TETRA TECH

August 4, 2017

Mr. David Bowers
Project Officer
Montana Department of Environmental Quality
Remediation Division
P.O. Box 200901
Helena, Montana 59620-0901

Subject: Final 2016 Annual Sampling and Monitoring Report, for the Montana Pole and Treating Plant, Butte-Silver Bow, Montana, Revision 0

Dear Mr. Bowers:

Tetra Tech, Inc. [EMI Unit] (Tetra Tech) is submitting the Final 2016 Annual Sampling and Monitoring Report, for the Montana Pole and Treating Plant, Butte-Silver Bow, Montana, Revision 0.

This document addresses all Montana Department of Environmental Quality and U.S. Environmental Protection Agency comments received via email on July 21, 2017, and July 26, 2017.

As requested, two hardcopies and two CDs will be hand delivered to your office today; a delivery email will also be sent.

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

Sincerely,

Kathie M. Roos

Kathie Roos, P.E.
Project Manager

Enclosures

cc: Lisa DeWitt, DEQ
Tetra Tech, Inc. [EMI Unit] file

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FINAL

2016
ANNUAL SAMPLING AND MONITORING REPORT
FOR THE
MONTANA POLE AND TREATING PLANT
BUTTE-SILVER BOW, MONTANA

Revision 0

Prepared for:

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August 2017

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ACRONYMS AND ABBREVIATIONS

pg/L	Picograms per liter
µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter
ARCO	Atlantic Richfield Company
BSB	Butte-Silver Bow
CDM	Camp Dresser & McKee, Inc.
COC	Chain of custody
Dioxin	Polychlorinated dibenzo-p-dioxins
DEQ	Montana Department of Environmental Quality
DQO	Data Quality Objective
DSR	Daily Summary Report
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
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
MDL	Method detection limit
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
NWS	National Weather Service
O&M	Operations and maintenance
OWS	Oil and water separator
PAH	Polycyclic aromatic hydrocarbons
PCP	Pentachlorophenol
PRL	Project reporting limit
PRP	Potentially responsible party
QC	Quality control

ACRONYMS AND ABBREVIATIONS (Cont.)

RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial investigation and feasibility study
ROD	Record of decision
RPD	Relative percent difference
SAP	Sampling and Analysis Plan
SDG	Sample delivery group
SSP	Soil staging and pretreatment piles
Tetra Tech	Tetra Tech, Inc. [EMI Unit]
TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin
TEF	Toxicity equivalency factors
TEQ	Toxicity equivalence quotient
USGS	U.S. Geological Survey
WET	Water and Environmental Technologies, Inc.
WTP	MPTP water treatment plant
WWTP	Wastewater 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 2016 calendar year. The report also discusses additional specific site operation and maintenance (O&M) activities for 2016, such as non-routine maintenance at the MPTP water treatment plant (WTP); use of the south-side infiltration system; impacts to groundwater from construction dewatering at the Butte Metro Sewer Treatment Plant, also referred to as the wastewater treatment plant (WWTP); operation of the land treatment unit (LTU); planning activities for the anticipated LTU offload; and other related projects completed at the site during the year.

The primary activities at the MPTP site in 2016 included (1) O&M activities, (2) sampling, and (3) planning for the next and final offload of treated soil from the LTU. LTU offload activities are being addressed in reports being prepared under separate contract task orders. The WTP facilities are currently in good working order.

A number of operational issues arose during the year; the more significant issues included:

- A decrease in the sustainable pumping rate in the near highway recovery trench (NHRT) (throughout 2016). Specifically, the sustainable pumping rate in the NHRT has generally decreased from 135 gallons per minute (gpm) in 2009 to about 72 gpm in 2016. Possible explanations for this phenomenon include: (1) impact on aquifer hydraulic conductivity due to loading of soils during construction of the interstate bridge embankment, and (2) perforated piping and gravels in the NHRT may be partially clogged by iron and manganese precipitates, inhibiting flow from trench gravels to the recovery plumbing. In way of support, the NHRT pump was replaced in August 2015 due to clogging associated with iron and manganese precipitation. Dewatering at the WWTP also influenced the sustainable pumping rate in 2016 (see below bullet item).
- Changes in WTP operations to offset groundwater pumping (construction dewatering) at the WWTP north of Silver Bow Creek (dewatering occurred from February 15, 2016, to April 26, 2016). Additional pumping in the near creek recovery trench (NCRT) was able to at least partially offset groundwater pumping associated with the WWTP construction dewatering by maintaining an inward hydraulic gradient toward the NCRT.

Other than needing to address the stated operational issues, O&M of the MPTP WTP was conducted on a routine basis in 2016.

The concentrations of pentachlorophenol (PCP) in WTP effluent samples (station EFF) were always below the 1 microgram per liter (µg/L) record of decision (ROD) discharge to surface water cleanup level.

The concentrations of polychlorinated dibenzo-p-dioxins (dioxin) and polychlorinated dibenzofurans (furans), collectively referred to as "dioxins," have varied over time, and low levels of dioxins have been detected in WTP effluent samples collected during monitoring events each year. Results for sampling conducted in 2016 confirm that concentration of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity equivalence quotient (TEQ), referred to as "dioxin (TEQ)," in WTP effluent met the ROD discharge to surface water cleanup level of 1.00E-5 µg/L (equivalent to 10 picograms per liter [pg/L]). For this report, the concentrations of dioxin (TEQ) are calculated using two different methodologies, referred to as the "MPTP ROD Methodology" and the "Montana Department of Environmental Quality [DEQ]-7 Methodology," as described below (Calculations for both methods are provided in Appendix A [database] and Appendix B [table in section B-3]):

- **MPTP ROD Methodology**

  Dioxin (TEQ) is calculated using 0 for values qualified as "U" (analyzed for but not detected above the method detection limit [MDL]) and ROD toxicity equivalency factors (TEF).

- **DEQ-7 Methodology**

  Dioxin (TEQ) is calculated using the 2005 World Health Organization methodology, using one-half the project reporting limit where not detected; using one-half the estimated maximum possible concentration when reported; and using 2005 TEFs as specified in DEQ-7 (DEQ 2012).

Using the MPTP ROD Methodology, the dioxin (TEQ) for WTP station EFF was 3.08E-07 µg/L (equivalent to 0.31 ρg/L), and was below the 1.00E-05 µg/L (equivalent to 10 ρg/L) ROD discharge to surface water cleanup level. Using the DEQ-7 Methodology, the dioxin (TEQ) for WTP station EFF was 9.51E-07 µg/L (equivalent to 0.95 ρg/L). The concentrations of metals, polycyclic aromatic hydrocarbons (PAH), chlorophenols, and anions for WTP effluent samples collected in August 2016, were all below the ROD discharge to surface water cleanup levels (where established).

No floating product (free oil) was measured in the NHRT during 2016. However, a slight oil sheen was noted on January 28, 2016, and throughout the third and fourth quarters of 2016. When coupled with the observation that floating product (free oil) was not detected in any monitoring well during any sampling conducted in calendar years 2010 through 2016, these observations suggest that significant ongoing transport of free-phase light oil is not a major concern at MPTP. However, some residual oils are still present near the NHRT, primarily below the interstate highway.

No soil tilling occurred at the LTU in 2016. Neither odors nor dust was documented at any time during the year. In addition, there was no need to irrigate the LTU, as the site received adequate precipitation throughout the year. Since the LTU irrigation system was never used in 2016, winterization of the system was not necessary. No LTU maintenance of any significance has taken place since the 2013 winterization.

The average concentration of PCP in all LTU zones sampled in 2012 was 26.7 milligrams per kilogram (mg/kg); in 2013, the average concentration of PCP in LTU soils was 26.8 mg/kg. These data indicate the average concentration of PCP in LTU soils was less than the ROD soil cleanup level (34 mg/kg) for the previous two monitoring events. LTU soils were not analyzed for PAH during the October 2013 round of sampling because all sections of the LTU had previously met the cleanup goal for PAH for two successive monitoring events. The average dioxin (TEQ) concentrations (using the MPTP ROD Methodology) for all LTU zones sampled in 2012 (2.8 micrograms per kilogram [µg/kg]) and 2013 (2.6 µg/kg) were above the ROD soil cleanup level of 0.2 µg/kg. Based on these historical data, LTU soil was not sampled in 2016 as part of site operations. Soil sampling conducted in 2016 as part of the upcoming LTU offload will be addressed in a separate report.

A semi-annual monitoring event was conducted during February 2016, and all groundwater and surface water samples were analyzed for PCP. The annual monitoring event for surface water and groundwater was conducted in August 2016. In 2016, the concentrations of PCP at all three surface water stations (SW-05, SS-06A, and SW-09) were below the laboratory detection limit value (0.2 µg/L, [0.1 µg/L after July 31, 2016[1]]) and were below the ROD surface water cleanup level (1.0 µg/L) for both monitoring events.

The concentration of benzo(a)pyrene at upstream station SW-09 and in WTP effluent (station EFF) was below detection (0.1U µg/L). The concentration of benzo(a)pyrene at station SS-06A (2.05 µg/L), located upstream of the MPTP discharge rill, and at downstream station SW-05 (2.06 µg/L), exceeded both the ROD surface water cleanup level (0.2 µg/L) and the DEQ-7 human health standard for benzo(a)pyrene in surface water (0.038 µg/L) (DEQ 2012). The concentration of benzo(a)pyrene in WTP effluent was below detection (0.1U µg/L). The concentrations of all other extended parameter list analytes in surface water were below ROD surface water cleanup levels, where established.

Benzo(a)pyrene has historically never been detected in MPTP surface water stations on Silver Bow Creek, and has never been detected in the WTP effluent. Available data suggest that the WTP effluent

[1] Starting in July 2016, and at the request of DEQ, laboratory detection limits were lowered to be consistent with the required reporting values specified in DEQ-7.

and groundwater were not the sources of benzo(a)pyrene in Silver Bow Creek in August 2016, and that the detections are likely laboratory anomalies.

Samples from 59 shallow monitoring wells, four intermediate wells, and eight deep wells were analyzed for PCP by EPA Method 528 during the 2016 first- and third-quarter monitoring events. Data from shallow wells were plotted and contoured to evaluate trends in concentration and the spatial distribution of PCP contamination. This analysis indicates the presence of a plume of PCP (as defined by the 1.0 ug/L contour) 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). In addition, there are several PCP "hot spots" at several locations on the site.

During the August 2016 annual monitoring event, groundwater samples from 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) were analyzed for the extended parameter list of analytes, including PAH, dioxins, and chlorophenols, as per the Groundwater and Surface Water Monitoring Plan (GWMP), Revision 2 (Tetra Tech, Inc. [EMI Unit] (Tetra Tech) 2013b). In 2016, the dioxin (TEQ) was below the 3.00E-05 µg/L (equivalent to 30 pg/L) ROD groundwater cleanup level in all monitoring wells. (The dioxin [TEQ] for each sample was calculated using both the MPTP ROD Methodology and the DEQ-7 Methodology.) The concentrations of PAH and chlorophenols in groundwater (the only exceptions being PCP, and a likely anomalous detection of benzo[a]pyrene in one well) were below ROD groundwater cleanup levels (where established).

Compliance with ROD groundwater cleanup requirements was assessed as part of this annual report, and the progress of remediation was evaluated. The analyses conducted support a conclusion that ongoing remediation continues to be effective, and since 1993 has reduced the original area of the PCP plume (as defined by the 1.0 ug/L contour) by approximately 62 percent.

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 2016 calendar year. The report also discusses additional specific site operation activities for 2016, such as non-routine operation and maintenance (O&M) activities at the MPTP water treatment plant (WTP); use of the south-side infiltration system; impacts to groundwater from construction dewatering at the Butte Metro Sewer Treatment Plant, also referred to as the wastewater treatment plant (WWTP); operation of the land treatment unit (LTU); planning activities for the anticipated LTU offload; 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 historical 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 provides a summary of database management. Climate and streamflow considerations are discussed in Section 8.0. References appear after Section 8.0. Tables and figures follow the text.

An electronic copy of the Microsoft Access database for the MPTP site is provided in Appendix A (separate CD). Appendix B provides a summary of sampling results and data. Appendix C provides a summary of pumping rates during the 2016 WWTP construction dewatering. Daily Summary Reports (DSR) for WTP-related incidents that occurred on August 3, 2016, and August 11, 2016, are provided in Appendices D and E. Results from Mann-Kendall statistical testing are provided in Appendix F. Plume area maps are provided in Appendix G. A summary of quality control (QC) activities for electronic data deliverables (EDD) is provided in Appendix H. Climate and streamflow statistics are provided in Appendices I and J.

1.2 SITE HISTORY

The MPTP site 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 pentachlorophenol (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 as “dioxins” — in site soils and oil samples. MDHES and EPA completed both a preliminary assessment and site inspection and a subsequent Hazard Ranking System score in July 1985.

Also in July 1985, the EPA Emergency Response Branch began a removal action on the site to minimize impacts to Silver Bow Creek and to stabilize the site. As part of the removal action, two groundwater interception and oil recovery systems were installed to alleviate oil seepage into the creek. 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 WTP went into operation on January 22, 1993.

1.4 REMEDY IMPLEMENTATION AND STATUS

The MPTP cleanup is being implemented in six phases. The design for Phase 1 of the remedial action was finalized in June 1996; construction occurred from May 1996 to November 1997. The primary components of the remedy completed during Phase 1 of the remedial action consisted of construction of the LTU and 13 soil staging and pretreatment piles (SSPs), building an addition to the previous WTP, construction of two groundwater recovery trenches that form the current remedy extraction system (the 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 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 consisted of excavating the south-side contaminated soils, offloading 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 highway embankment. The north side infiltration system has not been used since 2002.

Phase 4 is ongoing and involves continued capture and treatment of contaminated groundwater and the biological treatment of contaminated soils. This phase includes offloading the LTU as surface soil lifts are remediated to below the action limits set for the site in the ROD for certain contaminants of concern. Concentrations of contaminants of concern in LTU soil collected in 2012 and 2013 indicate these soils can be offloaded; DEQ is preparing for the final offload design. A data gaps investigation is scheduled for mid-2017, with the design to commence after the investigation results have been received and examined. The design will include offloading all of the soil in the LTU, removing and disposing of the LTU liner and associated materials and equipment, and reclaiming the current LTU area.

Phase 5 addresses the contaminated soils beneath the interstate that divides the site. In March 2009, Tetra Tech, Inc. [EMI Unit] (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

In 2013, the 2009 treatability study was revisited. As part of this effort, a draft memorandum was prepared that considered and screened out the two previous potentially applicable technologies and outlined a conceptual approach and approximate costs for full-scale implementation of three new potentially promising alternatives (Tetra Tech 2013a):

- Bioventing – Vertical Well Approach
- Bioventing – Horizontal Well Approach
- Chemical Oxidation – Horizontal Well Approach

As a result of complications associated with the WWTP construction dewatering conducted in 2014, 2015, and 2016, further evaluation of these technologies has been temporarily put on hold, and they will be evaluated again when conditions at the site are relatively stable from previous years of WWTP construction dewatering and after the LTU offload is complete. Also, 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 is currently in the planning state, and will consist of removal and disposal of the soil treatment facilities on the south side of the Site, final engineering controls (soil cover, storm water management), re-vegetation of all disturbed areas, and implementation of appropriate institutional controls to maintain protectiveness of the remedy. 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 EPA and DEQ to ensure long-term protectiveness of the remedy, consistent with the ROD.

2.0 WTP OPERATIONS AND ANALYTICAL RESULTS

The following sections provide information related to WTP operations and analytical results for 2016. A number of operational issues arose during the year; the details are discussed in Section 2.6. The more significant issues included:

- A decrease in the sustainable pumping rate in the NHRT (throughout 2016). See Section 2.6.1 for details.
- Changes in WTP operations to offset groundwater pumping (construction dewatering) at the WWTP north of Silver Bow Creek that has taken place in 2011, 2013, 2014, 2015, and most recently in 2016 (January 5, 2016, to January 18, 2016; and February 15, 2016, to April 27, 2016). See Section 2.6.2 for details.

Other than needing to address the stated operational issues, O&M of the MPTP WTP was conducted on a routine basis the remainder of 2016. WTP operations are discussed below.

2.1 WTP OPERATIONS

The groundwater treatment system at the MPTP site consists of a WTP, two groundwater recovery trenches (the NHRT and NCRT), and the south-side infiltration system, consisting of eight infiltration cells (see Figure 1.1 and Figure 2.1). In 2016, the daily WTP flow rate ranged from about 270 gallons per minute (gpm) to 385 gpm; the WTP treated an average of about 300 gpm for the January 1, 2016, through December 31, 2016, reporting period (Table 2.1). Short periods of time (hours) when WTP flow was temporarily halted to conduct maintenance and repairs are not factored into these estimates.

Water from the NHRT and NCRT is first pumped directly to groundwater holding tank T1C and then through the granulated activated carbon (GAC) treatment system. The current (2016) WTP configuration and water quality monitoring points are conceptualized in Figure 2.2.

After carbon treatment, the recovered groundwater (treated effluent) is discharged to Silver Bow Creek. WTP-treated effluent was not pumped to the south-side infiltration system at any time in 2016.

Approximately 19.8 kilograms of dissolved PCP were removed from groundwater at the site in 2016. Since the facility went into operation in January 1993, the WTP has treated more than 3.4 billion gallons of contaminated water (Table 2.2) and has removed approximately 1,768 kilograms of dissolved PCP from the groundwater. These amounts are 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. No measurable floating product has been recovered since 2009.

The mass of PCP removed from groundwater during the past 5 years (from 2012 to 2016) has continually decreased (from 76.5 kilograms in 2012 to 19.8 kilograms in 2016). Details are provided below:

Mass of PCP Removed - NHRT and NCRT

YEAR	Total PCP Removed from NHRT and NCRT (kilograms)	Average NHRT Flow (gallons per minute)	Average NHRT PCP Concentration (ug/L)	Average NCRT Flow (gallons per minute)	Average NCRT PCP Concentration (ug/L)
2012	76.5	129	318	213	8.8
2013	45.5	115	209	223	5.7
2014	41.9	85	222	213	5.7
2015	22.6	83	140	225	5.9
2016	19.8	72	130.5	228	5.4

The decrease in mass removal is likely a function of (1) a decrease in flow to the south-side infiltration system in recent years, (2) a decrease in the NHRT pumping rate, and (3) a decrease in the NHRT influent PCP concentrations. The pumping rate has been influenced by (1) operational issues at the WTP associated with WWTP construction dewatering, and (2) the ability of the NHRT to efficiently transmit water to the WTP (see Section 2.6.1 for details). The decrease in mass removal is associated with a lower water table and subsequent decrease in contact between groundwater and the contaminated smear zone.

The NHRT and NCRT, along with their associated pumps, continued to be reasonably effective in capturing site groundwater in 2016. Groundwater capture and plume containment are assessed by evaluating groundwater elevation data and verifying hydraulic gradients in the vicinity of the trenches. Performance monitoring, including an assessment of compliance with ROD cleanup levels, is discussed in Section 4.3.

The WTP facilities are currently in good working order.

2.2 WTP ANALYTICAL RESULTS

A summary of the sampling and analysis conducted at the MPTP site per the Final Groundwater and Surface Water Monitoring Plan (GWMP), Revision 2 (Tetra Tech 2013b), is provided in Table 2.3. WTP samples are collected for analysis of PCP on a weekly basis and are analyzed using EPA Method 528. A more comprehensive list of parameters (semivolatile organic compounds, dioxins, metals, and anions) is analyzed on an annual basis in August each year (Tetra Tech 2013b). This list is referred to as the “extended parameter list” in the GWMP, as well as this annual report. The concentrations of PCP in effluent from both the NHRT and NCRT are measured monthly. WTP station locations are provided on Figure 2.2.

The results of sampling for PCP in the NHRT (station NHRTEFF) and the NCRT (station NCRTEFF) in 2016 are provided in Appendix A and Appendix B-1 and are summarized for the 2001 to 2016 period of record in Table 2.4. The average concentration of PCP in the NHRT in 2016 was 131 micrograms per liter (µg/L). The average concentration of PCP in the NCRT was 5.4 µg/L. PCP concentrations have generally decreased over time in samples from both trenches (see discussion in Section 2.1).

