	Groundwater	MW-11-03	MW-11-03080612	**161**	D			µg/L
8/6/2012	Groundwater	MW-11-04	MW-11-04080612	**1440**	D			µg/L
8/9/2012	Groundwater	MW-11-05	MW-11-05080912	**404**	D			µg/L
8/8/2012	Groundwater	MW-14	MW-1402080812	0.995				µg/L

MPTP 2012Q3 SAMPLE RESULTS FOR GROUNDWATER

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration [a]	Qualifier	Duplicate Result	Duplicate Qualifier	Units
8/6/2012	Groundwater	MW-87-03	MW-87-03080612	**15.4**				µg/L
8/8/2012	Groundwater	MW-A-95	MW-A-95080812	**3.44**				µg/L
8/6/2012	Groundwater	MW-A-96	MW-A-96-080612	0.202				µg/L
8/8/2012	Groundwater	MW-A-99	MW-A-99080812	0.412				µg/L
8/6/2012	Groundwater	MW-B-96	MW-B-96-080612	**1.22**				µg/L
8/13/2012	Groundwater	MW-B-98	MW-B98081312	0.41				µg/L
8/8/2012	Groundwater	MW-C-01	MW-C-01080812	0.452				µg/L
8/6/2012	Groundwater	MW-C-96	MW-C-96-080612	0.422				µg/L
8/6/2012	Groundwater	MW-D-96	MW-D-96-080612	0.349				µg/L
8/6/2012	Groundwater	MW-E-96	MW-E-96-080612	0.856				µg/L
8/8/2012	Groundwater	MW-F-01	MW-F-01080812	0.311				µg/L
8/9/2012	Groundwater	MW-G-01	MW-G-01080912	**1.14**				µg/L
8/8/2012	Groundwater	MW-H-01	MW-H-01080812	**26.5**		26.4		µg/L
8/9/2012	Groundwater	MW-H-95	MW-H-95080912	**57.6**	D			µg/L
8/6/2012	Groundwater	MW-I-01	MW-I-01080612	**532**	D			µg/L
8/9/2012	Groundwater	MW-I-96	MW-I-96080912	**10.7**				µg/L
8/6/2012	Groundwater	MW-J-01	MW-J-01080612	**6.56**				µg/L
8/8/2012	Groundwater	MW-J-96	MW-J-96080812	**1.47**				µg/L
8/6/2012	Groundwater	MW-K-01	MW-K-01080612	**3.45**				µg/L
8/8/2012	Groundwater	MW-L-01	MW-L-01080812	0.651				µg/L
8/8/2012	Groundwater	MW-O-01	MW-O-01080812	0.584				µg/L
8/8/2012	Groundwater	MW-S-01	MW-S-01080812	**164**	D			µg/L
8/13/2012	Groundwater	MW-V-01	MW-V-01081312	0.263				µg/L
8/9/2012	Groundwater	MW-X-01	MW-X-01080912	**4.84**				µg/L
8/8/2012	Groundwater	NC-06-S	NC-06-S080812	0.2	U			µg/L
8/9/2012	Groundwater	NCRT PZ-03	NCRTPZ-03080912	**8.19**				µg/L
8/9/2012	Groundwater	NCRT-2010	NCRT-2010080912	**21**				µg/L
8/9/2012	Groundwater	NHRT PZ-04	NHRTPZ-04080912	**2.49**				µg/L
8/9/2012	Groundwater	PZ-N5-03	PZ-N5-03080912	**53.2**	D			µg/L
8/9/2012	Groundwater	PZ-N9-03	PZ-N9-03080912	**23.2**				µg/L
8/8/2012	Groundwater	PZ-S2-02	PZ-S202080812	**1.73**				µg/L
8/9/2012	Groundwater	PZ-S3-02	PZ-S3-02080912	**28.8**				µg/L
8/8/2012	Groundwater	PZ-S4-01	PZ-S401080812	0.986				µg/L
8/9/2012	Groundwater	PZ-S4-02	PZ-S4-02080912	**1.12**				µg/L
8/9/2012	Groundwater	PZ-S5-01	PZ-S5-01080912	**3.96**				µg/L
8/9/2012	Groundwater	PZ-S6-01	PZ-S6-01080912	**20.8**				µg/L
8/8/2012	Groundwater	PZ-S7-01	PZ-S7-01080812	**1.02**				µg/L

8/7/2012	QC-Field blank	MW-18	MW-18080712	0.2	U			µg/L

MPTP 2012Q3 SAMPLE RESULTS FOR GROUNDWATER

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration [a]	Qualifier	Duplicate Result	Duplicate Qualifier	Units
8/9/2012	QC-Field blank	MW-19	MW-19080912	0.2	U			µg/L
8/13/2012	QC-Field blank	MW-20	MW-20081312	0.2	U			µg/L
8/8/2012	QC-Field blank	MW-21	MW-21080812	0.2	U			µg/L

Notes:

a	Cleanup concentration for PCP in groundwater is 1 µg/L (ppb). Exceedences are bold
SW	surface water
GW	groundwater
QC	Quality Control
µg/L	micrograms per liter
NCRT	Near Creek Recovery Trench
NHRT	Near Highway Recovery Trench
NC	Near Creek
SS	Surface Station
PZ	piezometer

The Station Name for each QC sample is a placeholder name only and is not associated with any specific monitoring well.
All samples analyzed by Method 528

QUALIFIERS:

J	Detected above method detection limit (MDL) but less than method reporting limit (MRL)
U	Analyzed for but not detected above MDL
B	Compound found in sample and blank
D	Post extraction dilution
N	Duplicate out of compliance (±20%)
M	Matrix Spike recovery out of compliance (40-150%)
S	Surrogate recovery out of compliance (50-130%)
C	Calibration check out of compliance (70-130%)
CS	Surrogate Calibration Check out of Compliance

MPTP 2012Q3 SAMPLE RESULTS FOR SURFACE WATER

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration [a]	Qualifier	Duplicate Result	Duplicate Qualifier	Units
8/13/2012	Surface Water	SS-06A	SS-06A081312	0.2	U			µg/L
8/13/2012	Surface Water	SW-05	SW-05081312	0.2	U			µg/L
8/13/2012	Surface Water	SW-09	SW-09081312	0.2	U			µg/L

Notes:

a	Cleanup concentration for PCP in surface water is 1 µg/L (ppb)
SW	surface water
QC	Quality Control
µg/L	micrograms per liter
SS	Surface Station