The results of sampling for PCP in plant influent (recovered groundwater — station IN), treatment process sampling (between carbon units — station BABB) and effluent (treated discharge from the plant — station EFF) in 2016 are provided in Appendix A and Appendix B-1 and are summarized for the 2001 to 2016 period of record in Table 2.4. PCP concentrations have generally decreased over time in the influent samples, ranging from about 130 µg/L to 631 µg/L (in 2001), to 22.3 µg/L to 52.5 µg/L (in 2016). Sampling results throughout 2016 indicate that approximately 88 percent of the contaminant load to the WTP comes from the NHRT and that 12 percent of the contaminant load comes from the NCRT.

In 2016, the concentrations of PCP in WTP effluent samples (station EFF) were always below the 1 µg/L ROD discharge to surface water cleanup level and below the 0.2 µg/L laboratory detection limit value 29 percent of the time (15 of 52 weeks).

For this report, the concentrations of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity equivalence quotient (TEQ), referred to in this report as “dioxin (TEQ),” are calculated using two different methodologies, referred to as the “MPTP ROD Methodology” and the “DEQ-7 Methodology,” as described below. Calculations for both methods are provided in Appendix A and are summarized in Appendix B-3.

- **MPTP ROD Methodology**

  Dioxin (TEQ) is calculated using 0 for values qualified as "U" (analyzed for but not detected above the method detection limit [MDL]) and ROD toxicity equivalency factors (TEF).

- **DEQ-7 Methodology**

  Dioxin (TEQ) is calculated using the 2005 World Health Organization methodology, using one-half the project reporting limit where not detected; using one-half the estimated maximum possible concentration when reported; and using 2005 TEFs as specified in DEQ-7 (DEQ 2012).

The dioxin (TEQ) for WTP samples for the 2001 to 2016 period of record are provided in Appendix A, Appendix B-3, and Table 2.5. Dioxin levels have varied over time, and low levels of dioxins have been detected in WTP effluent samples collected during monitoring 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 1.00E-05 µg/L (equivalent to 10 picograms per liter [pg/L]) ROD discharge to surface water cleanup level since 2001. Using the MPTP ROD Methodology, the concentration of dioxin (TEQ) in the WTP treated effluent sample collected on August 8, 2016, was 3.08E-07 µg/L (equivalent to 0.31 pg/L) (Table 2.5 and Appendix B-3). Using the DEQ-7 Methodology, the concentration of dioxin (TEQ) in the WTP treated effluent sample collected on August 8, 2016, was 9.51E-07 µg/L (equivalent to 0.95 pg/L) (Table 2.5 and Appendix B-3).

The ROD requires 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). Acute and chronic DEQ-7 aquatic life standards for cadmium, copper, lead, and zinc are hardness dependent. A hardness of 125 mg/L is representative of Silver Bow Creek.

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 bromide, chloride, fluoride, nitrate, nitrite, and phosphate. Even though it is not required by the ROD, the stations NHRTEFF, NCRTEFF, IN, and EFF continue to be analyzed for anions (by EPA Method 300.0) on an annual basis. The concentrations of metals, anions, PAH, and chlorophenols for WTP samples collected from four stations (NHRTEFF, NCRTEFF, IN, and EFF) during the August 8, 2016, annual monitoring event are provided in Appendix A and Table 2.6. The concentrations of constituents in the MPTP WTP effluent sample (station EFF) were all below the ROD discharge to surface water cleanup levels, and below aquatic and chronic aquatic life standards in the current Montana DEQ-7 standards (adjusted for hardness). There are no ROD cleanup levels for anions or for any analytes at the other three stations (NHRTEFF, NCRTEFF, and IN).

2.2.1 Floating Product Recovery and Treatment

No floating product (free oil) was measured in the NHRT during 2016. This result continues a trend of zero measureable oil in the NHRT beginning in November 2006 (two exceptions being October 23, 2014 [0.01 foot], and October 28, 2014 [0.02 foot]), suggesting that the mobile light oil phase of contamination may no longer be a significant concern at MPTP. However, a slight oil sheen was noted on January 28, 2016, and throughout the third and fourth quarters of 2016. When coupled with the observation that floating product (free oil) was not detected in any monitoring well during any sampling conducted in calendar years 2010 through 2016, these observations suggest that significant ongoing transport of free-phase light oil is not a major concern at MPTP, but that some residual oils are still present near the NHRT, primarily below the interstate highway.

2.3 QUALITY CONTROL

QC samples were collected and analyzed in 2016 as per the GWMP, Revision 2 (Tetra Tech 2013b). QC 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 monitoring event to assess potential external sources of contamination. Field duplicates were also collected at a frequency of one per 20 water samples per monitoring event.

Source Water Blanks

A total of 79 source water blanks were prepared and analyzed in 2016 (Table 2.7). The concentrations of constituents for 75 of 79 (95 percent) source water blanks were below the corresponding laboratory detection limit. All 33 PCP samples (100 percent) were below the detection limit value (0.2 µg/L, [0.1 µg/L after July 31, 2016[2]]). However, dioxin (TEQ), cadmium, iron, and zinc were detected in one source water blank sample (SW-07080816) submitted to the laboratory on August 8, 2016. Detectable concentrations of an analyte in a source water blank suggest that the original sample concentrations of these analytes on this date may be biased high. Overall, the data for source water blanks are interpreted to mean there was little or no cross contamination in the sampling process for sampling conducted in 2016.

Field Duplicates

A total of 79 field duplicate samples were collected and analyzed in 2016 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 monitoring event. The variance between the samples was then calculated as a relative percent difference (RPD). The formula for RPD is:

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

[2] Starting in July 2016, and at the request of DEQ, laboratory detection limits were lowered to be consistent with the required reporting values specified in DEQ-7.

where: A = First duplicate concentration (original sample)

B = Second duplicate concentration (duplicate sample)

The RPD goal for this project is 20 percent (or lower) (EPA 2014). Seventy-one of 79 duplicate samples (90 percent) met the RPD goal (Table 2.8). The average RPD for all duplicate samples in 2016 was 8.3 percent. Based on these results, the level of precision for sampling conducted in 2016 is considered to have met the overall project goal.

2.4 WTP IMPROVEMENTS

No WTP improvements of significance were made in 2016.

2.5 INJECTION ACTIVITIES

Approximately 25 to 30 gpm of treated WTP water continued to be directed to the west-side infiltration area near the west end of the NHRT throughout 2016 (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 also adds oxygenated water to the aquifer, stimulating biological reactions and increasing treatment rates. Treated WTP water was not directed to the south-side infiltration system in 2016 (Figure 2.1). Any treated WTP effluent not directed to the west side of the NHRT as described above was discharged to Silver Bow Creek.

Runoff that collected in the LTU retention pond after late May and early June rainstorms (estimated to be about 50,000 gallons) was pumped to the south-side infiltration system on June 2, 2016, and June 16, 2016.

Lastly, it is estimated that a total of about 862,000 gallons of WTP backwash was directed to the south-side infiltration system, cells 2 and 3 in 2016. Specifically, the WTP primary carbon tanks were backwashed 12 times: January 11, 2016; February 15, 2016; March 14, 2016; April 11, 2016; May 16, 2016; June 13, 2016; July 18, 2016; August 15, 2016; September 19, 2016; October 17, 2016; November 14, 2016; and December 12, 2016. The secondary carbon tanks were backwashed five times: January 8, 2016; March 4, 2016, May 2, 2016; July 6, 2016; and October 4, 2016.

2.6 OPERATIONAL ISSUES

A number of non-routine operational issues arose in 2016. These issues are discussed below.

2.6.1 January 1, 2016, to December 31, 2016 – Pumping Rate in the NHRT

An overall decrease in the sustainable pumping rate in the NHRT has been observed for several years and continued throughout 2016. Specifically, the sustainable pumping rate in the NHRT has generally decreased from 135 gpm in 2009 to about 72 gpm in 2016. Possible explanations for this phenomenon include: (1) impact on aquifer hydraulic conductivity due to loading of soils during construction of the interstate bridge embankment, and (2) perforated piping and gravels in the NHRT may be partially clogged by iron and manganese precipitates, inhibiting flow from trench gravels to the recovery plumbing. In way of support, the NHRT pump was replaced in August 2015 due to clogging associated with iron and manganese precipitation. The situation in the NHRT will be further investigated after construction dewatering is completed for the WWTP and the groundwater system returns to steady state (most likely beginning sometime in 2017).

2.6.2 January 1, 2016, to April 27, 2016– WWTP Construction Dewatering

In late 2015, the project engineering firm (Morrison-Maierle, Inc.) and the dewatering consultant (Water and Environmental Technologies [WET]) for the BSB WWTP Phase 2 membrane bioreactor project, requested that BSB, DEQ, EPA, and Atlantic Richfield Company approve an additional 2-week groundwater pumping event in January 2016; the agencies granted permission. Pumping at the BSB WWTP began on January 5, 2016, and continued through January 18, 2016. In addition, the contractor's schedule included Phase B dewatering, which began on February 15, 2016, and continued through April 27, 2016.

Groundwater pumping at the WWTP site lowers the water table to facilitate construction, but also alters the groundwater regime at the MPTP site (Tetra Tech 2010). Dewatering at the WWTP requires modifications to the NCRT and NHRT pumping regimes to help maintain capture of the groundwater contaminant plume. For example, when groundwater is pumped at the WWTP, pumping at the NCRT is increased to partially offset the WWTP pumping stress. The result is that the water table elevation at the MPTP site falls below the elevation of the smear zone, and less of the water that would be in contact with residual contamination can be collected. In addition, the recovery of contaminants in groundwater is also reduced because the pumping rate in the NHRT was reduced.

On January 1, 2016, the pumping rate in the NCRT was increased to 305 gpm in an attempt to partially offset the upcoming groundwater pumping at the WWTP. The NHRT rate was 85 gpm at this time.

Pumping rates in the NCRT and NHRT varied over the course of the first quarter in response to groundwater pumping at the WWTP. WWTP, NCRT, and NHRT pumping rates for the first quarter of 2016 are summarized in Appendix C, Figure C-1.

Pumping rates in the NCRT and NHRT varied over the course of the second quarter in response to groundwater pumping at the WWTP. Once WWTP construction dewatering was terminated (April 27, 2016), the NCRT pumping rate was reduced to 195 gpm and the NHRT pumping rate was gradually increased to between 80 gpm and 90 gpm. WWTP, NCRT, and NHRT pumping rates associated with groundwater pumping at the WWTP during the second quarter are summarized in Appendix C, Figure C-2.

2.6.3 Other Disturbances to WTP Operations

Several other disturbances to WTP operations occurred in 2016, including:

- On August 3, 2016, a power surge and brief power outage occurred at the plant at approximately 1500 hours, and plant systems shut down. The plant returned to normal flows by 1530 hours. Details of this incident are provided in Appendix D.
- On August 11, 2016, a power surge and outage occurred at the plant at approximately 1005 hours, and plant systems shut down. In addition, electrical power to the NCRT was knocked out by failure of the associated 24-volt power supply. On August 12, 2016, an electrician from Trademark Electric in Butte, Montana, wired the NCRT pump directly, and flow was physically adjusted using a valve in the plant. The plant then ran without control to the NCRT pump until August 24, 2016, when the 24-volt power supply was replaced with a new one, and associated wiring was returned to its original position. Details of this incident are provided in Appendix E.
- On September 9, 2016, a power surge occurred at the plant at approximately 0930 hours, but did not significantly affect plant operations.
- On September 20, 2016, a power surge occurred at the plant at approximately 1130 hours, but did not significantly affect plant operations.

2.7 MISCELLANEOUS REPAIRS AND ACTIVITIES

A number of miscellaneous repairs and activities took place at the MPTP site in 2016, as described below.

- July 1, 2016. Full Armor, LLC, sprayed for noxious weeds. The area of coverage included the entire site within the fence boundary, plus a small buffer along the site fence lines, and an area where the pole mound removal was conducted in early 2012. All weed spraying was completed in less than 8 hours using a hand sprayer.
- August 3, 2016. A request to order two typhoon-type pumps for typical sampling and one super twister pump for deep sampling was submitted to DEQ. The request was approved and the pumps were purchased.
- August 10, 2016. An exterior security light failed. A replacement bulb did not correct the problem, and an electrician from Trademark Electric was called in to troubleshoot and repair the

light.

- August 24, 2016. The failed 24-volt power supply was replaced (see Section 2.6.3 for details).
- October 17, 2016. The uninterruptible power supply for plant control computer and the main programmable logic controller failed. A replacement unit was purchased and then installed on October 18, 2016.
- October 21, 2016 and October 27, 2016. Full Armor, LLC, sprayed noxious weeds. The area of coverage included the entire site plus a small buffer along the site fence lines and an area where the power pole removal was conducted in early 2012. All weed spraying was completed using a hand sprayer.
- October 31, 2016. To address deer mortality issues, the Montana Department of Transportation reconfigured fencing associated with the interstate bridge.

No other repairs or activities of significance were required at the MPTP site in 2016.

3.0 LAND TREATMENT UNIT OPERATIONS

Historical LTU soil management, LTU operation in 2016, 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 of contaminated soil that had been excavated from the south side was 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, approximately 3.2 million gallons of water were applied to the LTU through a center pivot unit at regular intervals from April to September to facilitate biologic degradation of the contaminants. Irrigation water was supplied from the retention pond, with make-up water added from the WTP as necessary. 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 were 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). No soil was tilled at the LTU during 2011.

In 2012, the LTU was tilled during the second quarter 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 monitoring event. In addition, the LTU was irrigated on an as-needed basis during the second and third quarters to control fugitive dust when conditions were dry (8 days, between May 14, 2012, and September 5, 2012). A total of 1,171,900 gallons of irrigation water were applied in 2012.

In 2013, the three sampling zones (LTU zones 2, 3, and 4) that did not met the cleanup standard for PCP during the 2012 LTU soil monitoring event were tilled two times in May and once in July. Soil moisture during the May and July 2013 tilling events was sufficiently high to avoid generation of dust.

The LTU was irrigated seven times during the third quarter of 2013 on an as-needed basis to control dust. A total of 884,700 gallons of irrigation water were applied. Neither odors nor dust was detected during tilling operations at any time in 2013.

No soil tilling or irrigation occurred at the LTU in 2014 or 2015.

3.2 LTU OPERATIONS IN 2016

Including the sand layer, the volume of soil that remains on the LTU is estimated at 53,000 cubic yards; the sand layer is approximately 6 to 12 inches thick (approximately 15 percent by volume).

No soil tilling occurred at the LTU in 2016. Neither odors nor dust was documented at any time during the year. In addition, there was no need to irrigate the LTU, as the site received adequate precipitation throughout the year. Historical LTU water application data for the 1999 to 2016 period of record are provided in Table 3.1.

The LTU irrigation system was last winterized mid-September 2013, which included turning off the water, draining the system, and turning off power to the system. Since the LTU irrigation system was never used, winterization of the system was not necessary in 2016. No LTU maintenance of any significance has taken place since the 2013 winterization.

3.3 LTU SOIL SAMPLING AND RESULTS

Soil currently in the LTU was sampled on an annual basis from 2007 through 2013. Based on historical data LTU soils were not sampled in 2014, 2015, or 2016 as part of site operations. Soil sampling conducted in 2016 as part of the upcoming LTU offload will be addressed in a separate report. Table 3.2 summarizes the historical analytical data.

The average concentration of PCP in all LTU zones sampled in 2012 was 26.7 mg/kg; in 2013, the average concentration of PCP in LTU soils was 26.8 mg/kg. These data indicate the average concentration of PCP in LTU soils was less than the ROD soil cleanup level (34 mg/kg) for two consecutive monitoring events. The average dioxin (TEQ) concentrations from the 2012 and 2013 monitoring events are above the ROD clean up level of 0.2 μg/kg, as was the case in previous offloads. Therefore, the cleanup goal for dioxin in soil has not been met. LTU soils were not analyzed for PAH during the October 2013 round of sampling because all sections of the LTU had previously met the cleanup goal for PAH for two successive monitoring events.

3.4 LTU UNDERDRAIN AND POND SAMPLING AND RESULTS

On May 2, 2016, the LTU underdrain discharge was sampled and analyzed for PCP. During the August 8, 2016, annual monitoring event, the LTU underdrain discharge and LTU retention pond water were sampled and analyzed for PCP. The LTU discharge sample is representative of leachate associated with the underdrain of the soil treatment area. Leachate from the underdrain gravity flows to the LTU retention pond. The LTU retention pond water sample is representative of water that has been temporarily stored in the retention pond.

On May 2, 2016, the concentration of PCP in LTU underdrain discharge was 975 µg/L; the LTU retention pond water was not sampled on this date.

On August 8, 2016, the concentration of PCP in LTU underdrain discharge was 16.6 µg/L. The concentration of PCP in the LTU retention pond water on this date was substantially lower (3.51 µg/L). These data continue to support a conclusion that physical and biological degradation of PCP occurs in the LTU pond.

3.5 LTU FINAL OFFLOAD PLANNING AND ACTIVITIES

LTU offload activities for 2016 are below, organized by quarter. LTU offload activities are more fully addressed in reports being prepared under separate task orders.

First Quarter, 2016

- Began the process of identifying data gaps and compiling data quality objectives related to the LTU offload design.
- Prepared non-technical drawings of several possible offload designs for use at stakeholder meetings.
- Subcontracted and completed additional surveying along the railroad right-of-way. These data are needed for the possible design of a culvert under the railroad tracks.
- Provided limited input on safety and long-term planning for the soil screening task being coordinated by DEQ.
- Collected soil samples from the stockpiled soil pile, and submitted these samples for agronomic testing.

Second Quarter, 2016

- DJ&A, P.C., from Missoula, Montana, completed a land survey near the Burlington Northern Santa Fe right-of-way for incorporation into the offload culvert design.
- Both the channel design memorandum and culvert feasibility memorandum were submitted to DEQ.
- A total of 28 monitoring wells and piezometers that are not part of the current MPTP monitoring program and that will not be needed in the future were abandoned the week of April 4, 2016.
- Jordan Contracting, from Butte, Montana, continued screening material from the clean soil stockpile area.
- The leachability of PCP from LTU soils and previously offloaded soils was investigated.
- An inventory of offload material that may need to be incinerated was generated by Weston

Solutions, Inc., from Helena, Montana.

- The transfer and purchase of storage buildings was approved by BSB county commissioners.

Third Quarter, 2016

- Prepared a technical memorandum discussing the synthetic precipitation leaching procedure sampling results
- Developed a data quality objectives (DQO) table for the offload sampling and analysis plan (SAP)
- Prepared the offload SAP to address DQOs and data gaps.

Fourth Quarter, 2016

- The Draft Data Gaps SAP was submitted to DEQ for review.
- Jordan Contracting discontinued screening of material in the waste rock piles because the percentage rock was lower than expected.
- The current soil pile topography was evaluated.
- A tentative schedule for LTU offload construction activities in 2017 was prepared.

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 (Camp Dresser & McKee, Inc. [CDM] 2000). The MPTP monitoring program was revised starting with the November 2010 monitoring event as specified in the GWMP, Revision 0 (Tetra Tech 2011). Data presented in this 2016 annual sampling and monitoring report were collected according to the guidelines provided in the GWMP, Revision 2 (Tetra Tech 2013b). GWMP, Revision 2, supersedes previous versions of this document. Future revisions to the GWMP, as needed, will continue to be numbered sequentially.

During February 2016, a semi-annual monitoring event was conducted and all groundwater and surface water samples were analyzed for PCP. The annual monitoring event for surface water and groundwater was conducted in August 2016. Table 2.3 provides a summary of monitoring conducted in 2016.

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 2016 (PCP only) and again in August 2016 (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 chlorophenols (by EPA Method SW8270C), PAH (by EPA Method

SW8270C), and dioxins (by EPA Method SW8290). Surface water monitoring locations sampled in 2016 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.

Analytical results for each category of contaminant are discussed below.

PCP

The concentrations of PCP in surface water are provided in Appendix A and Appendix B-2 and are summarized for the 2001 to 2016 period of record in Table 4.1. In 2016, the concentrations of PCP at surface water stations SW-05, SS-06A, and SW-09 were below the laboratory detection limit (0.2 µg/L, [0.1 µg/L after July 31, 2016[3]]) and were below the ROD surface water cleanup level (1.0 µg/L).

Over the last 5-year period (2012 to 2016), 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 below the detection limit (0.2 µg/L, [0.1 µg/L after July 31, 2016]).
- The concentrations of PCP at stations SW-05 and SS-06A have been undetected, or slightly above the detection limit (0.2 µg/L, [0.1 µg/L after July 31, 2016]), and consistently below the ROD surface water cleanup level for PCP (1 µg/L).

In August 2016, samples from surface water stations SW-05, SS-06A, and SW-09 were also analyzed for the extended parameter list of analytes. Results are provided in Appendix A (full database), Appendix B-3 (dioxin TEQ), Table 4.2 (dioxins) and Table 4.3 (PAH and chlorophenols). Analytical results are discussed below.

<u>Chlorophenols</u>

The concentrations of all chlorophenols in surface water at stations SW-05, SS-06A, and SW-09 were below ROD surface water cleanup levels (where established).

<u>PAHs</u>

Benzo(a)pyrene and fluoranthene were the only PAHs detected in surface water during the August 2016 sampling event. There is no surface water cleanup level for fluoranthene.

[3] Starting in July 2016, and at the request of DEQ, laboratory detection limits were lowered to be consistent with the required reporting values specified in DEQ-7.

The concentration of benzo(a)pyrene at upstream station SW-09 and in WTP effluent (station EFF) was below detection (0.1U µg/L). The concentration of benzo(a)pyrene at station SS-06A (2.05 µg/L), located upstream of the MPTP discharge rill, and at downstream station SW-05 (2.06 µg/L), exceeded both the ROD surface water cleanup level (0.2 µg/L) and the DEQ-7 human health standard for benzo(a)pyrene in surface water (0.038 µg/L) (DEQ 2012). The concentration of benzo(a)pyrene in WTP effluent was below detection (0.1U µg/L). The concentrations of benzo(a)pyrene in monitoring wells along Silver Bow Creek (HCA-21, GW-14R-98, 10-12, BMW-01A, and BMW-01B) were also below detection (0.1U µg/L). Benzo(a)pyrene has historically never been detected in MPTP surface water stations on Silver Bow Creek and has never been detected in the WTP effluent.[4]

These data suggest that the WTP effluent and groundwater were not the sources of benzo(a)pyrene in Silver Bow Creek in August 2016.

There are no known or documented point source or non-point source contributors of benzo(a)pyrene to Silver Bow Creek located between upstream station SW-09 and station SS-06A adjacent to the site. In available literature, EPA notes that the main source of atmospheric benzo(a)pyrene is residential wood burning (EPA 2016). Also noted is that benzo(a)pyrene is found in coal tar, in automobile exhaust fumes (especially from diesel engines), in all smoke resulting from the combustion of organic material (including cigarette smoke), and in charbroiled food. It is not clear how these potential atmospheric sources of benzo(a)pyrene could explain the elevated concentrations of benzo(a)pyrene in surface water at stations SS-06A and SW-05, and benzo(a)pyrene has never been detected in surface water at these stations. An alternative explanation might be that the two benzo(a)pyrene results detected this quarter may be laboratory anomalies. This situation will continue to be monitored in the future.

The PAH, fluoranthene, was detected at surface water station SW-09 (1.33 µg/L) and station SW-05 (1.35 µg/L). There is no established ROD surface water cleanup level for fluoranthene, and the recorded fluoranthene concentrations are much lower than the DEQ-7 human health standard for fluoranthene in surface water (130 µg/L) (DEQ 2012). Fluoranthene is virtually insoluble in water, and these two results are likely anomalies.

The concentrations of all other PAHs were below ROD cleanup levels (where established) at all three surface water stations during the August 2016 annual sampling event.

<u>Dioxins</u>

Using both the MPTP ROD Methodology (Table 4.2 and Appendix B-3) and the DEQ-7 Methodology

[4] The detection limit for benzo(a)pyrene (0.1 µg/L) is greater than the DEQ-7 surface water standard (0.038 µg/L).

(Appendix B-3), the dioxin (TEQ) was below the 1.00E-05 µg/L (equivalent to 10 ρg/L) ROD surface water cleanup level at MPTP surface stations SW-05, SS-06A, and SW-09.

4.2 GROUNDWATER MONITORING

The locations of all MPTP groundwater monitoring wells are provided on Figure 4.2. The concentrations of 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) are summarized for the 2000 to 2016 period of record in Table 4.4. Complete results are provided in Appendix A and Appendix B-2. Monitoring results are discussed further in Section 4.3 below.

Appendix A, Appendix B-3, and Table 4.5 provide analytical results for dioxins in groundwater for historical sampling and for samples collected from seven representative monitoring wells (10-12, BMW-01A, BMW-01B, GW-14R-98, HCA-21, INF-04, and MW-11-04) during the 2016 annual monitoring event, as specified in the GWMP, Revision 2 (Tetra Tech 2013b). Analytical results for PAH and chlorophenols in groundwater for these same seven monitoring wells are provided in Appendix A and Table 4.6. Results are discussed further in Section 4.3 below.

A potentiometric surface map was prepared using static water level data collected on July 28, 2016, from 59 shallow monitoring wells (Figure 4.3). Figure 4.3 indicates that the hydraulic gradient at the MPTP was generally from the southeast to the northwest. The magnitude of the hydraulic gradient was approximately 0.005 foot/foot. These results are consistent with values obtained during historical monitoring 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 on July 28, 2016, resulted in localized flooding and groundwater mounding, 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. Beaver activity along Silver Bow Creek near the MPTP site in 2016 is discussed in Section 6.3.

Figure 4.4 provides a more focused analysis of the July 28, 2016, 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. Groundwater mounding related to flooding from the beaver dam in the WTP discharge rill can also be observed on Figure 4.4.

Starting on April 20, 2010, and continuing throughout all of 2016, 25 to 30 gpm of treated effluent from the WTP has been continuously diverted to the west side infiltration area (near the west end of the NHRT) in an effort to influence the hydraulic gradient in this area (Figure 1.1). Groundwater elevation data in 2016 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 (Figure 4.4).

4.2.1 Association between Turbidity and Dioxin Results

The MPTP Fourth Five-Year Review Report (DEQ 2017) states that "*turbidity is expected to be measured in future sampling events, which will allow for a long-term relationship to be established between dioxin (TEQ) results and turbidity values at specific wells.*"

During the 2016 annual sampling event, turbidity was measured at monitoring stations where dioxin samples were collected and analyzed (Table 4.7). These 2016 data augment data collected in 2015 (Table 4.7). Two (or fewer) data points (temporally) are insufficient to draw a statistically valid conclusion regarding the correlation between dioxin (TEQ) results and turbidity values at specific monitoring stations over time. However, data for monitoring well MW-11-04, and perhaps at station LTUDIS (unfiltered), may be consistent with the premise that higher values of turbidity appear to be "associated" with higher dioxin (TEQ) values at locations when dioxin is present in the sample (Table 4.7). Note that there is less confidence in the turbidity-dioxin relationship for station NHRTEFF, as is stated in the Fourth Five-Year Review Report (DEQ 2017):

> *"it is also possible that some dioxins are introduced to the trenches in sheens of oils, though in recent years observations of sheens have been limited to just a few instances at the NHRT and are not commonplace."*

Lastly, it is important to note that a sample can have high turbidity but a low dioxin (TEQ) if the particulates near that well are not impacted by dioxin.

It is recommend that turbidity data continue to be collected when samples are collected to be analyzed for dioxin, so that an adequate data set can be gathered over time to evaluate patterns of dioxin versus turbidity at individual monitoring stations.

4.3 ROD COMPLIANCE MONITORING

ROD compliance monitoring incorporates water quality data for ROD contaminants measured in plant discharge (station EFF), surface water (stations SW-05, SS-06A, and SW-09), and groundwater (monitoring wells (BMW-01A, BMW-01B, and 10-12) throughout 2016 as specified in the GWMP (Tetra Tech 2013b).

The concentrations of PCP from the February (semi-annual) and August (annual) groundwater monitoring events were evaluated to assess the distribution of PCP in groundwater during 2016. The results of groundwater monitoring and an assessment of compliance with ROD requirements and cleanup levels are presented in the following sections.

4.3.1 2016 Monitoring Events

WTP Effluent

WTP effluent (treated groundwater at WTP station EFF) was monitored for PCP on a weekly basis; 52 samples were collected and analyzed for PCP in 2016. WTP effluent was also monitored for the extended parameter list of analytes during the August 2016 annual sampling event.

One hundred percent of results from weekly PCP analyses (52 samples) were below the PCP 1.0 μg/L ROD discharge to surface water cleanup level. The concentrations of dioxins, PAH, and chlorophenols were below the ROD discharge to surface water cleanup levels, where established.

Surface Water

Surface water in Silver Bow Creek (stations SW-09, SS-06A, and SW-05) were monitored for PCP and the extended parameter list of analytes during the August 2016 annual sampling event.

The concentrations of PCP, dioxins, PAH, and chlorophenols were below the respective ROD surface water cleanup levels (where established), with the exceptions of benzo(a)pyrene at stations SS-06A (2.05 μg/L) and SW-05 (2.06 μg/L) that exceeded the DEQ-7 human health standard (0.038 μg/L). As noted in Section 4.1 The detections of benzo(a)pyrene in surface water in August 2016 are considered anomalous.

Groundwater

Samples from 59 shallow monitoring wells, four intermediate wells, and eight deep wells were analyzed for PCP by EPA Method 528 during the 2016 first- and third-quarter monitoring events (Appendix A and Appendix B). 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 2, 2016, semi-annual monitoring event and the most current (August 8, 2016) annual monitoring 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, in 2016, included:

February 2, 2016, Semi-annual Monitoring Event

- An area beneath the interstate highway embankment and extending northeast in the vicinity of the WTP and monitoring well MW-11-04 (1,220 µg/L), MW-11-02 (269 µg/L), and INF-04 (109 µg/L)
- West of the LTU near monitoring wells GW-05 (60.1 µg/L), INF-13 (165 µg/L) and INF-16 (47.6 µg/L)
- North of the NCRT adjacent to the Burlington Northern railroad tracks in the vicinity of monitoring well MW-I-01 (140 µg/L)

August 8, 2016 Annual Monitoring Event

- An area beneath the interstate highway embankment and extending northeast in the vicinity of the WTP and monitoring wells MW-11-02 (263µg/L), MW-11-04 (1,606 µg/L), and INF-04 (83 µg/L)
- West of the LTU near monitoring well GW-05 (30.8 µg/L), INF-13 (28.5 µg/L), PZ-S6-01 (143) and INF-16 (52.8 µg/L)
- North of the NCRT and adjacent to the Burlington Northern railroad tracks in the vicinity of monitoring well MW-I-01 (248 µg/L).

During the August 8, 2016, annual monitoring event, groundwater samples from 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) were analyzed for the extended parameter list of analytes, including PAH, dioxins, and chlorophenols, as per the GWMP, Revision 2 (Tetra Tech 2013b). These seven wells were selected to provide a range of representative groundwater quality conditions across the site relative to (1) the location of the PCP plume (as defined by the 1 µg/L PCP contour interval), and (2) PCP “hot spots” within the plume. The rationale for selecting these wells included:

- 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.
- 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 footprint of the PCP plume, have a long-term period of record, and can be used to evaluate the progress of groundwater remediation over an extended period of 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.

All available results for dioxin in groundwater (both historical and for 2016) are provided in Appendix A, Appendix B-3, and Table 4.5. In 2016, the dioxin (TEQ) was below the 3.00E-05 µg/L (equivalent to 30 pg/L) ROD groundwater cleanup level in all monitoring wells (using both the MPTP ROD Methodology and the DEQ-7 Methodology). 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 and an anomalous detection of benzo[a]pyrene in well MW-11-04 [2.16 µg/L]) were below ROD groundwater cleanup levels (where established) for the seven selected wells.

4.3.2 Data Evaluation and Progress of Remediation

One WTP station (station EFF [treated groundwater]), three surface water stations (stations SW-05, SS-06A, and SW-09), and five groundwater stations (monitoring wells BMW-01A, BMW-01B, 10-12, GW-14R-98, and HCA-21) were selected to evaluate compliance with ROD requirements related to the progress of remediation. Figure 4.7 provides the location of these representative monitoring stations relative to the location of the recent PCP plume boundary (August 8, 2016). To be consistent with ROD requirements, the following seven criteria should be met; data needs to evaluate each criterion are also noted:

<u>Criterion 1</u>. 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, where established).

- Data from WTP station EFF (treated groundwater) were evaluated to determine if this criterion was met.

<u>Criterion 2</u>. Surface water in Silver Bow Creek must meet the 1 µg/L surface water cleanup level for PCP (and specified cleanup levels for other contaminants listed in the ROD).

- Data from surface water stations SW-05 (downstream from the site), SS-06A (adjacent to the site), and SW-09 (upstream of the site) located on Silver Bow Creek were evaluated to determine if this criterion was met.

<u>Criterion 3</u>. The PCP plume must remain on site. This criterion is assumed to be met if the concentration of PCP in groundwater in downgradient sentinel monitoring wells continue to meet the groundwater cleanup level for PCP.

- Data from downgradient sentinel monitoring wells (stations BMW-01A, BMW-01B, and 10-12) were evaluated to determine if the ROD groundwater cleanup level for PCP (1 µg/L) continued to be met at these locations.

<u>Criterion 4</u>. The concentrations of dioxins, PAH, and chlorophenols in groundwater at representative monitoring wells along the south bank of Silver Bow Creek must meet the specified ROD groundwater cleanup levels, where established.

- Data from monitoring wells BMW-01A, BMW-01B, 10-12, GW-14R-98, and HCA-21 were evaluated to determine if this criterion was met.

<u>Criterion 5</u>. The long-term trend in the concentrations of PCP in groundwater over time should be decreasing, suggesting that groundwater quality will eventually meet the 1 µg/L groundwater cleanup level for PCP.

- Data from groundwater monitoring wells with a long-term period of record (2004 to 2016) located along the south bank of Silver Bow Creek, and within the PCP plume footprint were evaluated to determine if this criterion was met (stations GW-14R-98 and HCA-21).

Criterion 6. The long-term trend in the area of the PCP plume must be stable or shrinking, showing that ongoing remedial action is effectively preventing the spread of contamination.

- The long-term trend (since 1993) in the digitized area of the PCP plume was evaluated using all available monitoring well data to construct the 1 µg/L PCP isocontour for each year that data were accessible.

Criterion 7. The short-term trend (previous 5 years) in the area of the PCP plume must be stable or shrinking, showing that ongoing remedial action is effectively preventing the spread of contamination.

- The short-term trend (previous 5 years) in the digitized area of the PCP plume using the 1 µg/L isocontour was evaluated to determine if this criterion was met.

Water quality data collected in 2016 were used to evaluate the first four criteria (Criterion 1 through Criterion 4). Available historical data (1993 to 2016) were used evaluate the last three criteria (Criterion 5 through Criterion 7) by analyzing trends through time. Results are provided in Table 4.7, and are summarized below.

- **Criterion 1**. Criterion 1 was satisfied. One hundred percent of results from weekly PCP analyses (52 samples) were below the PCP 1.0 µg/L ROD discharge to surface water cleanup level. The concentrations of dioxins, PAH, and chlorophenols were below the ROD discharge to surface water cleanup levels, where established.

- **Criterion 2**. Criterion 2 was mostly satisfied. The concentrations of PCP, dioxins, PAH, and chlorophenols were below the respective ROD surface water cleanup levels (where established), with the exceptions of benzo(a)pyrene at stations SS-06A (2.05 µg/L) and SW-05 (2.06 µg/L) that exceeded the DEQ-7 human health standard (0.038 µg/L).

  The concentrations of benzo(a)pyrene in WTP effluent (station EFF) and in MPTP monitoring wells immediately upgradient of Silver Bow Creek were below detection (0.1U µg/L).[5] Therefore, WTP effluent and groundwater are not considered potential sources of benzo(a)pyrene in Silver Bow Creek. In addition, benzo(a)pyrene has historically never been detected at MPTP surface water stations along Silver Bow Creek, and has never been detected in the WTP effluent. Lastly, there are no known or documented point source or non-point source contributors of benzo(a)pyrene to Silver Bow Creek located between upstream station SW-09 and station SS 06A adjacent to the site. The detections of benzo(a)pyrene in surface water in August 2016 are considered anomalous and are expected to be a one-time event. This situation will be monitored in the future.

- **Criterion 3**. Criterion 3 was satisfied. The concentrations of PCP in downgradient sentinel monitoring wells (BMW-01A, BMW-01B, and 10-12) continued to meet the 1 µg/L groundwater cleanup level for PCP indicating the onsite PCP plume was not migrating offsite.

[5] The detection limit for benzo(a)pyrene (0.1 µg/L) is greater than the DEQ-7 surface water standard (0.038 µg/L).

- **Criterion 4**. Criterion 4 was mostly satisfied. PCP in monitoring well GW-14R-98 (1.28 μg/L) on August 8, 2016, which slightly exceeded the ROD groundwater cleanup level (1.0 μg/L).

  Phase B dewatering associated with construction work for upgrades to the BSB WWTP began February 15, 2016, and continued through April 26, 2016. Construction dewatering that took place during the early part of 2016 likely had a negative (but temporary) impact on the concentration of PCP in monitoring well GW-14R-98. This situation will be monitored in the future.

- **Criterion 5**. Criterion 5 was satisfied. Mann-Kendall statistical testing of PCP data for monitoring wells GW-14R-98 and HCA-21 indicates the long-term (2004 to 2016) trend in concentrations of PCP in these two wells is decreasing at greater than the 90 percent confidence level (Appendix F, and Table 4.8). This analysis supports a conclusion that ongoing remediation continues to be effective in the long term.
- **Criterion 6**. Criterion 6 was satisfied. Digitized PCP plumes and plume area calculations are provided in Appendix G. All available monitoring well data were used to construct the 1 μg/L PCP isocontour for each year that data were accessible. A long-term plume area comparison is also provided in Figure 4.8. 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 24 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 August 1993) to 16.0 acres (in August 2016). This 25.7-acre decrease represents an approximate 62 percent reduction in the area of the PCP plume since 1993. Mann-Kendall statistical testing indicates that, over the long term (2004 to 2016), and during the last 5-year period (2012 to 2016), the area of the PCP plume has been decreasing in size at greater than 90 percent confidence level (see Appendix F).
- **Criterion 7**. Criterion 7 was satisfied. No particular trend is exhibited when evaluating the shorter-term five-year trend (2012 to 2016) (Appendix F). However, during the last five-year period the vast majority (70 percent) of detections of PCP have been below the 1.0 μg/L groundwater cleanup level; the highest recorded concentration over the past 5 years was 1.32 μg/L in monitoring well GW-14R-98 on August 10, 2015. This analysis supports a conclusion that the downgradient edge of the plume is not expanding.

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.

4.3.3 Light Non-Aqueous Phase Liquid

Other than a sheen detected within in the NHRT (Section 2.2.1), LNAPL was not detected in any monitoring well during any sampling conducted in calendar year 2016. The historical volume of LNAPL recovered for the 2000 through 2016 period of record is provided in Table 4.9.

4.3.4 Groundwater Quality Impact Associated with Long-term WWTP Dewatering

Potential groundwater quality impacts associated with long-term WWTP construction dewatering (including the impact associated with the need to increase the MPTP pumping rates to offset WWTP pumping) was evaluated. Intermittent groundwater pumping at the WWTP occurred from 2011 to 2016, as summarized below:

2011: July 25, 2011, to October 21, 2011.

2012: No WWTP dewatering occurred

2013: May 22, 2013, to June 17, 2013

2014: October 16, 2014, to December 31, 2014

2015: January 1, 2015, to April 29, 2015

2016: January 5, 2016, to January 18, 2016; and February 15, 2016, to April 27, 2016

The trends in concentrations of PCP in (1) shallow groundwater along the southern boundary of Silver Bow Creek, and (2) groundwater north of Silver Bow Creek between the creek and the WWTP were evaluated using the Mann-Kendall statistical test for trends (Appendix F). The analysis was conducted to evaluate whether increased pumping in the NCRT was able to offset groundwater pumping at the WWTP, thus preventing the higher concentrations of PCP within the MPTP plume from migrating off site. It was hypothesized that increasing trends in the concentrations of PCP in selected wells would indicate that increases in pumping at the NCRT pumping could not offset WWTP groundwater pumping associated with construction dewatering. Representative selected wells for this evaluation included:

- Monitoring wells 10-02 and GW-14R-98 – on site and along the Silver Bow Creek boundary
- Monitoring wells 10-21, 10-09, GS-34-S, and 10-14 north of Silver Bow Creek and downgradient of the NCRT (upgradient of the WWTP).

The Mann-Kendall statistical analysis for the 2010 to 2016 period of record indicates there were no increasing trends in the concentrations of PCP in any of the wells that were analyzed (Appendix F). However, a “decreasing” trend in the concentration of PCP in well 10-14 and a “probably decreasing” trend in the concentration of PCP in well 10-02 were noted.