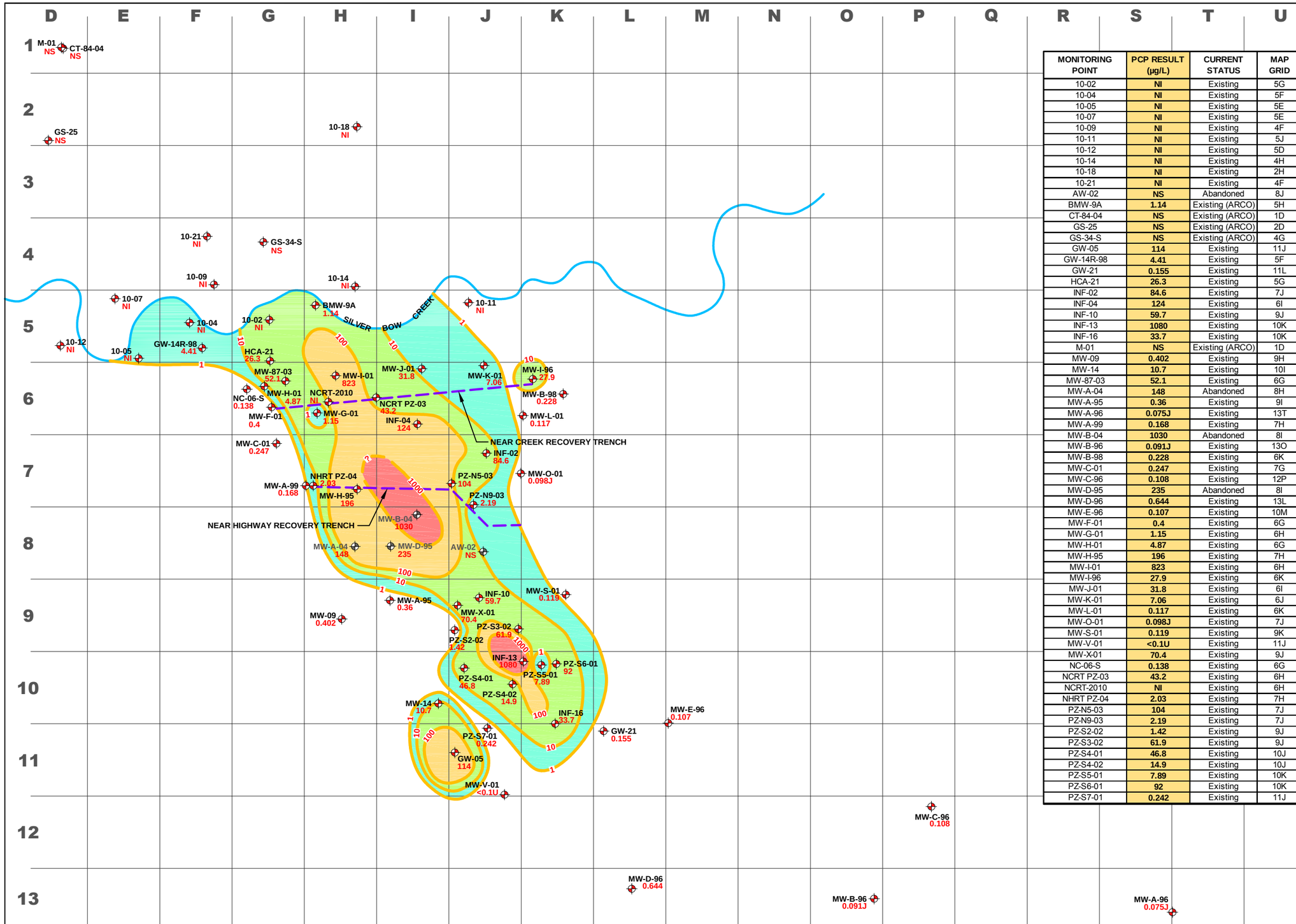
The Station Name for each QC sample is a placeholder name only and is not associated with any specific monitoring well.
All samples analyzed by Method 528

QUALIFIERS:

J	Detected above method detection limit (MDL) but less than method reporting limit (MRL)
U	Analyzed for but not detected above MDL
B	Compound found in sample and blank
D	Post extraction dilution
N	Duplicate out of compliance (±20%)
M	Matrix Spike recovery out of compliance (40-150%)
S	Surrogate recovery out of compliance (50-130%)
C	Calibration check out of compliance (70-130%)
CS	Surrogate Calibration Check out of Compliance

APPENDIX C

PLUME AREA MAPS



MONITORING POINT	PCP RESULT (µg/L)	CURRENT STATUS	MAP GRID
10-02	NI	Existing	5G
10-04	NI	Existing	5F
10-05	NI	Existing	5E
10-07	NI	Existing	5E
10-09	NI	Existing	4F
10-11	NI	Existing	5J
10-12	NI	Existing	5D
10-14	NI	Existing	4H
10-18	NI	Existing	2H
10-21	NI	Existing	4F
AW-02	NS	Abandoned	8J
BMW-9A	1.14	Existing (ARCO)	5H
CT-84-04	NS	Existing (ARCO)	1D
GS-25	NS	Existing (ARCO)	2D
GS-34-S	NS	Existing (ARCO)	4G
GW-05	114	Existing	11J
GW-14R-98	4.41	Existing	5F
GW-21	0.155	Existing	11L
HCA-21	26.3	Existing	5G
INF-02	84.6	Existing	7J
INF-04	124	Existing	6I
INF-10	59.7	Existing	9J
INF-13	1080	Existing	10K
INF-16	33.7	Existing	10K
M-01	NS	Existing (ARCO)	1D
MW-09	0.402	Existing	9H
MW-14	10.7	Existing	10I
MW-87-03	52.1	Existing	6G
MW-A-04	148	Abandoned	8H
MW-A-95	0.36	Existing	9I
MW-A-96	0.075J	Existing	13T
MW-A-99	0.168	Existing	7H
MW-B-04	1030	Abandoned	8I
MW-B-96	0.091J	Existing	13O
MW-B-98	0.228	Existing	6K
MW-C-01	0.247	Existing	7G
MW-C-96	0.108	Existing	12P
MW-D-95	235	Abandoned	8I
MW-D-96	0.644	Existing	13L
MW-E-96	0.107	Existing	10M
MW-F-01	0.4	Existing	6G
MW-G-01	1.15	Existing	6H
MW-H-01	4.87	Existing	6G
MW-H-95	196	Existing	7H
MW-I-01	823	Existing	6H
MW-I-96	27.9	Existing	6K
MW-J-01	31.8	Existing	6I
MW-K-01	7.06	Existing	6J
MW-L-01	0.117	Existing	6K
MW-O-01	0.098J	Existing	7J
MW-S-01	0.119	Existing	9K
MW-V-01	<0.1U	Existing	11J
MW-X-01	70.4	Existing	9J
NC-06-S	0.138	Existing	6G
NCRT PZ-03	43.2	Existing	6H
NCRT-2010	NI	Existing	6H
NHRT PZ-04	2.03	Existing	7H
PZ-N5-03	104	Existing	7J
PZ-N9-03	2.19	Existing	7J
PZ-S2-02	1.42	Existing	9J
PZ-S3-02	61.9	Existing	9J
PZ-S4-01	46.8	Existing	10J
PZ-S4-02	14.9	Existing	10J
PZ-S5-01	7.89	Existing	10K
PZ-S6-01	92	Existing	10K
PZ-S7-01	0.242	Existing	11J

Area in Acres

>/= 1 - <10	Area = 7.43
>/= 10 - <100	Area = 7.67
>/= 100 - <1000	Area = 5.22
>/= 1000	Area = 1.07
	Total = 21.39

>/= GREATER THAN OR EQUAL TO
< LESS THAN

TABLE LEGEND

µg/L	MICROGAMS PER LITER
J	ESTIMATED VALUE
NI	NOT INSTALLED AT THE TIME OF SAMPLING
NS	NOT SAMPLED
PCP	PENTACHLOROPHENOL
U	NOT DETECTED AT LIMIT SHOWN
<	LESS THAN

LEGEND

- MONITORING WELL
- MONITORING WELL (ABANDONED IN 2009)
- PCP ISOCONTOUR - DASHED WHERE INFERRED ? WHERE UNKNOWN

NOTES:
1) 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 **HISTORIC SILVER BOW CREEK CHANNEL IS INTERPRETED** TO BE MIGRATING TOWARD THE NCRT.