This evaluation suggests that the increased pumping in the NCRT was able to offset pumping at the WWTP, and that the NCRT continued to be reasonably effective in capturing contaminated groundwater at the MPTP site.

5.0 RESIDENTIAL WELL MONITORING

The historical concentrations of PCP in groundwater collected from residential wells were below the ROD groundwater cleanup level for several years leading up to 2010; therefore, no residential wells were sampled in 2016. The results of residential well sampling for the 2001 to 2016 period of record are provided in Table 5.1.

6.0 ADDITIONAL SITE ACTIVITIES

No other activities of significance took place at the MPTP site in 2016.

6.1 MONITORING OF BEAVER ACTIVITY IN 2016

Groundwater contours have been influenced by beaver-related activity (beaver dam construction and resulting ponding of water) since the third quarter of 2010. In 2016, only one beaver dam was located in the WTP discharge rill, resulting in localized flooding and groundwater mounding, as exemplified in Figure 4.3 and Figure 4.4. Groundwater mounding along Silver Bow Creek north of the WTP assists in facilitating the flow of groundwater south of Silver Bow Creek back toward the NCRT, thus aiding in recovery of remaining dissolved contaminants in this area.

In the future, it is anticipated that DEQ will make no effort to remove the existing beaver dam on Silver Bow Creek because beaver dam-induced flooding north of the MPTP site helps maintain a hydraulic gradient toward the NCRT, which enhances capture of PCP-contaminated groundwater in this area.

7.0 DATABASE MANAGEMENT

The following database-related activities were completed in 2016:

- Uploaded all EDDs received from the Montana Bureau of Mines and Geology (MBMG) and Pace Analytical Services, Inc. to the MPTP Microsoft Access2010 database
- Performed QC of all chains of custody (COCs), MBMG laboratory EDDs, MBMG sample delivery groups (SDGs), and MBMG laboratory Microsoft Excel spreadsheets
- Added 1,386 records to the existing database; at the end of 2016, there were 11,345 individual data records in the database for the 2010 to 2016 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 (Appendix H).

8.0 CLIMATE AND STREAMFLOW

Climatic conditions such as temperature, precipitation, and stream flow factor into understanding how the MPTP site is operated and how water is managed. For example, extremes in temperature can affect pipeline integrity, pump operational issues, and the ability to obtain samples from shallow monitoring wells. Precipitation affects surface runoff and on-site ponding of water, groundwater recharge, the elevation of the water table, and the movement of contaminants in the vadose zone and aquifer. Stream flow conditions vary from base flow to flood conditions and potentially affect sample collection, groundwater flow, and the migration of contaminants. Relevant climate statistics for 2016 were obtained from the National Weather Service (NWS) (NWS 2016) (Appendix I). Stream flow statistics were obtained from the U.S. Geological Survey (USGS) National Water Information system Web Interface (USGS 2016) (Appendix J). Climate and streamflow characteristics that affected WTP operations or on-site water management activities in 2016 are summarized below:

2016 – First Quarter

- No climate-related or streamflow issues were noted during the first quarter.

2016 – Second Quarter

- Total recorded precipitation in Butte, Montana, for the second quarter of 2016 was 3.54 inches, which was 1.97 inches less than the normal second-quarter precipitation for the long-term period of record (5.51 inches). Lower than normal precipitation, higher temperatures, and groundwater pumping associated with construction dewatering at the WWTP resulted in decreased recharge to groundwater and lower than normal groundwater elevations. The result was that the water table elevation at the MPTP site fell below the elevation of the smear zone, and less of the groundwater in contact with residual contamination was collected.

2016 – Third Quarter

- Total recorded precipitation in Butte for the third quarter of 2016 was 2.92 inches, which was 0.79 inch (21 percent) less than the normal quarterly precipitation (3.71 inches) for the long-term period of record. Lower than normal rainfall in July and August resulted in less recharge to the aquifer and lower local groundwater levels. In addition, aquifer water levels were slow to rebound since groundwater pumping associated with construction dewatering at the WWTP terminated in April 2016. Similar to the second quarter, less of the smear zone was in direct contact with groundwater. These factors, as well as warmer temperature, contributed to a need to maintain a slightly lower (about 15 gpm) pumping rate in the NHRT. Recovery of PCP from the NHRT during the third quarter was also lower than normal as a result of these factors.

2016 – Fourth Quarter

- No climate-related or streamflow issues were noted during the fourth quarter.

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TABLES

TABLE 2.1
2016 WATER TREATMENT PLANT DISCHARGE RATES

Date	Approximate Discharge Rate [a] (gpm)
1/4/2016	380
1/11/2016	370
1/18/2016	365
1/25/2016	330
2/1/2016	330
2/8/2016	360
2/15/2016	360
2/22/2016	360
2/29/2016	360
3/7/2016	360
3/14/2016	360
3/21/2016	360
3/28/2016	360
4/4/2016	360
4/11/2016	355
4/18/2016	355
4/25/2016	355
5/2/2016	355
5/9/2016	275
5/16/2016	275
5/23/2016	285
5/31/2016	285
6/6/2016	285
6/13/2016	280
6/20/2016	275
6/27/2016	275
7/5/2016	275
7/11/2016	270
7/18/2016	270
7/25/2016	270
8/1/2016	270
8/8/2016	270
8/15/2016	270
8/22/2016	270
8/29/2016	270
9/6/2016	270
9/12/2016	270
9/19/2016	270
9/26/2016	270
10/3/2016	270
10/10/2016	270
10/17/2016	270
10/24/2016	270
10/31/2016	270
11/7/2016	270
11/14/2016	270
11/21/2016	270
11/28/2016	270
12/5/2016	270
12/12/2016	270
12/19/2016	270
12/27/2016	270
Annual Average	**300.4[b]**

Notes:

a The discharge rate is an instantaneous measurement recorded by the plant operator for the date shown.

b The annual average discharge rate is calculated from 365 daily flows and not on the 52 instantaneous measurement provided in this table.

gpm Gallons per minute

TABLE 2.2
APPROXIMATE VOLUME OF WATER TREATED

Dates	Approximate Volume of Water Treated (gallons)
1993 through 1996	231,920,600
1996 through 1997	51,321,600
1998	96,832,800
1999	119,730,200
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	177,127,200
2014	156,518,200
2015	161,514,000
2016	158,342,400
Total	**3,431,732,600**

TABLE 2.3

SUMMARY OF MONITORING EVENTS - 2016

Monitoring Event[a]	Location	Number of Samples 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] (79)	Plant Water	Influent Water (1) Effluent Water (1) BABB Water (1) NCRT/NHRT effluent (2)	PCP	EPA Method 528
	Groundwater	Shallow Monitoring Wells (59)[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 (59)[c] Intermediate Monitoring Wells (4) Deep Monitoring Wells (8)	PCP	EPA Method 528

TABLE 2.3 (Cont.)

SUMMARY OF MONITORING EVENTS

Monitoring Event[a]	Location	Number of Samples Collected and Analyzed[b]	Analytical Parameters of Interest	Method Number for Analysis
(Continued) **Annual Sampling Event[a] (86)**	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

Notes:

a The number in parenthesis is the total number of samples that are planned to be collected per monitoring event.
b The number in parenthesis is the total number of samples that are planned to be collected per station.
c A pump was lost in monitoring well MW-11-05 in February~~,~~ 2016; thus, the well could not be sampled.
d Analysis for metals includes arsenic, cadmium, chromium, copper, lead, and zinc; analysis for anions includes bromide, chloride, fluoride, nitrate, nitrite, and phosphate.

The depth to water was measured in each well that was sampled.

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 2.4
HISTORICAL CONCENTRATIONS OF PCP FOR WTP SAMPLES

Date	Laboratory	EPA Method	NHRT Effluent (NHRTEFF)	NCRT Effluent (NCRTEFF)	WTP Influent (IN)	WTP Beteen Tanks (BABB)	WTP Effluent (EFF)	ROD Cleanup Level[a] (µg/L)
2001 Range	MBMG	528	476 - 1185	6.76 - 55.2	130 - 631	--	0.1U - **1.12**	1.0
2002 Range	MBMG	528	272 - 842	11.5 - 24	143 - 463	--	0.1U - **7.08**	1.0
2003 Range	MBMG	528	140 - 304	4.3 - 8.8	47 - 262	17.0	0.04U - **1.7**	1.0
2004 Range	MBMG	528	97 - 192	2.4 - 6.7	33 - 82	0.11 - 4.1	0.056 - 0.39	1.0
2005 Range	MBMG	528	60 - 149	1.10 - 5.8	25.7 - 73.7	0.04 - 1.2	0.1U - 0.4	1.0
2006 Range	MBMG	528	98 - 180	1.56 - 6.06	4.21 - 98.8	0.062 - 9.83	0.1U - **3.35**	1.0
2007 Range	MBMG	528	63.2 - 286	2.69 - 3.92	19.3 - 310	0.126 - 1.05	0.06 - 0.483	1.0
2008 Range	MBMG	528	84.5 - 306	2.98 - 7.81	16.9 - 296	0.11 - 17.2	0.089 - **2.58**	1.0
2009 Range	MBMG	528	36.4 - 306	1.03 - 4.84	17.8 - 153	0.2U - 18.7	0.082 - **7.13**	1.0
2010 Range	MBMG	528	31.1 - 233	1.70 - 7.38	10.8 - 84.6	0.2U - 4.3	0.207 - **1.46**	1.0
2011 Range	MBMG	528	84.2 - 333	3.18 - 11.5	9.14 - 137	0.267 - 39.4	0.208 - **15.7**	1.0
2012 Range	MBMG	528	232 -379	0.79 - 49.4	35.5 - 161	0.456 - 14.6	0.23 - **1.03**	1.0
2013 Range	MBMG	528	126 - 345	2.54 - 8.71	0.852 -176	0.2U - 31.1	0.2U - **11.1**	1.0
2014 Range	MBMG	528	159 - 326	0.2U - 12.2	17.5 - 250	0.2U - 38.9	0.2U - **10.4**	1.0
2015 Range	MBMG	528	100 - 245	4.10 - 9.5	22.7 - 52.3	0.2U - 0.64	0.2U - 0.271	1.0
2016 Range	MBMG	528	97 - 186	3.58 - 6.8	22.3 - 52.5	0.2U - 0.93	0.2U - 0.633	1.0
1/4/2016	MBMG	528	128	3.58	24.7	0.931	0.633	1.0
1/11/2016	MBMG	528	--	--	25.6	0.740	0.355	1.0
1/18/2016	MBMG	528	--	--	22.3	0.449	0.2U	1.0
1/25/2016	MBMG	528	--	--	27.9	0.269	0.2U	1.0
2/1/2016	MBMG	528	144	5.88	32.8	0.256	0.2U	1.0
2/8/2016	MBMG	528	--	--	30.5	0.546	0.284	1.0
2/15/2016	MBMG	528	--	--	29.7	0.335	0.214	1.0
2/22/2016	MBMG	528	--	--	27.9	0.327	0.220	1.0
2/29/2016	MBMG	528	--	--	28.1	0.314	0.247	1.0
3/7/2016	MBMG	528	125	5.60	26.8	0.271	0.2U	1.0
3/14/2016	MBMG	528	--	--	30.4	0.2U	0.2U	1.0
3/21/2016	MBMG	528	--	--	23.2	0.230	0.2U	1.0
3/28/2016	MBMG	528	--	--	25.8	0.2U	0.2U	1.0
4/4/2016	MBMG	528	100	5.53	22.8	0.2U	0.2U	1.0
4/11/2016	MBMG	528	--	--	23.8	0.2U	0.2U	1.0
4/18/2016	MBMG	528	--	--	23.7	0.2U	0.2U	1.0
4/25/2016	MBMG	528	--	--	23.8	0.2U	0.2U	1.0
5/2/2016	MBMG	528	121	5.77	23.7	0.2U	0.2U	1.0
5/9/2016	MBMG	528	--	--	41.3	0.210	0.2U	1.0
5/16/2016	MBMG	528	--	--	37.1	0.272	0.2U	1.0
5/23/2016	MBMG	528	--	--	39.4	0.469	0.246	1.0
5/31/2016	MBMG	528	--	--	34.3	0.287	0.2U	1.0
6/6/2016	MBMG	528	112	5.58	38.5	0.342	0.223	1.0
6/13/2016	MBMG	528	--	--	37.5	0.318	0.266	1.0
6/20/2016	MBMG	528	--	--	36.4	0.310	0.211	1.0
6/27/2016	MBMG	528	--	--	37.7	0.398	0.221	1.0
7/5/2016	MBMG	528	97	5.08	35.0	0.274	0.250	1.0
7/11/2016	MBMG	528	--	--	35.6	0.436	0.206	1.0
7/18/2016	MBMG	528	--	--	35.7	0.293	0.240	1.0
7/25/2016	MBMG	528	--	--	37.2	0.350	0.215	1.0
8/1/2016	MBMG	528	--	--	44.0	0.311	0.245	1.0
8/8/2016	MBMG	528	153	6.83	31.4	0.302	0.302	1.0
8/15/2016	MBMG	528	--	--	38.7	0.556	0.328	1.0
8/22/2016	MBMG	528	--	--	36.1	0.338	0.314	1.0
8/29/2016	MBMG	528	--	--	36.5	0.588	0.294	1.0
9/6/2016	MBMG	528	116	5.68	30.0	0.373	0.242	1.0
9/12/2016	MBMG	528	--	--	31.8	0.320	0.220	1.0
9/19/2016	MBMG	528	--	--	39.0	0.274	0.216	1.0
9/26/2016	MBMG	528	--	--	46.9	0.242	0.313	1.0
10/3/2016	MBMG	528	140	5.00	52.5	0.238	0.191	1.0
10/10/2016	MBMG	528	--	--	44.5	0.376	0.153	1.0
10/17/2016	MBMG	528	--	--	35.4	0.430	0.210	1.0
10/24/2016	MBMG	528	--	--	37.8	0.283	0.201	1.0
10/31/2016	MBMG	528	--	--	40.6	0.245	0.220	1.0
11/7/2016	MBMG	528	186	4.73	32.6	0.366	0.180	1.0
11/14/2016	MBMG	528	--	--	42.2	0.224	0.184	1.0
11/21/2016	MBMG	528	--	--	33.8	0.510	0.312	1.0
11/28/2016	MBMG	528	--	--	41.4	0.473	0.320	1.0
12/5/2016	MBMG	528	144	5.36	41.2	0.580	0.495	1.0
12/12/2016	MBMG	528	--	--	47.2	0.560	0.458	1.0
12/19/2016	MBMG	528	--	--	35.9	0.274	0.164	1.0
12/27/2016	MBMG	528	--	--	30.5	0.437	0.333	1.0

Notes:
All units are in µg/L unless otherwise noted.

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

TABLE 2.5
HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR WTP SAMPLES

(µg/L)

Sample Date	NHRT Effluent (NHRTEFF) (µg/L)	NCRT Effluent (NCRTEFF) (µg/L)	WTP Influent (IN) (µg/L)	WTP Effluent (EFF) (µg/L)	ROD Cleanup Level[a] (µg/L)
8/13/2001	4.60E-07	9.20E-07	2.03E-06	2.40E-07	1.00E-05
2/4/2002	4.60E-07	1.60E-07	3.21E-06	1.30E-07	1.00E-05
8/12/2002	5.50E-07	1.19E-06	1.53E-06	2.10E-07	1.00E-05
2/3/2003	2.70E-07	4.17E-06	2.16E-06	6.90E-07	1.00E-05
8/4/2003	2.30E-07	2.16E-06	1.57E-06	3.00E-07	1.00E-05
2/2/2004	1.50E-07	8.30E-07	8.50E-07	1.40E-07	1.00E-05
8/2/2004	2.20E-07	3.09E-06	1.40E-06	5.60E-07	1.00E-05
8/8/2005	7.60E-07	1.29E-06	1.95E-05	1.28E-06	1.00E-05
2/6/2006	2.10E-07	8.50E-07	2.78E-06	1.00E-06	1.00E-05
8/21/2006	2.10E-07	2.70E-07	7.70E-07	2.86E-06	1.00E-05
8/27/2007	8.70E-08	8.10E-07	0.00E+00	3.10E-07	1.00E-05
8/26/2008	1.70E-07	1.58E-06	5.60E-07	1.70E-07	1.00E-05
8/10/2009	6.20E-07	3.92E-06	1.80E-06	1.80E-07	1.00E-05
8/16/2010	1.12E-05	5.84E-06	4.40E-06	5.80E-07	1.00E-05
8/15/2011 [b]	1.91E-07	1.90E-07	3.91E-07	7.60E-08	1.00E-05
8/13/2012	2.27E-05	1.21E-05	7.26E-06	4.40E-07	1.00E-05
8/12/2013	1.27E-04	7.72E-06	3.58E-05	3.69E-07	1.00E-05
8/11/2014	1.06E-05	3.07E-06	6.75E-06	7.99E-07	1.00E-05
8/10/2015	5.68E-06	7.72E-06	4.48E-06	4.00E-07	1.00E-05
8/8/2016	4.95E-06	2.12E-06	2.80E-06	3.08E-07	1.00E-05

HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR WTP SAMPLES

(pg/L)

Sample Date	NHRT Effluent (NHRTEFF) (pg/L)	NCRT Effluent (NCRTEFF) (pg/L)	WTP Influent (IN) (pg/L)	WTP Effluent (EFF) (pg/L)	ROD Cleanup Levela (pg/L)
8/13/2001	0.46	0.92	2.03	0.24	10.00
2/4/2002	0.46	0.16	3.21	0.13	10.00
8/12/2002	0.55	1.19	1.53	0.21	10.00
2/3/2003	0.27	4.17	2.16	0.69	10.00
8/4/2003	0.23	2.16	1.57	0.30	10.00
2/2/2004	0.15	0.83	0.85	0.14	10.00
8/2/2004	0.22	3.09	1.40	0.56	10.00
8/8/2005	0.76	1.29	19.50	1.28	10.00
2/6/2006	0.21	0.85	2.78	1.00	10.00
8/21/2006	0.21	0.27	0.77	2.86	10.00
8/27/2007	0.09	0.81	0.00	0.31	10.00
8/26/2008	0.17	1.58	0.56	0.17	10.00
8/10/2009	0.62	3.92	1.80	0.18	10.00
8/16/2010	11.2	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	22.7	12.1	7.26	0.44	10.00
8/12/2013	127	7.72	35.80	0.37	10.00
8/11/2014	10.6	3.07	6.75	0.80	10.00
8/10/2015	5.68	7.72	4.48	0.40	10.00
8/8/2016	4.95	2.12	2.80	0.31	10.00

Notes:

For this table, TEQs are calculated using the MPTP ROD Methodology.