N

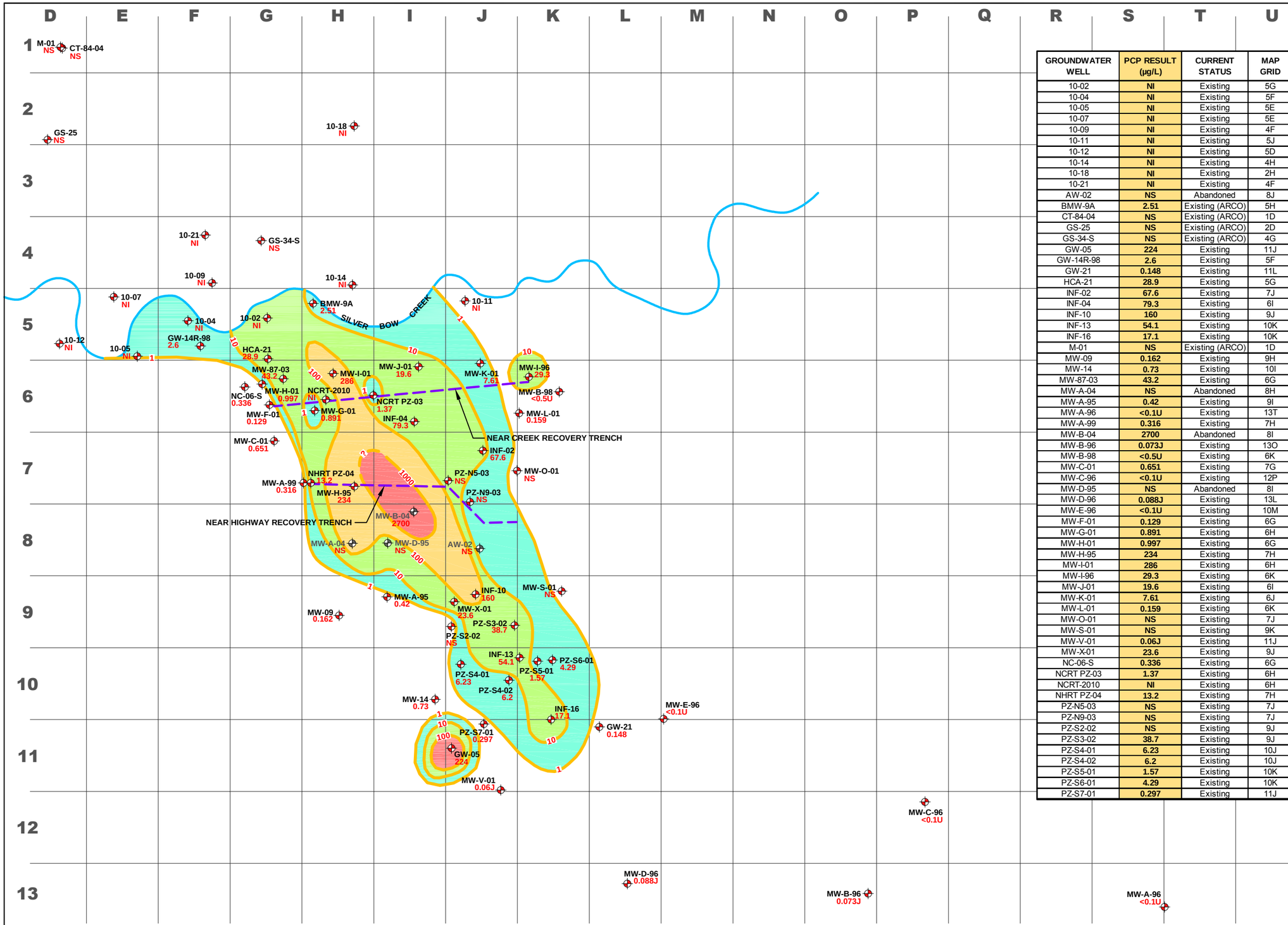
150 0 150 300
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE C1
PCP DATA - AUGUST 2008

TETRA TECH

Figure_C1_PCP Areas_August 2008.dwg - DWH - 10/01/2014



GROUNDWATER WELL	PCP RESULT (µg/L)	CURRENT STATUS	MAP GRID
10-02	NI	Existing	5G
10-04	NI	Existing	5F
10-05	NI	Existing	5E
10-07	NI	Existing	5E
10-09	NI	Existing	4F
10-11	NI	Existing	5J
10-12	NI	Existing	5D
10-14	NI	Existing	4H
10-18	NI	Existing	2H
10-21	NI	Existing	4F
AW-02	NS	Abandoned	8J
BMW-9A	2.51	Existing (ARCO)	5H
CT-84-04	NS	Existing (ARCO)	1D
GS-25	NS	Existing (ARCO)	2D
GS-34-S	NS	Existing (ARCO)	4G
GW-05	224	Existing	11J
GW-14R-98	2.6	Existing	5F
GW-21	0.148	Existing	11L
HCA-21	28.9	Existing	5G
INF-02	67.6	Existing	7J
INF-04	79.3	Existing	6I
INF-10	160	Existing	9J
INF-13	54.1	Existing	10K
INF-16	17.1	Existing	10K
M-01	NS	Existing (ARCO)	1D
MW-09	0.162	Existing	9H
MW-14	0.73	Existing	10I
MW-87-03	43.2	Existing	6G
MW-A-04	NS	Abandoned	8H
MW-A-95	0.42	Existing	9I
MW-A-96	<0.1U	Existing	13T
MW-A-99	0.316	Existing	7H
MW-B-04	2700	Abandoned	8I
MW-B-96	0.073J	Existing	13O
MW-B-98	<0.5U	Existing	6K
MW-C-01	0.651	Existing	7G
MW-C-96	<0.1U	Existing	12P
MW-D-95	NS	Abandoned	8I
MW-D-96	0.088J	Existing	13L
MW-E-96	<0.1U	Existing	10M
MW-F-01	0.129	Existing	6G
MW-G-01	0.891	Existing	6H
MW-H-01	0.997	Existing	6G
MW-H-95	234	Existing	7H
MW-I-01	286	Existing	6H
MW-I-96	29.3	Existing	6K
MW-J-01	19.6	Existing	6I
MW-K-01	7.61	Existing	6J
MW-L-01	0.159	Existing	6K
MW-O-01	NS	Existing	7J
MW-S-01	NS	Existing	9K
MW-V-01	0.06J	Existing	11J
MW-X-01	23.6	Existing	9J
NC-06-S	0.336	Existing	6G
NCRT PZ-03	1.37	Existing	6H
NCRT-2010	NI	Existing	6H
NHRT PZ-04	13.2	Existing	7H
PZ-N5-03	NS	Existing	7J
PZ-N9-03	NS	Existing	7J
PZ-S2-02	NS	Existing	9J
PZ-S3-02	38.7	Existing	9J
PZ-S4-01	6.23	Existing	10J
PZ-S4-02	6.2	Existing	10J
PZ-S5-01	1.57	Existing	10K
PZ-S6-01	4.29	Existing	10K
PZ-S7-01	0.297	Existing	11J

Area in Acres

	>/= 1 - <10	Area = 8.76
	>/= 10 - <100	Area = 8.13
	>/= 100 - <1000	Area = 3.16
	>/= 1000	Area = 0.99
		Total = 21.04

>/= GREATER THAN OR EQUAL TO
< LESS THAN

TABLE LEGEND

µg/L	MICROGAMS PER LITER
J	ESTIMATED VALUE
NI	NOT INSTALLED AT THE TIME OF SAMPLING
NS	NOT SAMPLED
PCP	PENTACHLOROPHENOL
U	NOT DETECTED AT LIMIT SHOWN
<	LESS THAN

LEGEND

- MONITORING WELL
- MONITORING WELL (ABANDONED IN 2009)
- PCP ISOCONTOUR - DASHED WHERE INFERRED ? WHERE UNKNOWN

NOTES:
1) 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 **HISTORIC SILVER BOW CREEK CHANNEL IS INTERPRETED** TO BE MIGRATING TOWARD THE NCRT.