See Appendix B-3 for TEQ values calculated using both the MPTP ROD Methodology and the DEQ-7 Methodology

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

TABLE 2.6
CONCENTRATIONS OF METALS, PAH, CHLOROPHENOLS, ANIONS, AND METALS FOR WTP SAMPLES

	NHRT Effluent (NHRTEFF)	NCRT Effluent (NCRTEFF)	WTP Influent (IN)	WTP Effluent (EFF)	ROD[b]
ANALYTES					
METALS, TOTAL[a] (EPA Method 200.8)					
ARSENIC	8.62	2.39	3.77	2.32	48
CADMIUM	0.25U	0.25U	0.25U	0.25U	1.1 (0.8) [c]
CHROMIUM	0.25U	0.25U	0.25U	0.25U	11
COPPER	3.5	4.49	1.25U	1.25U	12
IRON (mg/L)	1.265	0.038U	0.314	0.038U	-
LEAD	0.15U	0.15U	0.15U	0.15U	3.2
MANGANESE (mg/L)	0.439	0.071	0.170	0.005U	-
ZINC	4.27	18.68	15.78	26	110
PAH (EPA Method SW8270C)					
ACENAPHTHENE	1.53	1U	1U	1U	-
ACENAPHTHYLENE	1U	1U	1U	1U	-
ANTHRACENE	1U	1U	1U	1U	-
BENZO(A)ANTHRACENE	0.1U	0.1U	0.1U	0.1U	1
BENZO(A)PYRENE	0.1U	0.1U	0.1U	0.1U	0.2 (0.05/0.038) [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	0.1U	0.1U	0.1U	0.1U	1
CHRYSENE	0.1U	0.1U	0.1U	0.1U	1
DIBENZO(A,H)ANTHRACENE	0.1U	0.1U	0.1U	0.1U	0.2
FLUORANTHENE	1U	1.34	1U	1.33	-
FLUORENE	1.83	1U	1U	1U	-
INDENO(1,2,3-CD)PYRENE	0.1U	0.1U	0.1U	0.1U	1
NAPHTHALENE	2.16	1U	1U	1U	-
PHENANTHRENE	1U	1U	1U	1U	-
PYRENE	1U	1U	1U	1U	-
TOTAL D PAHs	5.5	1.34	1U	1.33	360
CHLOROPHENOLS (EPA Method SW8270C)					
2,3,4,6-TETRACHLOROPHENOL	5.55	1.0U	1.65	1U	-
2,3,5,6-TETRACHLOROPHENOL	7.62	1.0U	1.9	1U	267
2,4,5-TRICHLOROPHENOL	1.0U	1.0U	1.0U	1U	-
2,4,6-TRICHLOROPHENOL	1.0U	1.0U	1.0U	1U	-
2,4-DICHLOROPHENOL	1.0U	1.0U	1.0U	1U	45
2-CHLOROPHENOL	1.0U	1.0U	1.0U	1U	27
4-CHLORO-3-METHYLPHENOL	1.0U	1.0U	1.0U	1U	6.5
PENTACHLOROPHENOL	153	6.83	31.4	0.302	1
ANIONS[a] (EPA Method 300)					
BROMIDE	236	235	234	235	-
CHLORIDE (mg/L)	54.68	65.2	61.84	61.97	-
FLUORIDE (mg/L)	0.31	0.5	0.45	0.45	-
NITRATE (mg/L)	1.77	9.54	7.39	7.38	-
NITRITE (mg/L)	0.01U	0.01U	0.01U	0.01U	-
PHOSPHATE (mg/L)	0.16	0.08	0.09	0.05	-
METALS (TOTAL RECOVERABLE) (EPA Method 200.8)					
ARSENIC	8.62	2.39	3.77	2.32	48
CADMIUM	0.25U	0.25U	0.25U	0.25U	1.1
CHROMIUM	0.25U	0.25U	0.25U	0.25U	11
COPPER	3.5	4.49	1.25U	1.25U	12
IRON (mg/L)	1.265	0.038U	0.314	0.038U	-
LEAD	0.15U	0.15U	0.15U	0.15U	3.2
MANGANESE (mg/L)	0.439	0.071	0.17	0.005U	-
ZINC	4.27	18.68	15.78	26	110

Notes:
All units are in ug/L unless otherwise noted.
All samples were collected on August 8, 2016.
- No cleanup level specified in the ROD.
a Concentration units for anion constituents (other than bromide), as well as the two metals - iron and manganese, are mg/L.
b Cleanup level applies to the WTP effluent sample (station EFF), only.
c The water quality standards for cadmium and benzo(a)pyrene outlined in Circular DEQ-7 are lower than the cleanup levels for groundwater and surface water specified in the ROD tables; therefore, the lower DEQ-7 standards (in parentheses) currently take precedence over the ROD cleanup levels for these analytes.
The hardness-adjusted DEQ-7 Aquatic Life Standard for the chronic standard for cadmium is 0.8 µg/L.
The DEQ-7 standard for benzo(a)pyrene for groundwater is 0.05 µg/L; the DEQ-7 standard for benzo(a)pyrene for surface water is 0.038 µg/L

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

TABLE 2.7
QUALITY CONTROL - SOURCE WATER BLANKS

Date Sampled	Sample ID	Analyte	EPA Method	Concentration	Q	Units
PENTACHLOROPHENOL (EPA Method 528)						
1/11/2016	WTPVS011116	PENTACHLOROPHENOL	528	0.2	U	µg/L
1/18/2016	OPOQVS011816	PENTACHLOROPHENOL	528	0.2	U	µg/L
2/1/2016	SW-07020116	PENTACHLOROPHENOL	528	0.2	U	µg/L
2/2/2016	MW-E-98020216	PENTACHLOROPHENOL	528	0.2	U	µg/L
2/3/2016	MW-21020316	PENTACHLOROPHENOL	528	0.2	U	µg/L
2/4/2016	MW-G-98020416	PENTACHLOROPHENOL	528	0.2	U	µg/L
2/15/2016	WTPVS0215516	PENTACHLOROPHENOL	528	0.2	U	µg/L
2/22/2016	OPOQVS022216	PENTACHLOROPHENOL	528	0.2	U	µg/L
3/14/2016	WTPVS031416	PENTACHLOROPHENOL	528	0.2	U	µg/L
3/28/2016	WTPVS032816	PENTACHLOROPHENOL	528	0.2	U	µg/L
4/4/2016	OPOQVS040416	PENTACHLOROPHENOL	528	0.2	U	µg/L
4/25/2016	WTPVS042516	PENTACHLOROPHENOL	528	0.2	U	µg/L
5/9/2016	WTPVS050916	PENTACHLOROPHENOL	528	0.2	U	µg/L
5/23/2016	WTPVS052316	PENTACHLOROPHENOL	528	0.2	U	µg/L
5/31/2016	OPOQVS053116	PENTACHLOROPHENOL	528	0.2	U	µg/L
6/20/2016	WTPVS062016	PENTACHLOROPHENOL	528	0.2	U	µg/L
6/27/2016	OPOQVS062716	PENTACHLOROPHENOL	528	0.2	U	µg/L
7/18/2016	WTPVS071816	PENTACHLOROPHENOL	528	0.2	U	µg/L
8/1/2016	WTPVS080116	PENTACHLOROPHENOL	528	0.1	U	µg/L
8/2/2016	MW-C-99080216	PENTACHLOROPHENOL	528	0.1	U	µg/L
8/2/2016	MW-18080216	PENTACHLOROPHENOL	528	0.1	U	µg/L
8/3/2016	MW-19080316	PENTACHLOROPHENOL	528	0.1	U	µg/L
8/8/2016	SW-07080816	PENTACHLOROPHENOL	528	0.1	U	µg/L
8/22/2016	WTPVS082216	PENTACHLOROPHENOL	528	0.1	U	µg/L
8/29/2016	OPOQVS082916	PENTACHLOROPHENOL	528	0.1	U	µg/L
9/19/2016	WTPVS091916	PENTACHLOROPHENOL	528	0.1	U	µg/L
9/26/2016	OPOQVS092616	PENTACHLOROPHENOL	528	0.1	U	µg/L
10/17/2016	WTPVS101716	PENTACHLOROPHENOL	528	0.1	U	µg/L
10/31/2016	WTPVS103116	PENTACHLOROPHENOL	528	0.1	U	µg/L
11/14/2016	WTPVS111416	PENTACHLOROPHENOL	528	0.1	U	µg/L
11/21/2016	OPOQVS112116	PENTACHLOROPHENOL	528	0.1	U	µg/L
12/5/2016	OPOQVS120516	PENTACHLOROPHENOL	528	0.1	U	µg/L
12/27/2016	WTPVS122716	PENTACHLOROPHENOL	528	0.1	U	µg/L
SVOC (EPA Method 8270)						
8/8/2016	SW-07080816	2,3,4,6-TETRACHLOROPHENOL	8270	1	U	µg/L
8/8/2016	SW-07080816	2,3,5,6-TETRACHLOROPHENOL	8270	1	U	µg/L
8/8/2016	SW-07080816	2,4,5-TRICHLOROPHENOL	8270	1	U	µg/L
8/8/2016	SW-07080816	2,4,6-TRICHLOROPHENOL	8270	1	U	µg/L
8/8/2016	SW-07080816	2,4-DICHLOROPHENOL	8270	1	U	µg/L
8/8/2016	SW-07080816	2-CHLOROPHENOL	8270	1	U	µg/L
8/8/2016	SW-07080816	4-CHLORO-3-METHYLPHENOL	8270	1	U	µg/L
PAH (EPA Method 8270)						
8/8/2016	SW-07080816	ACENAPHTHENE	8270	1	U	µg/L
8/8/2016	SW-07080816	ACENAPHTHYLENE	8270	1	U	µg/L
8/8/2016	SW-07080816	ANTHRACENE	8270	1	U	µg/L
8/8/2016	SW-07080816	BENZO(A)ANTHRACENE	8270	0.1	U	µg/L
8/8/2016	SW-07080816	BENZO(A)PYRENE	8270	0.1	U	µg/L
8/8/2016	SW-07080816	BENZO(B)FLUORANTHENE	8270	0.2	U	µg/L
8/8/2016	SW-07080816	BENZO(G,H,I)PERYLENE	8270	1	U	µg/L
8/8/2016	SW-07080816	BENZO(K)FLUORANTHENE	8270	0.1	U	µg/L
8/8/2016	SW-07080816	CHRYSENE	8270	0.1	U	µg/L
8/8/2016	SW-07080816	DIBENZO(A,H)ANTHRACENE	8270	0.1	U	µg/L
8/8/2016	SW-07080816	FLUORANTHENE	8270	1	U	µg/L
8/8/2016	SW-07080816	FLUORENE	8270	1	U	µg/L
8/8/2016	SW-07080816	INDENO(1,2,3-CD)PYRENE	8270	0.1	U	µg/L
8/8/2016	SW-07080816	NAPHTHALENE	8270	1	U	µg/L
8/8/2016	SW-07080816	PHENANTHRENE	8270	1	U	µg/L
8/8/2016	SW-07080816	PYRENE	8270	1	U	µg/L

TABLE 2.7
QUALITY CONTROL - SOURCE WATER BLANKS

Date Sampled	Sample ID	Analyte	EPA Method	Concentration	Q	Units
DIOXIN (TEQ) (EPA Method 8290)						
8/8/2016	SW-07080816	DIOXIN (TEQ)	8290	**0.01**		pg/L
ANIONS (EPA Method 300.1)						
8/8/2016	SW-07080816	BROMIDE	300.1	10.0	U	µg/L
8/8/2016	SW-07080816	CHLORIDE	300.1	0.1	U	mg/L
8/8/2016	SW-07080816	FLUORIDE	300.1	0.01	U	mg/L
8/8/2016	SW-07080816	NITRATE	300.1	0.01	U	mg/L
8/8/2016	SW-07080816	NITRITE	300.1	0.01	U	mg/L
8/8/2016	SW-07080816	PHOSPHATE	300.1	0.03	U	mg/L
METALS - TOTAL (EPA Method 200.8)						
8/8/2016	SW-07080816	ARSENIC	200.8	0.1	U	µg/L
8/8/2016	SW-07080816	CADMIUM	200.8	**0.4**		µg/L
8/8/2016	SW-07080816	CHROMIUM	200.8	0.1	U	µg/L
8/8/2016	SW-07080816	COPPER	200.8	0.5	U	µg/L
8/8/2016	SW-07080816	IRON	200.8	**0.042**	J	mg/L
8/8/2016	SW-07080816	LEAD	200.8	0.06	U	µg/L
8/8/2016	SW-07080816	MANGANESE	200.8	0.002	U	mg/L
8/8/2016	SW-07080816	ZINC	200.8	**0.8**	J	µg/L
METALS - DISSOLVED (EPA Method 200.8)						
8/8/2016	SW-07080816	ARSENIC	200.8	0.1	U	µg/L
8/8/2016	SW-07080816	CADMIUM	200.8	0.1	U	µg/L
8/8/2016	SW-07080816	CHROMIUM	200.8	0.1	U	µg/L
8/8/2016	SW-07080816	COPPER	200.8	0.5	U	µg/L
8/8/2016	SW-07080816	IRON	200.8	0.015	U	mg/L
8/8/2016	SW-07080816	LEAD	200.8	0.06	U	µg/L
8/8/2016	SW-07080816	MANGANESE	200.8	0.002	U	mg/L
8/8/2016	SW-07080816	ZINC	200.8	0.5	U	µg/L

Notes
Dioxin (TEQ) calculated using 0 for values qualified as "U" and ROD TEFs (MPTP ROD methodology).

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

TABLE 2.8
QUALITY CONTROL - FIELD DUPLICATES

Sample Date	Original Sample ID	Analyte	Original Concentration	Q	Original Sample RL	Duplicate Sample ID	Duplicate Concentration	Q	Duplicate Sample RL	Units	RPD[a]
PENTACHLOROPHENOL (EPA Method 528)											
1/4/2016	NHRTEFF010416	PENTACHLOROPHENOL	128	D	0.2	OPOQVS010416	131	D	0.2	µg/L	2.3
1/25/2016	IN012516	PENTACHLOROPHENOL	27.9		0.2	WTPVS012516	26.1		0.2	µg/L	6.7
2/1/2016	MW-K-01020116	PENTACHLOROPHENOL	2		0.2	MW-20020116	1.9		0.2	µg/L	5.1
2/2/2016	10-02020216	PENTACHLOROPHENOL	0.2	U	0.2	MW-18020216	0.2	U	0.2	µg/L	0.0
2/3/2016	MW-O-01020316	PENTACHLOROPHENOL	0.2	U	0.2	MW-C-99020316	0.2	U	0.2	µg/L	0.0
2/4/2016	MW-11-04020416	PENTACHLOROPHENOL	1220	D	0.2	MW-19020416	1230	D	0.2	µg/L	0.8
2/8/2016	BABB020816	PENTACHLOROPHENOL	0.546		0.2	OPOQVS020816	0.29		0.2	µg/L	**61.2**
2/29/2016	IN022916	PENTACHLOROPHENOL	28.1		0.2	WTPVS022916	29		0.2	µg/L	3.2
3/7/2016	NCRTEFF030716	PENTACHLOROPHENOL	5.6		0.2	OPOQVS030716	5.74		0.2	µg/L	2.5
3/21/2016	EFF032116	PENTACHLOROPHENOL	0.2	U	0.2	OPOQVS032116	0.2	U	0.2	µg/L	0.0
4/11/2016	BABB041116	PENTACHLOROPHENOL	0.2	U	0.2	WTPVS041116	0.2	U	0.2	µg/L	0.0
4/18/2016	IN041816	PENTACHLOROPHENOL	23.7		0.2	OPOQVS041816	23.6		0.2	µg/L	0.4
5/2/2016	LTUDIS050216	PENTACHLOROPHENOL	975	D	0.2	OPOQVS050216	1114	D	0.2	µg/L	13.3
5/16/2016	IN051616	PENTACHLOROPHENOL	37.1	D	0.2	OPOQVS051616	38.9	D	0.2	µg/L	4.7
6/6/2016	NHRTEFF060616	PENTACHLOROPHENOL	112	D	0.2	WTPVS060616	91.6	D	0.2	µg/L	20.0
6/13/2016	EFF061316	PENTACHLOROPHENOL	0.266		0.2	OPOQVS061316	0.243		0.2	µg/L	9.0
7/5/2016	BABB070516	PENTACHLOROPHENOL	0.274		0.2	WTPVS070516	0.286		0.2	µg/L	4.3
7/11/2016	EFF071116	PENTACHLOROPHENOL	0.206		0.2	OPOQVS071116	0.23		0.2	µg/L	11.0
8/1/2016	MW-J-01080116	PENTACHLOROPHENOL	0.697		0.1	OPOQVS080116	0.837		0.1	µg/L	18.3
8/2/2016	10-19080216	PENTACHLOROPHENOL	18		0.1	MW-E-98080216	16.2		0.1	µg/L	10.5
8/2/2016	NC-06-S080216	PENTACHLOROPHENOL	0.176		0.1	MW-21080216	0.168		0.1	µg/L	4.7
8/3/2016	GW-05080316	PENTACHLOROPHENOL	30.8	D	0.1	MW-G-98080316	26.5	D	0.1	µg/L	15.0
8/8/2016	SW-05080816	PENTACHLOROPHENOL	0.1	U	0.1	MW-20080816	0.172		0.1	µg/L	**52.9**
8/15/2016	IN081516	PENTACHLOROPHENOL	38.7	D	0.1	OPOQVS081516	40	D	0.1	µg/L	3.3
9/6/2016	NCRTEFF090616	PENTACHLOROPHENOL	5.68		0.1	WTPVS090616	4.15		0.1	µg/L	**31.1**
9/12/2016	EFF091216	PENTACHLOROPHENOL	0.22		0.1	OPOQVS091216	0.245		0.1	µg/L	10.8
10/3/2016	NHRTEFF100316	PENTACHLOROPHENOL	140	D	0.1	WTPVS100316	120	D	0.1	µg/L	15.4
10/10/2016	BABB101016	PENTACHLOROPHENOL	0.376		0.1	OPOQVS101016	0.27		0.1	µg/L	**32.8**
10/24/2016	EFF102416	PENTACHLOROPHENOL	0.201		0.1	OPOQVS102416	0.175		0.1	µg/L	13.8
11/7/2016	NCRTEFF110716	PENTACHLOROPHENOL	4.73		0.1	OPOQVS110716	4.56		0.1	µg/L	3.7
11/28/2016	IN112816	PENTACHLOROPHENOL	41.4	D	0.1	WTPVS112816	49.9	D	0.1	µg/L	18.6
12/12/2016	BABB121216	PENTACHLOROPHENOL	0.56		0.1	WTPVS121216	0.515		0.1	µg/L	8.4
12/19/2016	IN121916	PENTACHLOROPHENOL	35.9	D	0.1	OPOQVS121916	41.3	D	0.1	µg/L	14.0
SVOC (EPA Method 8270)											
8/8/2016	SW-05080816	2,3,4,6-TETRACHLOROPHENOL	1	U	1	MW-20080816	1	U	1	µg/L	0.0
8/8/2016	SW-05080816	2,3,5,6-TETRACHLOROPHENOL	1	U	1	MW-20080816	1	U	1	µg/L	0.0
8/8/2016	SW-05080816	2,4,5-TRICHLOROPHENOL	1	U	1	MW-20080816	1	U	1	µg/L	0.0
8/8/2016	SW-05080816	2,4,6-TRICHLOROPHENOL	1	U	1	MW-20080816	1	U	1	µg/L	0.0
8/8/2016	SW-05080816	2,4-DICHLOROPHENOL	1	U	1	MW-20080816	1	U	1	µg/L	0.0
8/8/2016	SW-05080816	2-CHLOROPHENOL	1	U	1	MW-20080816	1	U	1	µg/L	0.0
8/8/2016	SW-05080816	4-CHLORO-3-METHYLPHENOL	1	U	1	MW-20080816	1	U	1	µg/L	0.0
PAH (EPA Method 8270)											
8/8/2016	SW-05080816	ACENAPHTHENE	1	U	1	MW-20080816	1	U	1	µg/L	0.0
8/8/2016	SW-05080816	ACENAPHTHYLENE	1	U	1	MW-20080816	1	U	1	µg/L	0.0
8/8/2016	SW-05080816	ANTHRACENE	1	U	1	MW-20080816	1	U	1	µg/L	0.0
8/8/2016	SW-05080816	BENZO(A)ANTHRACENE	0.1	U	0.1	MW-20080816	0.1	U	0.1	µg/L	0.0
8/8/2016	SW-05080816	BENZO(A)PYRENE	2.06		0.1	MW-20080816	2.07		0.1	µg/L	0.5
8/8/2016	SW-05080816	BENZO(B)FLUORANTHENE	0.2	U	0.2	MW-20080816	0.2	U	0.2	µg/L	0.0
8/8/2016	SW-05080816	BENZO(G,H,I)PERYLENE	1	U	1	MW-20080816	1	U	1	µg/L	0.0
8/8/2016	SW-05080816	BENZO(K)FLUORANTHENE	0.1	U	0.1	MW-20080816	0.1	U	0.1	µg/L	0.0
8/8/2016	SW-05080816	CHRYSENE	0.1	U	0.1	MW-20080816	0.1	U	0.1	µg/L	0.0
8/8/2016	SW-05080816	DIBENZO(A,H)ANTHRACENE	0.1	U	0.1	MW-20080816	0.1	U	0.1	µg/L	0.0
8/8/2016	SW-05080816	FLUORANTHENE	1.35		1	MW-20080816	1	U	1	µg/L	**29.8**
8/8/2016	SW-05080816	FLUORENE	1	U	1	MW-20080816	1	U	1	µg/L	0.0
8/8/2016	SW-05080816	INDENO(1,2,3-CD)PYRENE	0.1	U	0.1	MW-20080816	0.1	U	0.1	µg/L	0.0
8/8/2016	SW-05080816	NAPHTHALENE	1	U	1	MW-20080816	1	U	1	µg/L	0.0
8/8/2016	SW-05080816	PHENANTHRENE	1	U	1	MW-20080816	1	U	1	µg/L	0.0
8/8/2016	SW-05080816	PYRENE	1	U	1	MW-20080816	1	U	1	µg/L	0.0

TABLE 2.8
QUALITY CONTROL - FIELD DUPLICATES

Sample Date	Original Sample ID	Analyte	Original Concentration	Q	Original Sample RL	Duplicate Sample ID	Duplicate Concentration	Q	Duplicate Sample RL	Units	RPD[a]
DIOXINS AND FURANS (TEQ) (EPA Method SW8290)											
8/8/2016	SW-05080816	Dioxin TEQ	0.215		-		0.328		-	pg/L	**41.6**
ANIONS (EPA Method 300.1)											
8/8/2016	EFF080816	BROMIDE	235		10	MW-F-99080816	236		10	µg/L	0.4
8/8/2016	EFF080816	CHLORIDE	61.97		0.1	MW-F-99080816	62.75		0.1	mg/L	1.3
8/8/2016	EFF080816	FLUORIDE	0.45		0.01	MW-F-99080816	0.41		0.01	mg/L	9.3
8/8/2016	EFF080816	NITRATE	7.38		0.01	MW-F-99080816	7.48		0.01	mg/L	1.3
8/8/2016	EFF080816	NITRITE	0.01	U	0.01	MW-F-99080816	0.01	U	0.01	mg/L	0.0
8/8/2016	EFF080816	PHOSPHATE	0.05	J	0.02	MW-F-99080816	0.06	J	0.02	mg/L	18.2
METALS - TOTAL (EPA Method 200.8)											
8/8/2016	EFF080816	ARSENIC	2.35		0.1	MW-F-99080816	2.32		0.1	µg/L	1.3
8/8/2016	EFF080816	CADMIUM	0.25	U	0.015	MW-F-99080816	0.25	U	0.015	µg/L	0.0
8/8/2016	EFF080816	CHROMIUM	0.25	U	0.1	MW-F-99080816	0.25	U	0.1	µg/L	0.0
8/8/2016	EFF080816	COPPER	1.25	U	0.5	MW-F-99080816	1.25	U	0.5	µg/L	0.0
8/8/2016	EFF080816	IRON	0.038	U	0.015	MW-F-99080816	0.038	U	0.015	mg/L	0.0
8/8/2016	EFF080816	LEAD	0.15	U	0.1	MW-F-99080816	0.15	U	0.1	µg/L	0.0
8/8/2016	EFF080816	MANGANESE	0.005	U	0.02	MW-F-99080816	0.005	U	0.02	mg/L	0.0
8/8/2016	EFF080816	ZINC	10.91		0.5	MW-F-99080816	8.48		0.5	µg/L	**25.1**
METALS - DISSOLVED (EPA Method 200.8)											
8/8/2016	EFF080816	ARSENIC	2.32		0.25	MW-F-99080816	2.58		0.25	µg/L	10.6
8/8/2016	EFF080816	CADMIUM	0.25	U	0.1	MW-F-99080816	0.25	U	0.1	µg/L	0.0
8/8/2016	EFF080816	CHROMIUM	0.25	U	0.25	MW-F-99080816	0.25	U	0.25	µg/L	0.0
8/8/2016	EFF080816	COPPER	1.25	U	1.25	MW-F-99080816	4.35	J	1.25	µg/L	**110.7**
8/8/2016	EFF080816	IRON	0.038	U	0.015	MW-F-99080816	0.038	U	0.015	mg/L	0.0
8/8/2016	EFF080816	LEAD	0.15	U	0.06	MW-F-99080816	0.15	U	0.06	µg/L	0.0
8/8/2016	EFF080816	MANGANESE	0.005	U	0.002	MW-F-99080816	0.005	U	0.002	mg/L	0.0
8/8/2016	EFF080816	ZINC	26		1.25	MW-F-99080816	24.47		1.25	µg/L	6.1
										Average RPD:	8.3

Notes:

µg/L	Micrograms per liter
pg/L	Picograms 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 percent project goal for precision
D	Dilution
EPA	U.S. Environmental Protection Agency
ID	Identification
J	Estimated
mg/L	Milligrams per liter
PAH	Polycyclic aromatic hydrocarbon
Q	Laboratory data qualifier
RL	Laboratory reporting limit
RPD	Relative percent difference
SVOC	Semivolatile organic compound
TEQ	Toxicity equivalence quotient
U	Analyzed for but not detected above the method detection limit

TABLE 3.1
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
2014	0
2015	0
2016	0
Total Volume Applied:	**47,958,150**

Note:
LTU Land treatment unit

TABLE 3.2
LTU SAMPLING RESULTS FOLLOWING 2007 LTU OFFLOAD

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

Notes:
October 2007 sampling was conducted after the 2007 LTU offload, and after addition of SSP soils for final treatment.
For this table, dioxin (TEQ) was calculated using the MPTP ROD Methodology. Also see Appendix B for TEQs calculated using the DEQ-7 Methodology, where available.
Soil samples were not collected from the LTU in 2014, 2015, or in 2016 as part of site operations.

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

TABLE 4.1
HISTORICAL CONCENTRATIONS OF PCP FOR SURFACE WATER SAMPLES

Surface Water Station:	**SW-05**	**SS-06A**	**SW-09**	
Analyte:	PCP	PCP	PCP	
Units:	(µg/L)	(µg/L)	(µg/L)	
Laboratory:	MBMG	MBMG	MBMG	ROD
EPA Method:	8270/528[a]	8270/528[a]	8270/528[a]	Cleanup Level (µg/L)
2001 Range	0.071 - **1.8**	--	--	1.0
2002 Range	0.423 - **2.36**	--	--	1.0
2003 Range	0.058 - 0.15	--	--	1.0
2004 Range	--	--	--	1.0
2005 Range	0.45 - 0.071	--	--	1.0
2006 Range	0.038 - **1.03**	--	0.6	1.0
2007 Range	0.1U - 0.349	--	0.1U - 0.246	1.0
2008 Range	0.1U - 0.349	--	0.1U - 0.246	1.0
2009 Range	0.061 - 0.188	--	0.064 - 0.454	1.0
2010 Range	0.2U - 0.186	0.2U	0.2U	1.0
2011 Range	0.2U - 0.281	0.2U	0.2U	1.0
2012 Range	0.2U - 0.670	0.2U	0.2U	1.0
2013 Range	0.2U	0.2U - 0.214	0.2U	1.0
2014 Range	0.2U	0.2U	0.2U	1.0
2015 Range	0.2U	0.2U	0.2U	1.0
2016 Range	0.1U - 0.2U	0.1U - 0.2U	0.1U - 0.2U	1.0
February 1, 2016 (semi-annual sampling event)	0.2U	0.2U	0.2U	1.0
August 8, 2016 (annual sampling event)	0.1U	0.1U	0.1U	1.0

Notes:

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

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	SS-06A (µg/L)	SW-05 (µg/L)	SW-09 (µg/L)	ROD Cleanup Level (µg/L)
8/21/2006	--	0	0	1.00E-05
8/26/2007	--	7.70E-07	--	1.00E-05
8/25/2008	--	0	5.10E-08	1.00E-05
8/10/2009	--	0	0	1.00E-05
8/16/2010	--	0	0	1.00E-05
8/15/2011	1.09E-07	8.10E-08	1.70E-08	1.00E-05
8/13/2012	4.10E-08	3.47E-07	3.40E-08	1.00E-05
8/13/2013[a]	1.90E-07	4.56E-07	1.86E-06	1.00E-05
8/11/2014	4.13E-08	5.84E-08	1.90E-08	1.00E-05
8/10/2015	3.94E-08	2.30E-08	5.14E-08	1.00E-05
8/8/2016	2.17E-07	2.15E-07	7.88E-08	1.00E-05

HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR SURFACE WATER SAMPLES

(pg/L)

Sample Date	SS-06A (pg/L)	SW-05 (pg/L)	SW-09 (pg/L)	ROD Cleanup Level (pg/L)
8/21/2006	--	0	0	10.00
8/26/2007	--	0.77	--	10.00
8/25/2008	--	0	0.05	10.00
8/10/2009	--	0	0	10.00
8/16/2010	--	0	0	10.00
8/15/2011	0.11	0.08	0.02	10.00
8/13/2012	0.04	0.35	0.03	10.00
8/12/2013[a]	0.19	0.46	1.86	10.00
8/11/2014	0.04	0.06	0.02	10.00
8/10/2015	0.04	0.02	0.05	10.00
8/8/2016	0.22	0.22	0.08	10.00

Notes:
For this table, TEQs are calculated using the MPTP ROD Methodology.
See Appendix B-3 for dioxin (TEQ) values calculated using both the MPTP ROD Methodology and the DEQ-7 Methodology.

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

TABLE 4.3
CONCENTRATIONS OF PAH AND CHLOROPHENOLS FOR SURFACE WATER SAMPLES

Surface Water Station:	SS-06A	SW-05	SW-09	ROD Cleanup Level (µg/L)
Sample Date:	8/8/2016	8/8/2016	8/8/2016	
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	0.1U	0.1U	0.1U	1
BENZO(A)PYRENE	**2.05**	**2.06**	0.1U	0.2/0.038[a]
BENZO(B)FLUORANTHENE	0.2U	0.2U	0.2U	0.2
BENZO(G,H,I)PERYLENE	1U	1U	1U	1
BENZO(K)FLUORANTHENE	0.1U	0.1U	0.1U	1
CHRYSENE	0.1U	0.1U	0.1U	1
DIBENZO(A,H)ANTHRACENE	0.1U	0.1U	0.1U	0.2
FLUORANTHENE	1.33	1.35	1.33	-
FLUORENE	1U	1U	1U	-
INDENO(1,2,3-CD)PYRENE	0.1U	0.1U	0.1U	1
NAPHTHALENE	1U	1U	1U	-
PHENANTHRENE	1U	1U	1U	-
PYRENE	1U	1U	1U	-
Total D PAH	1.33	1.35	1.33	360
CHLOROPHENOLS (EPA Method 8270)				
2,3,4,6-TETRACHLOROPHENOL	1.0U	1.0U	1.0U	-
2,3,5,6-TETRACHLOROPHENOL	1.0U	1.0U	1.0U	267
2,4,5-TRICHLOROPHENOL	1.0U	1.0U	1.0U	-
2,4,6-TRICHLOROPHENOL	1.0U	1.0U	1.0U	6.5
2,4-DICHLOROPHENOL	1.0U	1.0U	1.0U	27
2-CHLOROPHENOL	1.0U	1.0U	1.0U	45
4-CHLORO-3-METHYLPHENOL	1.0U	1.0U	1.0U	-
PENTACHLOROPHENOL	0.1U	0.1U	0.1U	1.0

Notes:
- \- No cleanup level specified in ROD
- µg/L Micrograms per liter
- a The water quality standard for benzo(a)pyrene outlined in Circular DEQ-7 is lower than the cleanup levels specified in the ROD tables; therefore, the lower DEQ-7 standard (in parentheses) currently takes precedence over the ROD cleanup level for this analyte. The DEQ-7 standard for benzo(a)pyrene for surface water is 0.038 µg/L.
- D PAH Sum of the acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene concentrations
- DEQ Montana Department of Environmental Quality
- EPA U.S. Environmental Protection Agency
- MBMG Montana Bureau of Mines and Geology
- PAH Polycyclic aromatic hydrocarbons
- ROD Record of Decision
- U Analyzed for but not detected above the method detection limit

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**	NS	NS	0.60 - **1.45**	**6.18 - 16.9**	**31.7 - 56.3**	**3,490**	1.0
2012 Range	0.2U - 0.351	0.2U	0.2U	**1.05**	**1.16 - 9.35**	**1.61 - 67.7**	**1,440 - 1,450**	1.0
2013 Range	0.213 - 0.305	0.2U - 0.251	0.2U	0.297	0.49	**21.5 - 43.2**	**1,536 - 7,400**[b]	1.0
2014 Range	0.2U - 0.626	0.2U	0.2U	0.2U	0.34	**10.3 - 105**	**668 - 1197**	1.0
2015 Range	0.2U	0.2U	0.2U	0.2U - 1.32	0.2U - 0.37	**47.7 - 53.4**	**340 - 1,022**	1.0
2016 Range	0.1U - 0.2U	0.1U - 0.2U	0.1U - 0.2U	0.903 - **1.28**	0.212 - 0.646	**83 - 109**	**1,220 - 1,606**	1.0
February 2, 2016 (semi-annual monitoring event)	0.2U	0.2U	0.2U	0.903	0.212	**109**	**1,220**	1.0
August 8, 2016 (annual monitoring event)	0.1U	0.1U	0.1U	**1.28**	0.646	**83**	**1,606**	1.0

Notes:

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

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 (µg/L)	MW-B-98 (µg/L)	MW-D-96 (µg/L)	MW-E-01 (µg/L)	MW-L-96 (µg/L)	MW-U-01 (µg/L)	MW-V-01 (µg/L)	NWW (µg/L)	ROD Cleanup Level (µg/L)
8/13/2001	--	--	--	--	--	--	--	--	3.83E-06	--	--	--	7.70E-08	2.10E-08	--	--	--	3.00E-05
8/12/2002	--	--	--	--	--	--	--	--	2.00E-07	--	--	--	2.10E-07	1.70E-07	--	--	--	3.00E-05
8/4/2003	--	--	--	--	--	--	--	--	4.90E-08	--	--	--	1.10E-07	0	--	--	--	3.00E-05
8/2/2004	--	--	--	--	--	--	--	--	7.00E-07	--	--	--	**4.35E-05**	0	--	--	--	3.00E-05
8/1/2005	--	--	--	--	--	--	--	--	9.20E-08	--	--	--	2.70E-06	5.30E-07	--	--	--	3.00E-05
8/21/2006	--	--	--	7.90E-08	--	--	1.29E-05	0	7.20E-08	--	7.80E-08	9.20E-08	**5.96E-05**	0	--	--	--	3.00E-05
8/27/2007	--	--	--	2.80E-07	--	--	6.90E-07	7.00E-08	0.00E+00	--	0	0	1.00E-07	0	--	--	--	3.00E-05
8/25/2008	--	--	--	0	--	--	1.26E-05	8.00E-08	0.00E+00	--	0	6.50E-07	1.30E-07	0	--	--	--	3.00E-05
8/10/2009	--	--	--	--	0	--	1.40E-07	--	--	--	0	--	--	--	0	--	--	3.00E-05
8/16/2010	--	--	--	--	0	--	**4.50E-05**	--	--	--	0	--	--	--	0	--	--	3.00E-05
8/15/2011	--	--	--	--	1.05E-06	--	4.09E-06	--	--	--	9.30E-09	--	--	--	--	2.82E-08	1.70E-08	3.00E-05
8/13/2012	--	--	--	--	1.18E-07	--	2.75E-05	--	--	--	1.04E-07	--	--	--	--	3.30E-08	7.40E-08	3.00E-05
8/13/2013	4.50E-08	8.81E-08	1.12E-07	--	6.70E-07	8.04E-08	5.59E-06	--	--	9.91E-06	--	--	--	--	--	--	--	3.00E-05
8/11/2014	2.70E-08	2.08E-08	1.83E-08	--	1.42E-07	7.77E-07	**1.38E-04**	--	--	7.15E-06	--	--	--	--	--	--	--	3.00E-05
8/10/2015	1.04E-07	7.50E-09	2.70E-08	--	9.03E-06	4.23E-07	6.31E-07	--	--	6.46E-06	--	--	--	--	--	--	--	3.00E-05
8/8/2016	2.30E-08	4.40E-08	1.94E-08	--	4.13E-07	2.02E-07	7.76E-07	--	--	1.56E-05	--	--	--	--	--	--	--	3.00E-05

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

Sample Date	10-12 (pg/L)	BMW-01A (pg/L)	BMW-01B (pg/L)	GW-12 (pg/L)	GW-14R-98 (pg/L)	HCA-21 (pg/L)	INF-04 (pg/L)	INF-05 (pg/L)	INF-06 (pg/L)	MW-11-04 (pg/L)	MW-B-98 (pg/L)	MW-D-96 (pg/L)	MW-E-01 (pg/L)	MW-L-96 (pg/L)	MW-U-01 (pg/L)	MW-V-01 (pg/L)	NWW (pg/L)	ROD Cleanup Level (pg/L)
8/13/2001	--	--	--	--	--	--	--	--	3.83	--	--	--	0.077	0.021	--	--	--	30.00
8/12/2002	--	--	--	--	--	--	--	--	0.20	--	--	--	0.21	0.17	--	--	--	30.00
8/4/2003	--	--	--	--	--	--	--	--	0.049	--	--	--	0.11	0.00	--	--	--	30.00
8/2/2004	--	--	--	--	--	--	--	--	0.70	--	--	--	**43.45**	0.00	--	--	--	30.00
8/1/2005	--	--	--	--	--	--	--	--	0.092	--	--	--	2.695	0.53	--	--	--	30.00
8/21/2006	--	--	--	0.079	--	--	12.92	0	0.072	--	0.078	0.092	**59.63**	0.00	--	--	--	30.00
8/26/2007	--	--	--	0.28	--	--	0.69	0.07	0	--	0	0	0.10	0	--	--	--	30.00
8/25/2008	--	--	--	0	--	--	12.64	0.08	0	--	0	0.650	0.13	0	--	--	--	30.00
8/10/2009	--	--	--	--	0	--	0.14	--	--	--	0	--	--	--	0	--	--	30.00
8/16/2010	--	--	--	--	0	--	**45.0**	--	--	--	0	--	--	--	0	--	--	30.00
8/15/2011	--	--	--	--	1.05	--	4.09	--	--	--	0.009	--	--	--	--	0.028	0.017	30.00
8/13/2012	--	--	--	--	0.12	--	27.50	--	--	--	0.104	--	--	--	--	0.033	0.074	30.00
8/12/2013	0.05	0.09	0.11	--	0.67	0.08	5.59	--	--	9.91	--	--	--	--	--	--	--	30.00
8/11/2014	0.03	0.02	0.02	--	0.14	0.78	**138**	--	--	7.15	--	--	--	--	--	--	--	30.00
8/10/2015	0.10	0.01	0.03	--	9.03	0.42	0.63	--	--	6.46	--	--	--	--	--	--	--	30.00
8/8/2016	0.02	0.04	0.02	--	0.41	0.20	0.78	--	--	15.60	--	--	--	--	--	--	--	30.00

Notes:
For this table, TEQs are calculated using the MPTP ROD Methodology.
See Appendix B-3 for dioxin (TEQ) values calculated using both the MPTP ROD Methodology and the DEQ-7 Methodology.