N

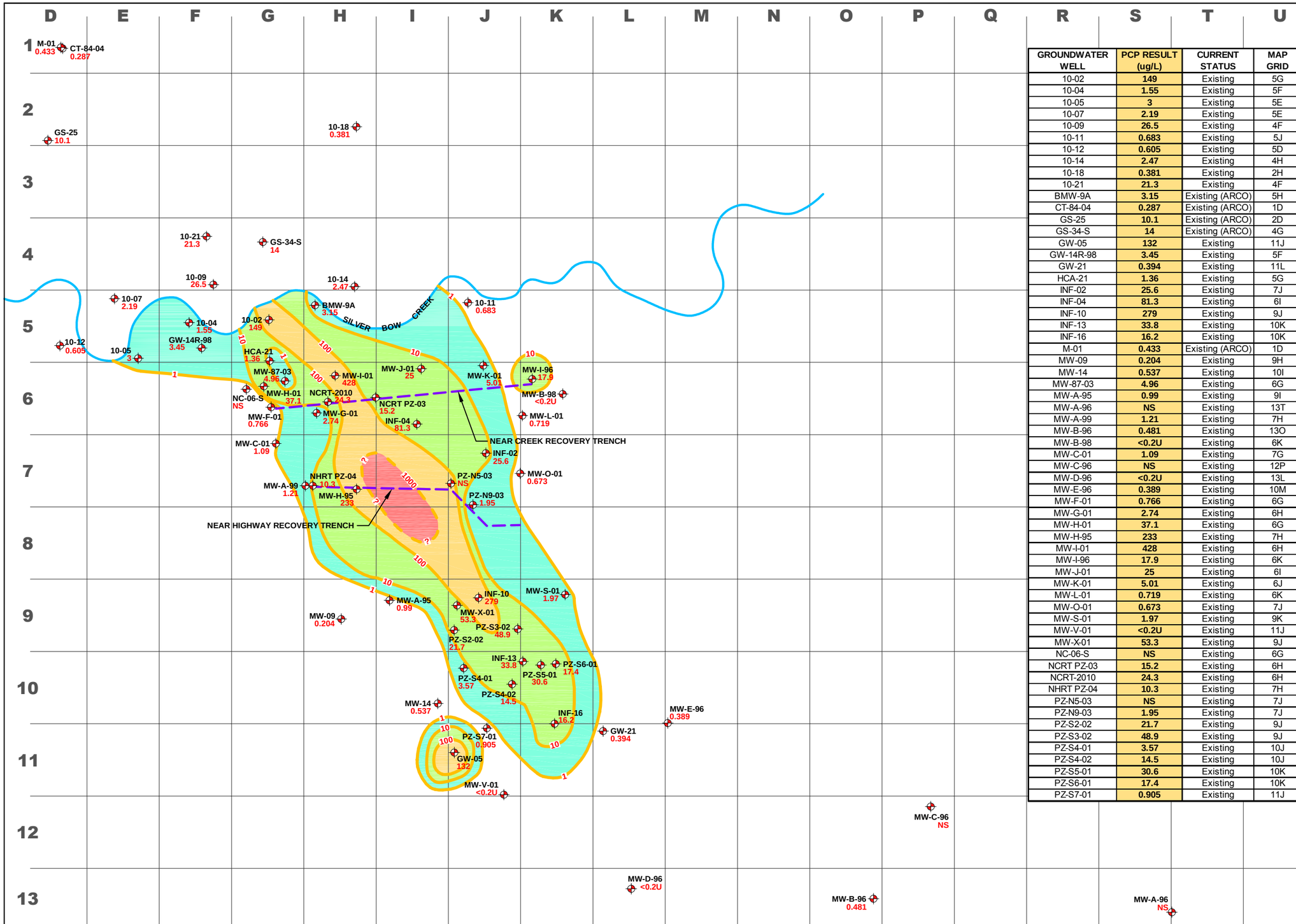
150 0 150 300
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE C2
PCP DATA - AUGUST 2009

TETRA TECH

Figure_C2_PCP Areas_August 2009.dwg - DWH - 10/01/2014



GROUNDWATER WELL	PCP RESULT (ug/L)	CURRENT STATUS	MAP GRID
10-02	149	Existing	5G
10-04	1.55	Existing	5F
10-05	3	Existing	5E
10-07	2.19	Existing	5E
10-09	26.5	Existing	4F
10-11	0.683	Existing	5J
10-12	0.605	Existing	5D
10-14	2.47	Existing	4H
10-18	0.381	Existing	2H
10-21	21.3	Existing	4F
BMW-9A	3.15	Existing (ARCO)	5H
CT-84-04	0.287	Existing (ARCO)	1D
GS-25	10.1	Existing (ARCO)	2D
GS-34-S	14	Existing (ARCO)	4G
GW-05	132	Existing	11J
GW-14R-98	3.45	Existing	5F
GW-21	0.394	Existing	11L
HCA-21	1.36	Existing	5G
INF-02	25.6	Existing	7J
INF-04	81.3	Existing	6I
INF-10	279	Existing	9J
INF-13	33.8	Existing	10K
INF-16	16.2	Existing	10K
M-01	0.433	Existing (ARCO)	1D
MW-09	0.204	Existing	9H
MW-14	0.537	Existing	10I
MW-87-03	4.96	Existing	6G
MW-A-95	0.99	Existing	9I
MW-A-96	NS	Existing	13T
MW-A-99	1.21	Existing	7H
MW-B-96	0.481	Existing	13O
MW-B-98	<0.2U	Existing	6K
MW-C-01	1.09	Existing	7G
MW-C-96	NS	Existing	12P
MW-D-96	<0.2U	Existing	13L
MW-E-96	0.389	Existing	10M
MW-F-01	0.766	Existing	6G
MW-G-01	2.74	Existing	6H
MW-H-01	37.1	Existing	6G
MW-H-95	233	Existing	7H
MW-I-01	428	Existing	6H
MW-I-96	17.9	Existing	6K
MW-J-01	25	Existing	6I
MW-K-01	5.01	Existing	6J
MW-L-01	0.719	Existing	6K
MW-O-01	0.673	Existing	7J
MW-S-01	1.97	Existing	9K
MW-V-01	<0.2U	Existing	11J
MW-X-01	53.3	Existing	9J
NC-06-S	NS	Existing	6G
NCRT PZ-03	15.2	Existing	6H
NCRT-2010	24.3	Existing	6H
NHRT PZ-04	10.3	Existing	7H
PZ-N5-03	NS	Existing	7J
PZ-N9-03	1.95	Existing	7J
PZ-S2-02	21.7	Existing	9J
PZ-S3-02	48.9	Existing	9J
PZ-S4-01	3.57	Existing	10J
PZ-S4-02	14.5	Existing	10J
PZ-S5-01	30.6	Existing	10K
PZ-S6-01	17.4	Existing	10K
PZ-S7-01	0.905	Existing	11J