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
MPTP	Montana Pole and Treating Plant
ND	Not detected
ROD	Record of Decision
TEQ	Toxicity equivalence 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
Sample Date:	8/8/2016	8/8/2016	8/8/2016	8/8/2016	8/8/2016	8/8/2016	8/8/2016	
Laboratory:	MBMG	MBMG	MBMG	MBMG	MBMG	MBMG	MBMG	
Units:	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
ANALYTE								
PAH (EPA Method 8270)								
ACENAPHTHENE	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	8.51	-
ACENAPHTHYLENE	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	2.76	-
ANTHRACENE	1.0U	1.0U	1.0U	1.2	1.0U	1.0U	11.3	-
BENZO(A)ANTHRACENE	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	1
BENZO(A)PYRENE	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	**2.16**	0.2/0.05[a]
BENZO(B)FLUORANTHENE	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2
BENZO(G,H,I)PERYLENE	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1
BENZO(K)FLUORANTHENE	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	1
CHRYSENE	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	1
DIBENZO(A,H)ANTHRACENE	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.2
FLUORANTHENE	1.33	1.34	1.36	1.31	1.34	1.31	1.0U	-
FLUORENE	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	8.92	-
INDENO(1,2,3-CD)PYRENE	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	1
NAPHTHALENE	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	54.4	-
PHENANTHRENE	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	5.05	-
PYRENE	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	-
Total D PAH	1.0U	1.0U	1.0U	1.20	1.0U	1.0U	90.94	360
CHLOROPHENOLS (EPA Method 8270)								
2,3,4,6-TETRACHLOROPHENOL	1.0U	1.0U	1.0U	1.0U	1.0U	2.26	78.6	-
2,3,5,6-TETRACHLOROPHENOL	1.0U	1.0U	1.0U	1.0U	1.0U	4.01	7.9	267
2,4,5-TRICHLOROPHENOL	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	-
2,4,6-TRICHLOROPHENOL	1.0U	1.0U	1.0U	1.47	1.0U	1.0U	1	6.5
2,4-DICHLOROPHENOL	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	27
2-CHLOROPHENOL	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	45
4-CHLORO-3-METHYLPHENOL	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	-
PENTACHLOROPHENOL	0.1U	0.1U	0.1U	**1.28**	0.646	**83.0**	**1,606**	1.0

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

TABLE 4.7
COMPARISON OF UNFILTERED AND FILTERED DIOXIN (TEQ) DATA
AND VALUES FOR TURBIDITY

Sample Date	Monitoring Well	UNFILTERED DEQ-7 Methodology Dioxin TEQ (ρg/L)	UNFILTERED MPTP ROD Methodology Dioxin TEQ (ρg/L)	FILTERED DEQ-7 Methodology Dioxin TEQ (ρg/L)	FILTERED MPTP ROD Methodology Dioxin TEQ (ρg/L)	UNFILTERED (unless noted) PCP (µg/L)	Q	Turbidity (NTU)	Comments	Sample Collection Method
10/5/15	10-01	1.2	0.05	-	-	11.2		0.36	Clear no particulate	Typhoon Pump
10/5/15	10-02	1.0	0.02	-	-	16.2		2.79	Clear no particulate	Peristaltic Pump
10/5/15	GW-09	1.5	0.61	-	-	0.2	U	0.66	Clear no particulate	Typhoon Pump
10/5/15	GW-14R-98	3.0	2.04	1.4	0.011	1.06		7.2	Clear no particulate	Typhoon Pump
10/5/15	INF-13	1.9	0.61	1.9	-	21.8		0.4	Clear no particulate	Peristaltic Pump
10/5/15	INF-14	1.7	0.43	1.6	-	0.2	U	0.32	Clear no particulate	Typhoon Pump
10/5/15	INF-15	1.2	0.36	1.4	-	0.2	U	0.61	Clear no particulate	Typhoon Pump
10/5/15	INF-16	103.6	139.66	4.3	3.4	24.1		4.09	Fine particulates	Typhoon Pump
10/5/15	INF-17	3.3	2.72	1.1	-	1.06		0.39	Clear no particulate	Typhoon Pump
10/5/15	INF-18	2.2	1.41	0.97	-	0.2	U	0.34	Clear no particulate	Typhoon Pump
10/5/15	MW-11-04	125.7	169.31	1.1	0.17	35,700		22.2	Slightly cloudy	Typhoon Pump
10/5/15	MW-W-01	1.0	0.01	-	-	0.2	U	0.48	---	Typhoon Pump
10/5/15	NCRTEFF	3.7	3.74	-	-	5.02		1.73	Clear no particulate	By hand
10/5/15	NHRTEFF	5.8	5.95	-	-	167		0.06	Clear no particulate	By hand
8/8/16	10-12	0.7	0.02	-	-	0.1	U	1.9	Clear	Typhoon Pump
8/8/16	BMW-01A	0.8	0.04	-	-	0.1	U	0.39	Clear	Typhoon Pump
8/8/16	BMW-01B	0.7	0.02	-	-	0.1	U	10.7	Clear	Typhoon Pump
8/8/16	EFF	1.0	0.31	-	-	0.302		0.12	Clear	By hand
8/8/16	GW-14R-98	1.1	0.41	-	-	1.28		25.4	Clouded with fine particulates	Peristaltic Pump
8/8/16	HCA-21	0.8	0.20	-	-	0.646		0.52	Clear	Peristaltic Pump
8/8/16	IN	2.9	2.80	-	-	31.4	D	0.49	Clear	By hand
8/8/16	INF-04	1.2	0.78	-	-	83	D	0.41	Very fine particulates	Typhoon Pump
8/8/16	LTUDIS (unfiltered)	30.8	38.49	-	-	16.7*	D	8.39	Fine particulates	Peristaltic Pump[a]
8/8/16	LTUDIS (filtered)	-	-	-	-	17.4*		0.25	Clear	Peristaltic Pump[a]
8/8/16	MW-11-04	12.1	15.60	-	-	1,606	D	2.59	Fine particulates	Typhoon Pump
8/8/16	NCRTEFF	2.1	2.12	-	-	6.83		0.72	Clear	By hand
8/8/16	NHRTEFF	4.7	4.95	-	-	153	D	1.29	Clear	By hand
8/8/16	RETPOND	-	-	-	-	3.51	D	---	---	By hand
8/8/16	SS-06A	0.7	0.22	-	-	0.1	U	3.59	Clear with fine particulates	By hand
8/8/16	SW-05	0.8	0.22	-	-	0.1	U	3.37	Clear with fine particulates	By hand
8/8/16	SW-09	1.1	0.08	-	-	0.1	U	3.53	Slightly cloudy with fine particulates	By hand

Notes:

*	The concentration of PCP in the filtered sample was greater than the concentration in the unfiltered sample.
-	A filtered sample was not submitted to laboratory.
---	Information unavailable
Yellow	Indicates samples exhibiting relatively higher turbidity (>2 NTU) coupled with relatively higher dioxin TEQ (>10 ρg/L) in the unfiltered sample.
a	Sample was collected in a container and then transferred to the sample jar using a peristaltic pump.
ρg/L	Picograms per liter
µg/L	Micrograms per liter
D	Dilution
DEQ-7 Methodology	2005 WHO methodology and using PRL/2 where ND, and EMPC/2 when reported.
DEQ	Montana Department of Environmental Quality
EMPC	Estimated possible maximum concentration
MPTP ROD Methodology	DEQ ROD methodology using 0 where ND
NTU	Nephelometric turbidity units
PCP	Pentachlorophenol
PRL	Project reporting limit
Q	Data qualifier
ROD	Record of Decision
TEQ	Toxicity equivalence quotient
U	Analyzed for but not detected above the method detection limit
WHO	World Health Organization

TABLE 4.8
DATA EVALUATION AND PROGRESS OF REMEDIATION

Criterion Number	Criterion	Data Used	Type of Analysis	Results from Analysis	Documentation of Results (refer to)	Comments	Compliance with ROD?
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, where established).	Data from WTP station EFF (treated groundwater) were evaluated to determine if this criterion was met.	Comparisons of the concentrations of contaminants at WTP station EFF to the ROD discharge to surface water cleanup levels.	One hundred percent of results from weekly PCP analyses (52 samples) were below the PCP 1.0 µg/L ROD discharge to surface water cleanup level. The concentrations of dioxins, PAH, and chlorophenols were below the ROD discharge to surface water cleanup levels, where established.	Table 2.4 (PCP) Table 2.5 (dioxins) Table 2.6 (PAH and chlorophenols) Appendix A	-	Yes
2	Surface water in Silver Bow Creek must meet the 1 µg/L surface water cleanup level for PCP (and specified cleanup levels for other contaminants listed in the ROD).	Data from surface water stations SW-05 (downstream from the site), SS-06A (adjacent to the site), and SW-09 (upstream of the site) located on Silver Bow Creek were evaluated to determine if this criterion was met.	Comparisons of the concentrations of contaminants at surface water stations SW-05, SS-06A, and SW-09 to the ROD surface water cleanup levels, where established.	The concentrations of PCP, dioxins, PAH, and chlorophenols were below the respective ROD surface water cleanup levels (where established), with the exceptions of benzo(a)pyrene at stations SS-06A (2.05 µg/L) and SW-05 (2.06 µg/L) that exceeded the DEQ-7 human health standard (0.038 µg/L).	Table 4.1 (PCP) Table 4.2 (dioxins) Table 4.3 (PAH and chlorophenols) Appendix A	The concentrations of benzo(a)pyrene in WTP effluent (station EFF) and in MPTP monitoring wells immediately upgradient of Silver Bow Creek were below detection (0.1U µg/L). Therefore, WTP effluent and groundwater are not considered potential sources of benzo(a)pyrene in Silver Bow Creek. In addition, benzo(a)pyrene has historically never been detected at MPTP surface water stations along Silver Bow Creek, and has never been detected in the WTP effluent. Lastly, there are no known or documented point source or non-point source contributors of benzo(a)pyrene to Silver Bow Creek located between upstream station SW-09 and station SS-06A adjacent to the site. The detections of benzo(a)pyrene in surface water in August 2016 are considered anomalous.	Mostly Yes, with exceptions as noted.
3	The PCP plume must remain on site. This criterion is assumed to be met if the concentration of PCP in groundwater in downgradient sentinel monitoring wells continue to meet the groundwater cleanup level for PCP.	Data from downgradient sentinel monitoring wells (stations BMW 01A, BMW-01B, and 10-12) were evaluated to determine if the ROD groundwater cleanup level for PCP (1 µg/L) continued to be met at these locations.	This criterion is met if the concentrations of PCP in downgradient sentinel monitoring wells (BMW-01A, BMW-01B, and 10-12) continue to meet the 1 µg/L groundwater cleanup level for PCP. Comparison of the concentrations of PCP in downgradient sentinel monitoring wells (BMW-01A, BMW-01B, and 10-12) to the 1 µg/L ROD groundwater cleanup level.	The concentrations of PCP were below the 1 µg/L ROD groundwater cleanup level at downgradient sentinel monitoring wells (BMW-01A, BMW-01B, and 10-12).	Table 4.4 (PCP) Appendix A	-	Yes
4	The concentrations of dioxins, PAH, and chlorophenols in groundwater at representative monitoring wells along the south bank of Silver Bow Creek must meet the specified ROD groundwater cleanup levels, where established.	Data from monitoring wells BMW-01A, BMW-01B, 10-12, GW-14R-98, and HCA-21 were evaluated to determine if this criterion was met.	Comparisons of the concentrations of dioxins, PAH, and chlorophenols at groundwater monitoring wells 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 respective cleanup levels except for PCP in monitoring well GW-14R-98 (1.28 µg/L) on August 8, 2016, which slightly exceeded the ROD groundwater cleanup level (1.0 µg/L).	Table 4.5 (dioxins) Table 4.6 (PAH and chlorophenols) Appendix A	Phase B dewatering associated with construction work for upgrades to the BSB WWTP began February 15, 2016 and continued through April 26, 2016. Construction dewatering that took place during the early part of 2016 likely had a negative (but temporary) impact on the concentration of PCP in monitoring well GW-14R-98 as noted during the August annual monitoring event.	Mostly Yes, with exceptions as noted.
5	The long-term trend in the concentrations of PCP in groundwater over time should be decreasing, suggesting that groundwater quality will eventually meet the 1 µg/L groundwater cleanup level for PCP.	Data from groundwater monitoring wells with a long-term period of record (2004 to 2016) located along the south bank of Silver Bow Creek, and within the PCP plume footprint were evaluated to determine if this criterion was met (stations GW-14R-98 and HCA-21).	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 greater than the 90 percent confidence level. The concentrations of PCP in monitoring wells HCA-21 (0.646 µg/L) and GW-14R-98 (1.28 µg/L) during the August 2016 sampling event suggest that groundwater quality will eventually meet the ROD 1 µg/L groundwater cleanup level for PCP.	Appendix A Appendix F	-	Yes
6	The long-term trend in the area of the PCP plume must be stable or shrinking, showing that ongoing remedial action is effectively preventing the spread of contamination.	The long-term trend (since 1993) in the digitized area of the PCP plume was evaluated using all available monitoring well data to construct the 1 µg/L PCP isocontour for each year that data were available.	Direct comparison of PCP plume area after the ROD was signed (1993) to the current area of the PCP plume (August 8, 2016).	Over the past 23 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 16.0 acres on August 8, 2016. This decrease represents a 62 percent reduction in the area of the PCP plume.	Figure 4.8 Appendix F Appendix G	-	Yes
7	The short-term trend (previous 5 years) in the area of the PCP plume must be stable or shrinking, showing that ongoing remedial action is effectively preventing the spread of contamination.	The short-term trend (previous 5 years) in the digitized area of the PCP plume using the 1 µg/L isocontour was evaluated to determine if this criterion was met.	Mann-Kendall statistical test for trends (90 percent confidence interval)	Over the past 5 years, no particular trend is exhibited. However, the vast majority (70 percent) of detections of PCP have been below the 1.0 µg/L groundwater cleanup level; the highest recorded concentration being 1.32 µg/L in monitoring well GW-14R-98 on August 10, 2015. This analysis supports a conclusion that the downgradient edge of the plume may be stable.	Appendix F Appendix G	-	Yes

Notes:

-	No comment
µg/L	Micrograms per liter
BSB	Butte-Silver Bow
Dioxins	Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans
EFF	WTP effluent station EFF
GAC	Granulated activated carbon
MK Tests	Mann-Kendall statistical tests for trends
MPTP	Montana Pole and Treating Plant
PAH	Polycyclic aromatic hydrocarbons
PCP	Pentachlorophenol
ROD	Record of Decision
U	Analyzed for but not detected above the method detection limit
WTP	MPTP water treatment plant
WWTP	Wastewater treatment plant

TABLE 4.9
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
2014	0[a,d]
2015	0[b,d]
2016	0[c,d]
Total	6,558

Notes:

a An oil sheen was noted in the NHRT from October 20, 2014, to October 23, 2014; adsorbent pads were emplaced.
b An oil sheen was noted in the NHRT on May 22, 2015, November 24, 2015, and December 22, 2015; adsorbent pads were emplaced.
c
d The temporary presence of minor amounts of oil was likely related to non-routine operation of the WTP to compensate for groundwater pumping and construction dewatering at the BSB WWTP.

BSB Butte-Silver Bow
MPTP Montana Pole and Treating Plant
NAPL Non-aqueous phase liquid
NHRT Near-highway recovery trench
WTP MPTP water treatment plant
WWTP Wastewater treatment plant

TABLE 5.1

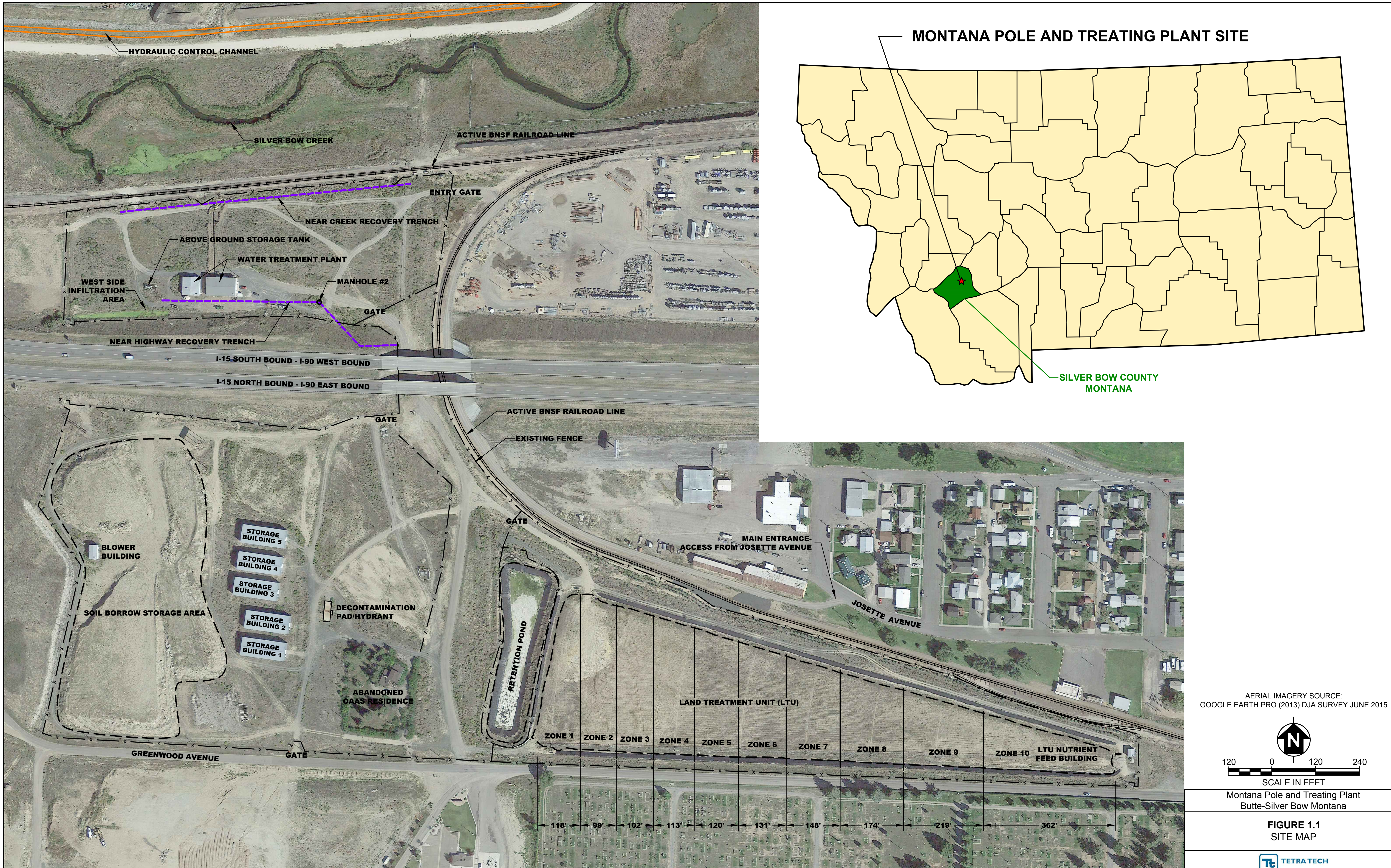
HISTORICAL CONCENTRATIONS OF PCP FOR RESIDENTIAL WELL SAMPLES

		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	--	--	--	--	0.2	--	--	1.0
2010	--	--	--	--	--	--	--	1.0
2011	--	--	--	--	--	--	--	1.0
2012	--	--	--	--	--	--	--	1.0
2013	--	--	--	--	--	--	--	1.0
2014	--	--	--	--	--	--	--	1.0
2015	--	--	--	--	--	--	--	1.0
2016	--	--	--	--	--	--	--	1.0

Notes:

--	Not sampled
µg/L	Micrograms per liter
Energy	Energy Laboratories Inc.
EPA	U.S. Environmental Protection Agency
MBMG	Montana Bureau of Mines and Geology
PCP	Pentachlorophenol
ROD	Record of Decision
U	Analyzed for but not detected above the method detection limit

FIGURES



Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 1.1
SITE MAP

TETRA TECH

Figure 1.1_Site Map.dwg - DWH - 02/22/2016

LEGEND

APPROXIMATE LOCATION OF INFILTRATION CELLS

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

N

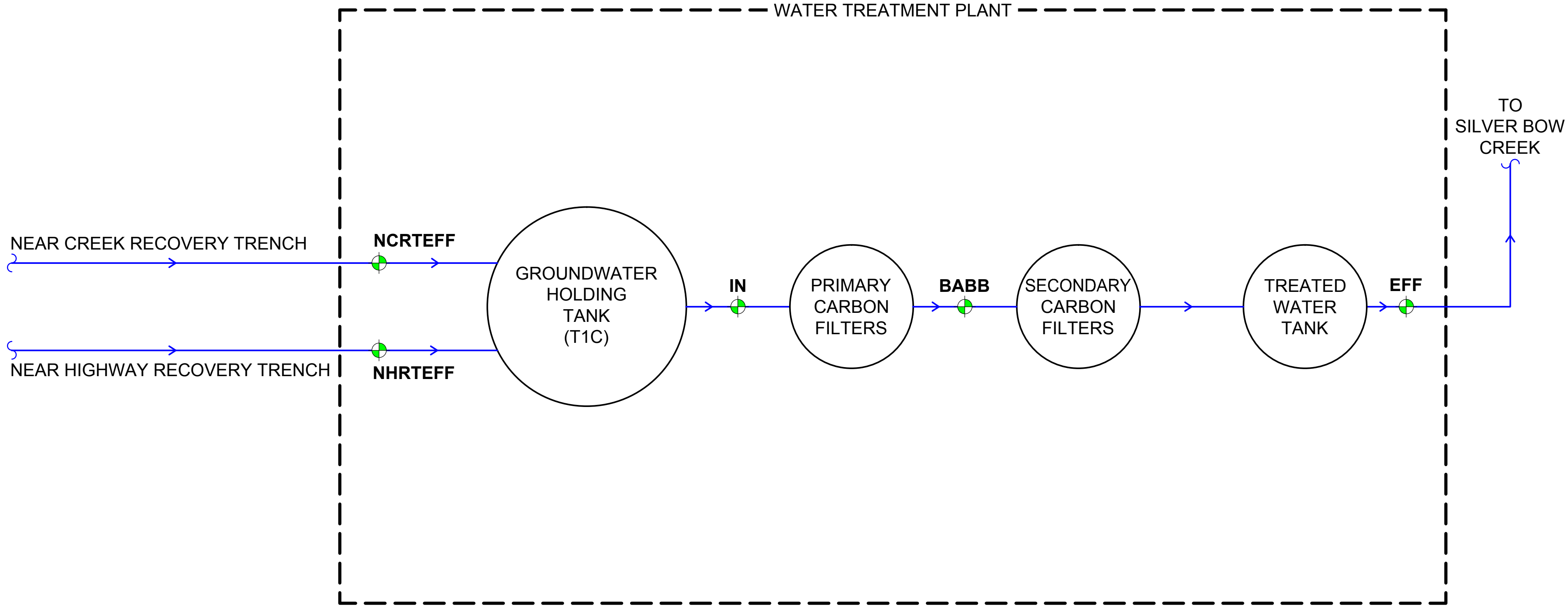
120 0 60 120

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 2.1
SOUTH INFILTRATION CELLS