Area in Acres

>/= 1 - <10	Area = 9.32
>/= 10 - <100	Area = 8.50
>/= 100 - <1000	Area = 3.61
>/= 1000	Area = 0.80
	Total = 22.23

>/= GREATER THAN OR EQUAL TO
< LESS THAN

TABLE LEGEND

µg/L	MICROGAMS PER LITER
PCP	PENTACHLOROPHENOL
NS	NOT SAMPLED
U	NOT DETECTED AT LIMIT SHOWN
<	LESS THAN

LEGEND

MONITORING WELL

PCP ISOCONTOUR - DASHED WHERE INFERRED
? WHERE UNKNOWN

NOTES:
1) PCP ISOCONTOURS ARE INTERPRETED; OTHER INTERPRETATIONS ARE POSSIBLE.

2) MONITORING WELL MW-B-04 WAS ABANDONED.
NO DATA AVAILABLE TO CONTOUR 1,000µg/L CONTOUR LINE.
CONTOUR LINE INFERRED BASED ON HISTORIC DATA.

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

N

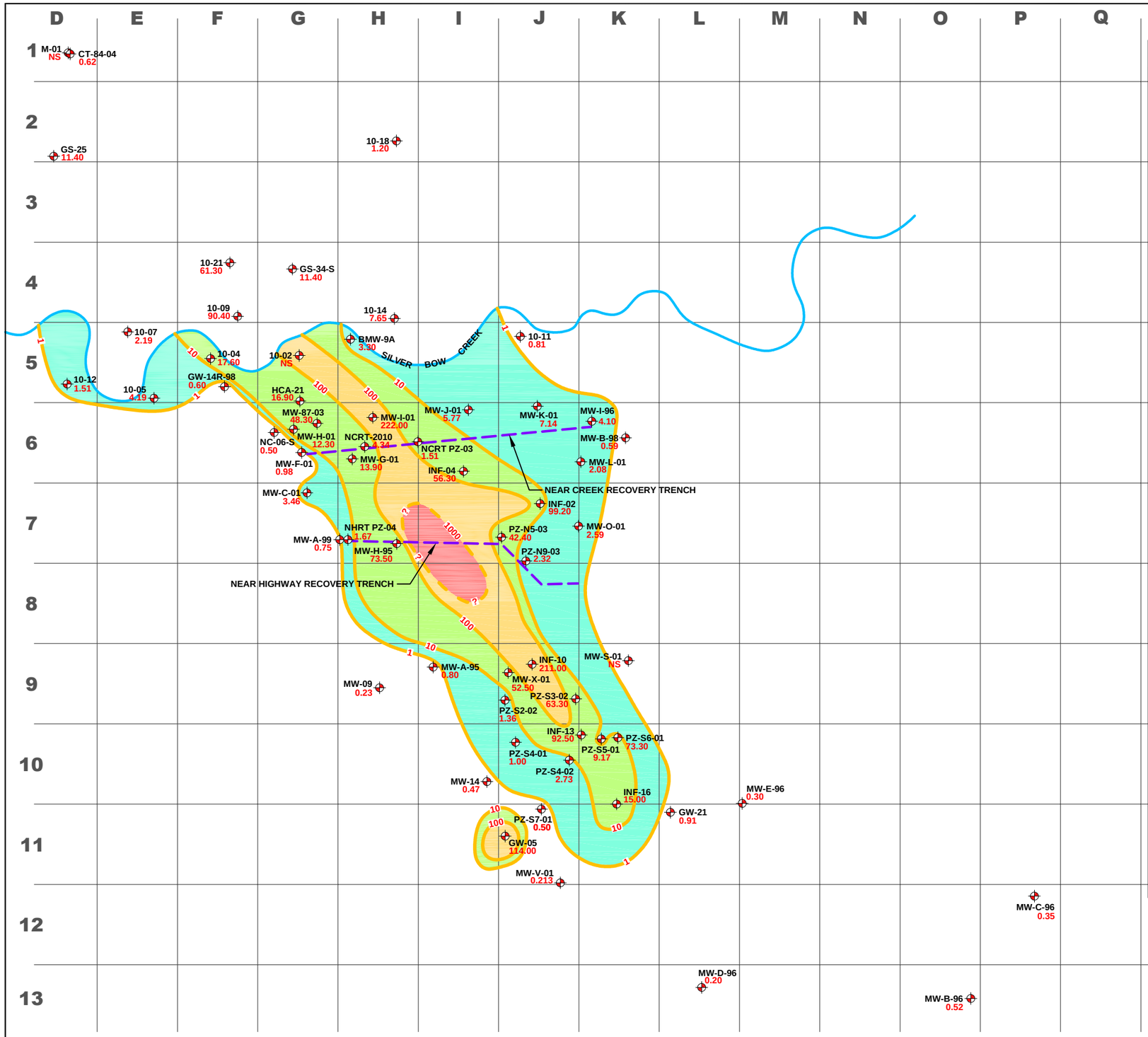
150 0 150 300
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE C3
PCP DATA - AUGUST 2010

TETRA TECH

Figure_C3_PCP Areas_August 2010.dwg - DWH - 10/01/2014



GROUNDWATER WELL	PCP Data (µg/L)	CURRENT STATUS	MAP GRID
10-02	NS	Existing	5G
10-04	17.60	Existing	5F
10-05	4.19	Existing	5E
10-07	2.19	Existing	5E
10-09	90.40	Existing	4F
10-11	0.81	Existing	5J
10-12	1.51	Existing	5D
10-14	7.65	Existing	4H
10-18	1.20	Existing	2H
10-21	61.30	Existing	4F
BMW-9A	3.30	Existing (ARCO)	5H
CT-84-04	0.62	Existing (ARCO)	1D
GS-25	11.40	Existing (ARCO)	2D
GS-34-S	11.40	Existing (ARCO)	4G
GW-05	114.00	Existing	11J
GW-14R-98	0.60	Existing	5F
GW-21	0.91	Existing	11L
HCA-21	16.90	Existing	5G
INF-02	99.20	Existing	7J
INF-04	56.30	Existing	6I
INF-10	211.00	Existing	9J
INF-13	92.50	Existing	10K
INF-16	15.00	Existing	10K
M-01	NS	Existing (ARCO)	1D
MW-09	0.23	Existing	9H
MW-14	0.47	Existing	10I
MW-87-03	48.30	Existing	6G
MW-A-95	0.80	Existing	9I
MW-A-96	0.20	Existing	13T
MW-A-99	0.75	Existing	7H
MW-B-96	0.52	Existing	13O
MW-B-98	0.59	Existing	6K
MW-C-01	3.46	Existing	7G
MW-C-96	0.35	Existing	12P
MW-D-96	0.20	Existing	13L
MW-E-96	0.30	Existing	10M
MW-F-01	0.98	Existing	6G
MW-G-01	13.90	Existing	6H
MW-H-01	12.30	Existing	6G
MW-H-95	73.50	Existing	7H
MW-I-01	222.00	Existing	6H
MW-I-96	4.10	Existing	6K
MW-J-01	5.77	Existing	6I
MW-K-01	7.14	Existing	6J
MW-L-01	2.08	Existing	6K
MW-O-01	2.59	Existing	7J
MW-S-01	NS	Existing	9K
MW-V-01	0.213	Existing	11J
MW-X-01	52.50	Existing	9J
NC-06-S	0.50	Existing	6G
NCRT PZ-03 *	1.51	Existing	6H
NCRT-2010 *	4.34	Existing	6H
NHRT PZ-04	1.67	Existing	7H
PZ-N5-03	42.40	Existing	7J
PZ-N9-03	2.32	Existing	7J
PZ-S2-02	1.36	Existing	9J
PZ-S3-02	63.30	Existing	9J
PZ-S4-01	1.00	Existing	10J
PZ-S4-02	2.73	Existing	10J
PZ-S5-01	9.17	Existing	10K
PZ-S6-01	73.30	Existing	10K
PZ-S7-01	0.50	Existing	11J

Area in Acres

>/= 1 - <10	Area = 11.56
>/= 10 - <100	Area = 7.38
>/= 100 - <1000	Area = 3.72
>/= 1000	Area = 0.77
	Total = 23.43

>/= GREATER THAN OR EQUAL TO
< LESS THAN

TABLE LEGEND

µg/L MICROGAMS PER LITER
PCP PENTACHLOROPHENOL
NS NOT SAMPLED
* NOT INCLUDED IN CONTOURING

LEGEND

MONITORING WELL
PCP ISOCONTOUR - DASHED WHERE INFERRED
? WHERE UNKNOWN

NOTES:
1) PCP ISOCONTOURS ARE INTERPRETED; OTHER INTERPRETATIONS ARE POSSIBLE.

2) MONITORING WELL MW-B-04 WAS ABANDONED. **NO DATA AVAILABLE TO CONTOUR 1,000µg/L CONTOUR LINE.** CONTOUR LINE INFERRED BASED ON HISTORIC DATA.

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

N

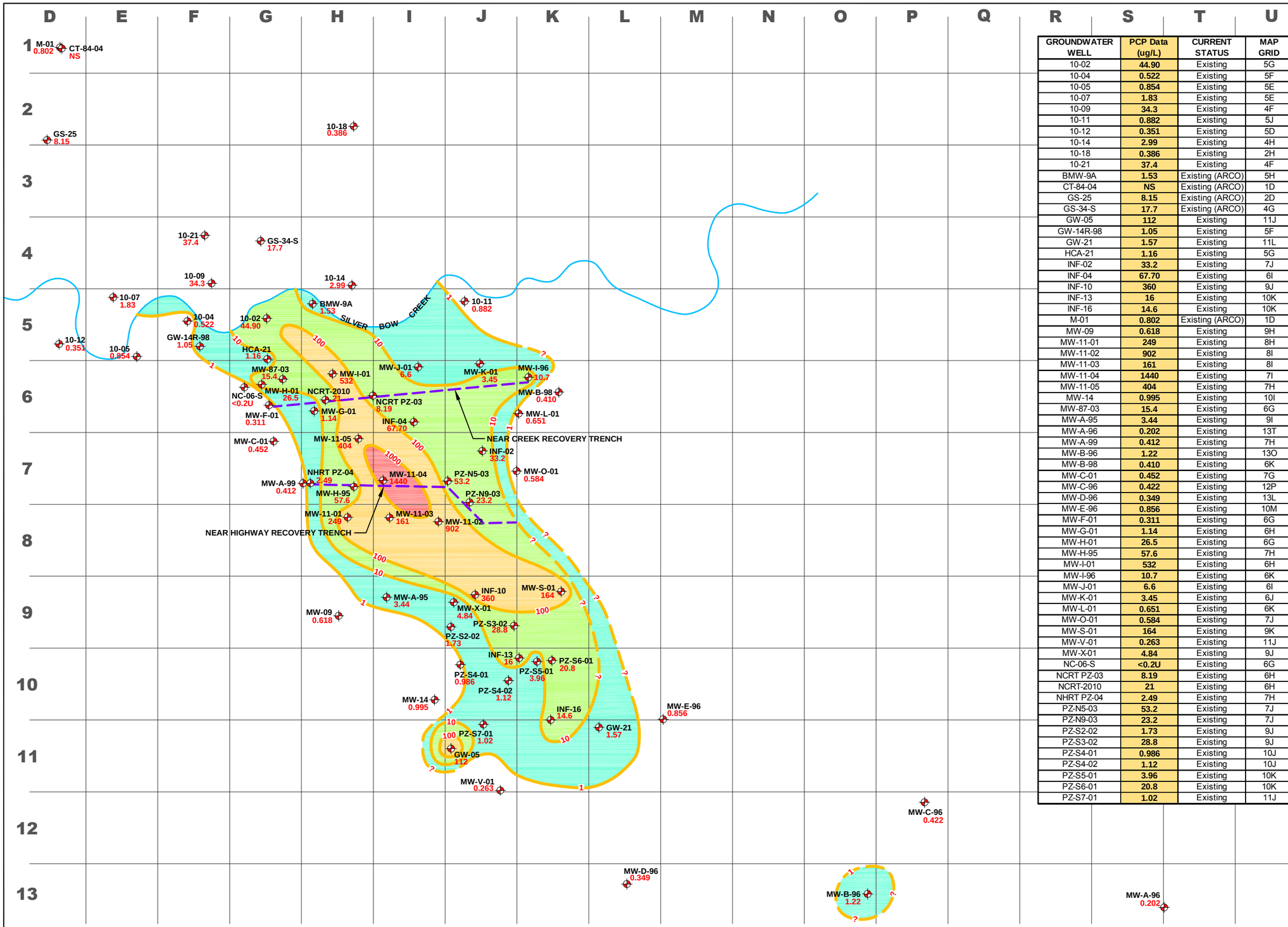
150 0 150 300
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE C4
PCP DATA - AUGUST 2011

TETRA TECH

Figure_C4_PCP Areas_August 2011.dwg - DWH - 10/01/2014



GROUNDWATER WELL	PCP Data (ug/L)	CURRENT STATUS	MAP GRID
10-02	44.90	Existing	5G
10-04	0.522	Existing	5F
10-05	0.854	Existing	5E
10-07	1.83	Existing	5E
10-09	34.3	Existing	4F
10-11	0.882	Existing	5J
10-12	0.351	Existing	5D
10-14	2.99	Existing	4H
10-18	0.386	Existing	2H
10-21	37.4	Existing	4F
BMW-9A	1.53	Existing (ARCO)	5H
CT-84-04	NS	Existing (ARCO)	1D
GS-25	8.15	Existing (ARCO)	2D
GS-34-S	17.7	Existing (ARCO)	4G
GW-05	112	Existing	11J
GW-14R-98	1.05	Existing	5F
GW-21	1.57	Existing	11L
HCA-21	1.16	Existing	5G
INF-02	33.2	Existing	7J
INF-04	67.70	Existing	6I
INF-10	360	Existing	9J
INF-13	16	Existing	10K
INF-16	14.6	Existing	10K
M-01	0.802	Existing (ARCO)	1D
MW-09	0.618	Existing	9H
MW-11-01	249	Existing	8H
MW-11-02	902	Existing	8I
MW-11-03	161	Existing	8I
MW-11-04	1440	Existing	7I
MW-11-05	404	Existing	7H
MW-14	0.995	Existing	10I
MW-87-03	15.4	Existing	6G
MW-A-95	3.44	Existing	9I
MW-A-96	0.202	Existing	13T
MW-A-99	0.412	Existing	7H
MW-B-96	1.22	Existing	13O
MW-B-98	0.410	Existing	6K
MW-C-01	0.452	Existing	7G
MW-C-96	0.422	Existing	12P
MW-D-96	0.349	Existing	13L
MW-E-96	0.856	Existing	10M
MW-F-01	0.311	Existing	6G
MW-G-01	1.14	Existing	6H
MW-H-01	26.5	Existing	6G
MW-H-95	57.6	Existing	7H
MW-I-01	532	Existing	6H
MW-I-96	10.7	Existing	6K
MW-J-01	6.6	Existing	6I
MW-K-01	3.45	Existing	6J
MW-L-01	0.651	Existing	6K
MW-O-01	0.584	Existing	7J
MW-S-01	164	Existing	9K
MW-V-01	0.263	Existing	11J
MW-X-01	4.84	Existing	9J
NC-06-S	<0.2U	Existing	6G
NCRT PZ-03	8.19	Existing	6H
NCRT-2010	21	Existing	6H
NHRT PZ-04	2.49	Existing	7H
PZ-N5-03	53.2	Existing	7J
PZ-N9-03	23.2	Existing	7J
PZ-S2-02	1.73	Existing	9J
PZ-S3-02	28.8	Existing	9J
PZ-S4-01	0.986	Existing	10J
PZ-S4-02	1.12	Existing	10J
PZ-S5-01	3.96	Existing	10K
PZ-S6-01	20.8	Existing	10K
PZ-S7-01	1.02	Existing	11J

Result in µg/L	Area in Acres
>/= 1 - <10	Area = 10.35
>/= 10 - <100	Area = 8.75
>/= 100 - <1000	Area = 4.57
>/= 1000	Area = 0.54
	Total = 24.21

>/= GREATER THAN OR EQUAL TO
< LESS THAN

TABLE LEGEND

µg/L	MICROGAMS PER LITER
PCP	PENTACHLOROPHENOL
NS	NOT SAMPLED
U	NOT DETECTED AT LIMIT SHOWN
<	LESS THAN

LEGEND

MONITORING WELL

PCP ISOCONTOUR - DASHED WHERE INFERRED
? WHERE UNKNOWN (µg/L)

NOTES:
1) 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 **HISTORIC SILVER BOW CREEK CHANNEL IS INTERPRETED** TO BE MIGRATING TOWARD THE NCRT.

N

150 0 150 300

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE C5
PCP DATA - AUGUST 2012

TETRA TECH

Figure_C5_PCP Areas_August 2012.dwg - DWH - 10/01/2014

APPENDIX D

MANN-KENDALL TESTS

State of Wisconsin
Department of Natural Resources
Remediation and Redevelopment Program

Mann-Kendall Statistical Test
Form 4400-215 (2/2001)

Notice: This form is the DNR supplied spreadsheet referenced in Appendices A of Comm 46 and NR 746, Wis. Adm. Code. It is provided to consultants as an optional tool for groundwater contaminant trend analysis to support site closure requests under s. Comm 46.07, Comm 46.08, NR 746.07, NR 746.08, Wis. Adm. Code. Use this form or a manual method when seeking case closure under those rules. Earlier versions of this form should not be used.

Instructions: Do not change formulas or other information in cells with a blue background, only cells with a yellow background are used for data entry. To use the spreadsheet, provide at least four rounds and not more than ten rounds of data that is not seasonally affected. Use consistent units. The spreadsheet contains several error checks, and a data entry error may cause "DATA ERR" or "DATE ERR" to be displayed. Dates that are not consecutive will show an error message and will not display the test results. The spreadsheet tests the data for both increasing and decreasing trends at both 80 percent and 90 percent confidence levels. If a declining trend is present at 80 percent but not at 90 percent, a site is still eligible for closure under Comm 46 and NR 746 provided that other conditions in those rules are met. If an increasing or decreasing trend is not present, an additional coefficient of variation test is used to test for stability, as proposed by Wiedemeier et al, 1999. For additional information, refer to the Interim Guidance on Natural Attenuation for Petroleum Releases, dated October 1999. Refer to the guidance for recommendations on data entry for non-detect values.

Site Name =	Montana Pole and Treating Plant	BRRTS No. =		Well Number =	GW-14-R-98

Event Number	Sampling Date (most recent last)	Compound -> PCP Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	1-Aug-04	4.60					
2	1-Aug-05	57.00					
3	1-Aug-06	39.20					
4	1-Aug-07	20.60					
5	1-Aug-08	26.30					
6	1-Aug-09	28.90					
7	1-Aug-10	1.36					
8	1-Aug-11	16.90					
9	1-Aug-12	1.16					
10							
	Mann Kendall Statistic (S) =	-16.0	0.0	0.0	0.0	0.0	0.0
	Number of Rounds (n) =	9	0	0	0	0	0
	Average =	21.78	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Standard Deviation =	18.633	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Coefficient of Variation(CV)=	0.856	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected			n<4	n<4	n<4	n<4	n<4
Trend ≥ 80% Confidence Level		**DECREASING**	n<4	n<4	n<4	n<4	n<4
Trend ≥ 90% Confidence Level		**DECREASING**	n<4	n<4	n<4	n<4	n<4
Stability Test, If No Trend Exists at			n<4	n<4	n<4	n<4	n<4
80% Confidence Level		NA	n<4	n<4	n<4	n<4	n<4

Data Entry By =	DB	Date =	19-Jul-12	Checked By =	DB

State of Wisconsin
Department of Natural Resources
Remediation and Redevelopment Program

Mann-Kendall Statistical Test
Form 4400-215 (2/2001)

Notice: This form is the DNR supplied spreadsheet referenced in Appendices A of Comm 46 and NR 746, Wis. Adm. Code. It is provided to consultants as an optional tool for groundwater contaminant trend analysis to support site closure requests under s. Comm 46.07, Comm 46.08, NR 746.07, NR 746.08, Wis. Adm. Code. Use this form or a manual method when seeking case closure under those rules. Earlier versions of this form should not be used.

Instructions: Do not change formulas or other information in cells with a blue background, only cells with a yellow background are used for data entry. To use the spreadsheet, provide at least four rounds and not more than ten rounds of data that is not seasonally affected. Use consistent units. The spreadsheet contains several error checks, and a data entry error may cause "DATA ERR" or "DATE ERR" to be displayed. Dates that are not consecutive will show an error message and will not display the test results. The spreadsheet tests the data for both increasing and decreasing trends at both 80 percent and 90 percent confidence levels. If a declining trend is present at 80 percent but not at 90 percent, a site is still eligible for closure under Comm 46 and NR 746 provided that other conditions in those rules are met. If an increasing or decreasing trend is not present, an additional coefficient of variation test is used to test for stability, as proposed by Wiedemeier et al, 1999. For additional information, refer to the Interim Guidance on Natural Attenuation for Petroleum Releases, dated October 1999. Refer to the guidance for recommendations on data entry for non-detect values.

Site Name :	Montana Pole and Treating Plant	BRRTS No. =		Well Number =	HCA-21

	Compound ->	PCP					
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	1-Aug-04	84.00					
2	1-Aug-05	57.00					
3	1-Aug-06	26.04					
4	1-Aug-07	20.40					
5	1-Aug-08	20.00					
6	1-Aug-09	13.45					
7	1-Aug-10	3.35					
8	1-Aug-11	10.37					
9	1-Aug-12	5.26					
10							
	Mann Kendall Statistic (S) =	-32.0	0.0	0.0	0.0	0.0	0.0
	Number of Rounds (n) =	9	0	0	0	0	0
	Average =	26.65	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Standard Deviation =	26.771	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Coefficient of Variation(CV)=	1.004	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected			n<4	n<4	n<4	n<4	n<4
Trend ≥ 80% Confidence Level		**DECREASING**	n<4	n<4	n<4	n<4	n<4
Trend ≥ 90% Confidence Level		**DECREASING**	n<4	n<4	n<4	n<4	n<4
Stability Test, If No Trend Exists at			n<4	n<4	n<4	n<4	n<4
80% Confidence Level		NA	n<4	n<4	n<4	n<4	n<4

Data Entry By =	DB	Date =	19-Jul-12	Checked By =	DB

State of Wisconsin
Department of Natural Resources
Remediation and Redevelopment Program

Mann-Kendall Statistical Test
Form 4400-215 (2/2001)

Notice: This form is the DNR supplied spreadsheet referenced in Appendices A of Comm 46 and NR 746, Wis. Adm. Code. It is provided to consultants as an optional tool for groundwater contaminant trend analysis to support site closure requests under s. Comm 46.07, Comm 46.08, NR 746.07, NR 746.08, Wis. Adm. Code. Use this form or a manual method when seeking case closure under those rules. Earlier versions of this form should not be used.

Instructions: Do not change formulas or other information in cells with a blue background, only cells with a yellow background are used for data entry. To use the spreadsheet, provide at least four rounds and not more than ten rounds of data that is not seasonally affected. Use consistent units. The spreadsheet contains several error checks, and a data entry error may cause "DATA ERR" or "DATE ERR" to be displayed. Dates that are not consecutive will show an error message and will not display the test results. The spreadsheet tests the data for both increasing and decreasing trends at both 80 percent and 90 percent confidence levels. If a declining trend is present at 80 percent but not at 90 percent, a site is still eligible for closure under Comm 46 and NR 746 provided that other conditions in those rules are met. If an increasing or decreasing trend is not present, an additional coefficient of variation test is used to test for stability, as proposed by Wiedemeier et al, 1999. For additional information, refer to the Interim Guidance on Natural Attenuation for Petroleum Releases, dated October 1999. Refer to the guidance for recommendations on data entry for non-detect values.

Site Name =	Montana Pole and Treating Plant - Digitized Plume Areas	BRRTS No. =	N/A	Well Number =	Plume Area

Event Number	Sampling Date (most recent last)	Compound -> Area (Acres) Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	1-Aug-08	21.64					
2	1-Aug-09	21.14					
3	1-Aug-10	22.27					
4	1-Aug-11	23.48					
5	1-Aug-12	24.29					
6							
7							
8							
9							
10							
	Mann Kendall Statistic (S) =	8.0	0.0	0.0	0.0	0.0	0.0
	Number of Rounds (n) =	5	0	0	0	0	0
	Average =	22.56	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Standard Deviation =	1.303	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Coefficient of Variation(CV)=	0.058	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected			n<4	n<4	n<4	n<4	n<4
Trend ≥ 80% Confidence Level		INCREASING	n<4	n<4	n<4	n<4	n<4
Trend ≥ 90% Confidence Level		INCREASING	n<4	n<4	n<4	n<4	n<4
Stability Test, If No Trend Exists at			n<4	n<4	n<4	n<4	n<4
80% Confidence Level		NA	n<4	n<4	n<4	n<4	n<4

Data Entry By =	DB	Date =	26-Jul-12	Checked By =	DB

APPENDIX E

PHOTOLOG

REVEGETATED POWER POLE REMOVAL AREA

Revegetated power pole removal area (facing north)

Revegetated power pole removal area (facing southwest)

APPENDIX F

HAZARDOUS WASTE SHIPPING PAPERWORK

CleanHarbors
ENVIRONMENTAL SERVICES®

Land Disposal Restriction Notification Form

Printed Date :Sep 18, 2012

MANIFEST INFORMATION

Generator : Montana Dept of Env Quality

Address: 220 West Greenwood
Butte,MT 59701

EPA ID #: M T D 9 8 6 0 7 3 5 8 3

Manifest Tracking Info.
005287662FLE

Sales Order No: UT4622173-002

LINE ITEM INFORMATION

Line Item:	Page No:	Profile No:	Treatability Group:	LDR Disposal Category
1.	1	AP302712_100B	NON-WASTEWATER	2 (This is subject to LDR.)

EPA Waste Code	EPA Waste SubCategory
F032K001	NONE

Certification	Applies to Manifest Line Items
Pursuant to 40 CFR 268.7(a), I hereby notify that this shipment contains waste restricted under 40 CFR Part 268.	1.

Waste analysis data, where available, is attached.

Signature : Tom Boulor Print Name Tom Boulor

Title : Plant Operator Date : 10-3-12

92829840 60551

Please print or type. (Form designed for use on elite (12-pitch) typewriter.) UT4622173-002 SC PPW 3/3/2011 Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number: MTD986073583
2. Page 1 of: 1
3. Emergency Response Phone: (800) 483-3718
4. Manifest Tracking Number: 005287662 FLE

GENERATOR

5. Generator's Name and Mailing Address
Montana Dept of Env Quality
220 West Greenwood
Butte, MT 59701
Generator's Phone: (406) 841-5037

Generator's Site Address (if different than mailing address): SAME

6. Transporter 1 Company Name: Clean Harbors Environmental Services Inc
U.S. EPA ID Number: MAD039322250

7. Transporter 2 Company Name
U.S. EPA ID Number

8. Designated Facility Name and Site Address
Clean Harbors Aragonite LLC
11600 North Aptus Road
Grantsville, UT 84029
Facility's Phone: (435) 884-8100
U.S. EPA ID Number: UTD981552177

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes		
X	1. NA3082 HAZARDOUS WASTE LIQUID, N.O.S., (F032, K001), 9, PG III	01	TT	1,200	G	F032	K001	
	2.							
	3.							
	4.							

14. Special Handling Instructions and Additional Information
1.AP302712 100B ERG#171

15. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: Tom Bowler
Signature: [signature] on behalf of U.S EPA
Month 10 Day 03 Year 12

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name: Jon Stokes
Signature: [signature]
Month 10 Day 3 Year 12
Transporter 2 Printed/Typed Name
Signature
Month Day Year

DESIGNATED FACILITY

18. Discrepancy
18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Manifest Reference Number:
18b. Alternate Facility (or Generator)
U.S. EPA ID Number
Facility's Phone:
18c. Signature of Alternate Facility (or Generator)
Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1.	2.	3.	4.
H040			

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a
Printed/Typed Name: Trasia Yal
Signature: [signature]
Month 10 Day 4 Year 12

EPA Form 8700-22 (Rev. 3-05) Previous editions are obsolete.

DESIGNATED FACILITY TO GENERATOR