TETRA TECH



LEGEND

(symbol)	MPTP WATER TREATMENT PLANT SAMPLE STATION
(line)	PIPING
MPTP	MONTANA POLE AND TREATING PLANT

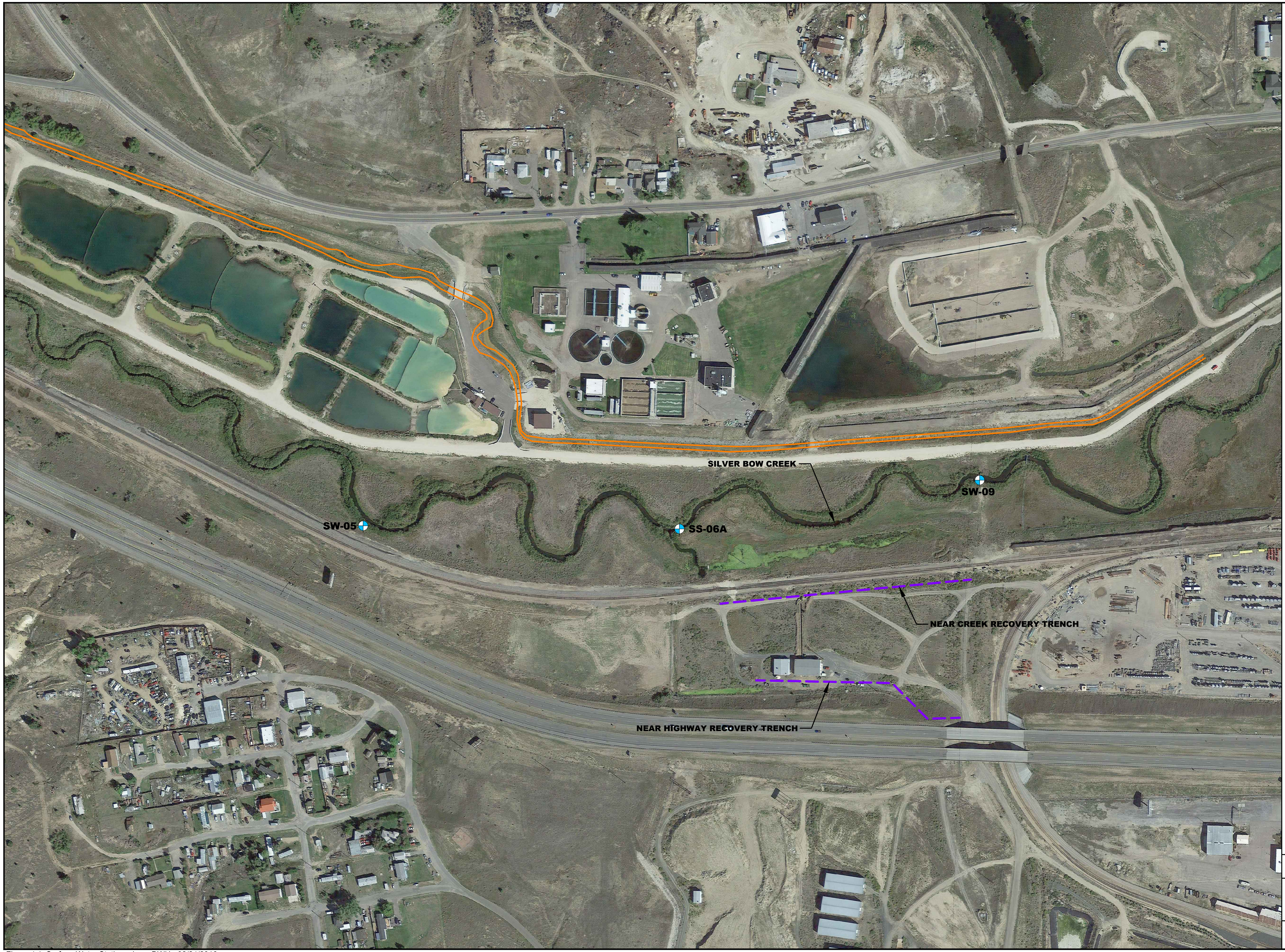
NO SCALE

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 - 02/22/2016



LEGEND

SURFACE WATER STATION

HYDRAULIC CONTROL CHANNEL

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

N

150 0 150 300

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.1
LOCATION OF SURFACE WATER STATIONS

TETRA TECH

Figure 4.1_Surface Water Stations.dwg - DWH - 02/24/2016

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 (ARCO)	6D
BMW-01B	Deep	Existing (ARCO)	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 (ARCO)	5H
GS-22	Shallow	Existing (ARCO)	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 (ARCO)	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
MP-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	10I
MW-87-03	Shallow	Existing (ARCO)	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 (ARCO)	11F
MW-H-01	Shallow	Existing	6G
MW-H-95	Shallow	Existing	7H
MW-H-96	Shallow	Existing (ARCO)	10F
MW-I-01	Shallow	Existing	6H
MW-I-96	Shallow/Intermediate	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	10I
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	Existing (BSB)	2E
Pump-2	Manhole	Existing (BSB)	3F
Pump-3	West Sump	Existing (BSB)	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 IMAGERY SOURCE: GOOGLE EARTH PRO (2013) DJA SURVEY JUNE 2015

LEGEND

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

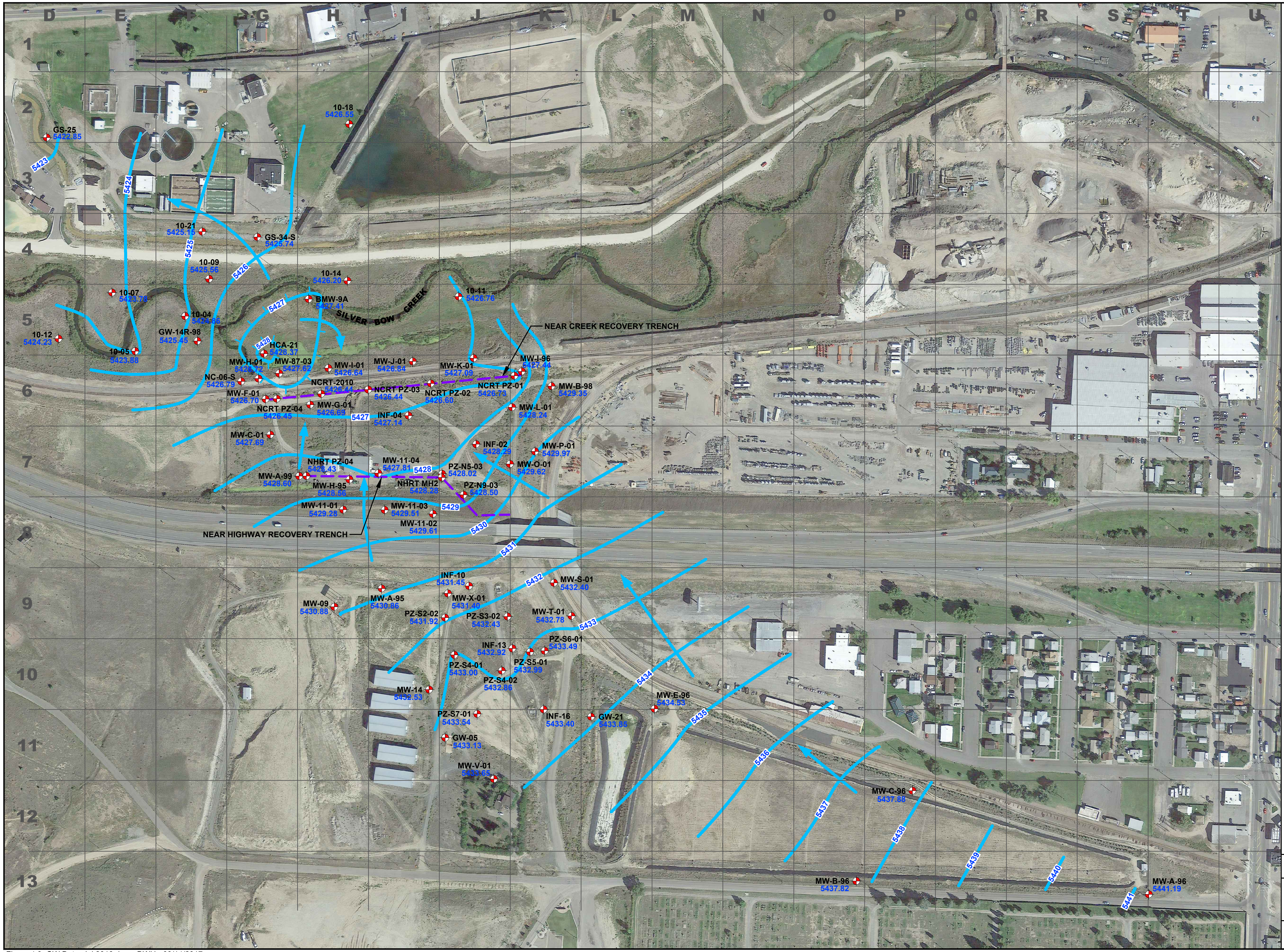
70 0 70 140
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.2
LOCATION OF ALL
MONTANA POLE AND TREATING PLANT
MONITORING WELLS

TETRA TECH

Figure 4.2_Location of All MPTP Monitoring Wells.dwg - DWH - 02/25/2016



LEGEND

MONITORING WELL

GROUNDWATER CONTOUR - 1' INTERVAL

GROUNDWATER MOUND

INTERPRETED DIRECTION OF GROUNDWATER FLOW

NOTES:

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

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

N

150 0 150 300

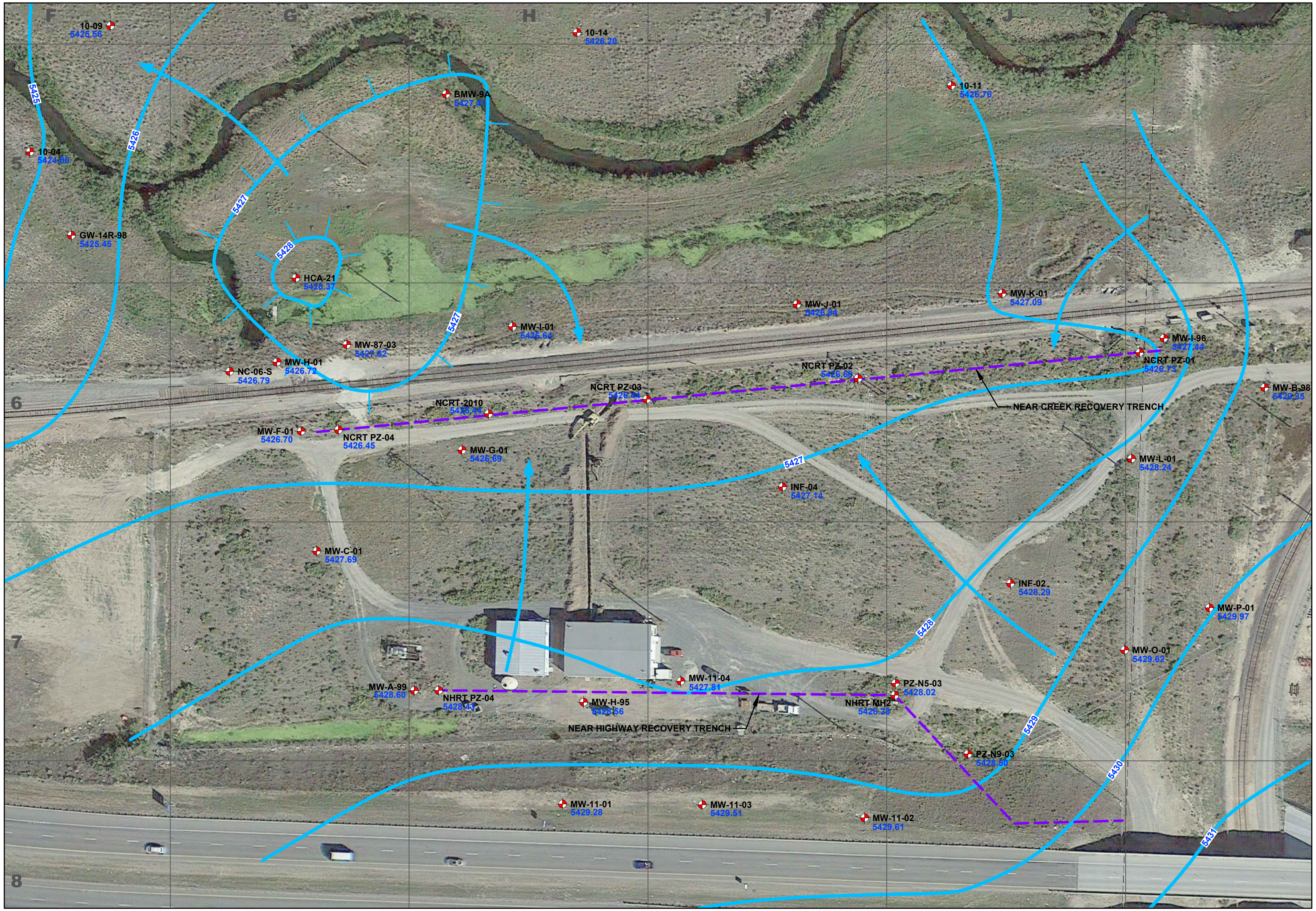
SCALE IN FEET

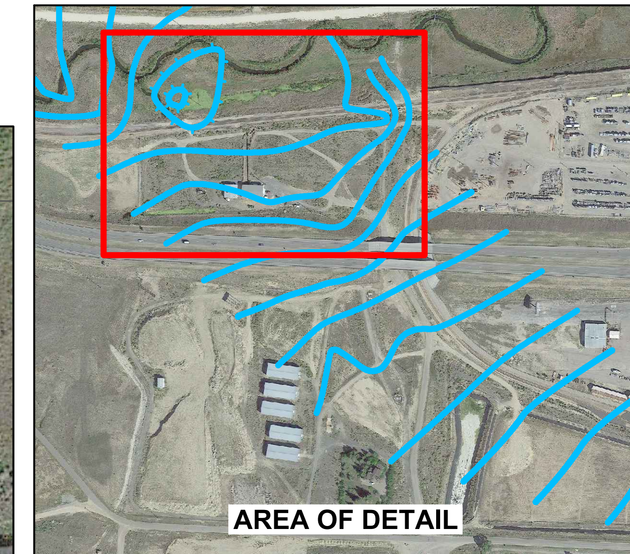
Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.3
GROUNDWATER LEVEL DATA -
JULY 28, 2016

TETRA TECH

Figure 4.3_GW Data_Jul 2016.dwg - DWH - 03/14/2017





LEGEND

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

NOTES:

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

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

N

50 0 50 100

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.4
ON-SITE GROUNDWATER LEVEL DATA - JULY 28, 2016

TETRA TECH

Figure 4.4_On-Site GW Data_Jul 2016.dwg - DWH - 03/14/2017

LEGEND

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

NOTES:

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

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

3) PLUME AREA BASED ON 1 µg/L CONTOUR INTERVAL: 15.9 ACRES

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

N

150 0 150 300

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.5
PCP DATA - FEBRUARY 2, 2016

TETRA TECH

Figure 4.5_PCP Data_Feb 2016.dwg - DWH - 03/14/2017

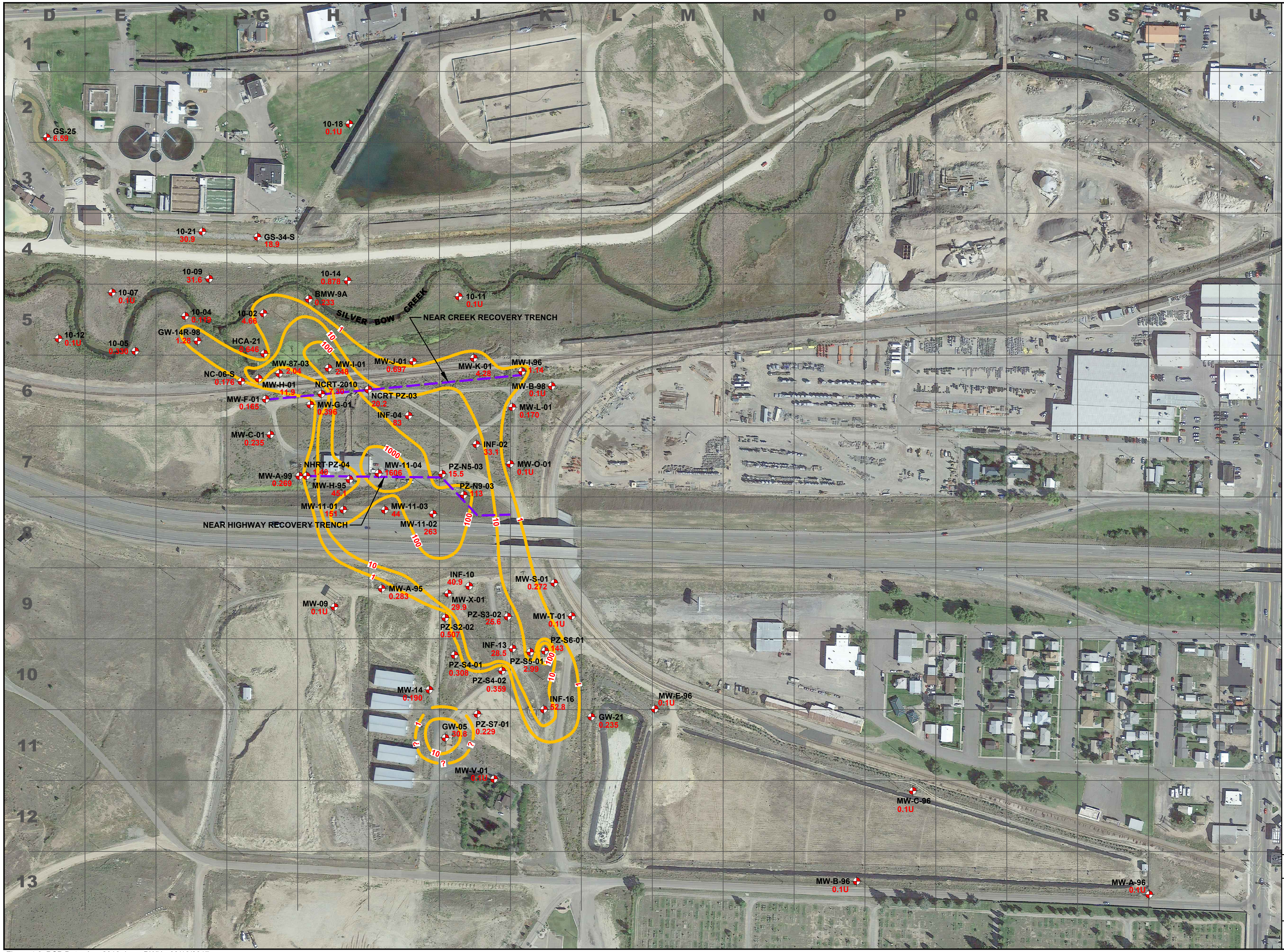


Figure 4.6_PCP Data_Aug 2016.dwg - DWH - 03/16/2017

LEGEND

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

NOTES:

1) PENTACHLOROPHENOL (PCP) ISOCONTOURS ARE INTERPRETED; OTHER INTERPRETATIONS ARE POSSIBLE.
2) THE PCP PLUME IS NOT INTERPRETED TO FLOW THROUGH THE NEAR CREEK RECOVERY TRENCH (NCRT). RATHER, CONTAMINATED GROUNDWATER NEAR THE HISTORICAL SILVER BOW CREEK CHANNEL IS INTERPRETED TO BE MIGRATING TOWARD THE NCRT.
3) PLUME AREA BASED ON 1 µg/L CONTOUR INTERVAL: 16.0 ACRES

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

N

150 0 150 300
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.6
PCP DATA - AUGUST 1, 2016

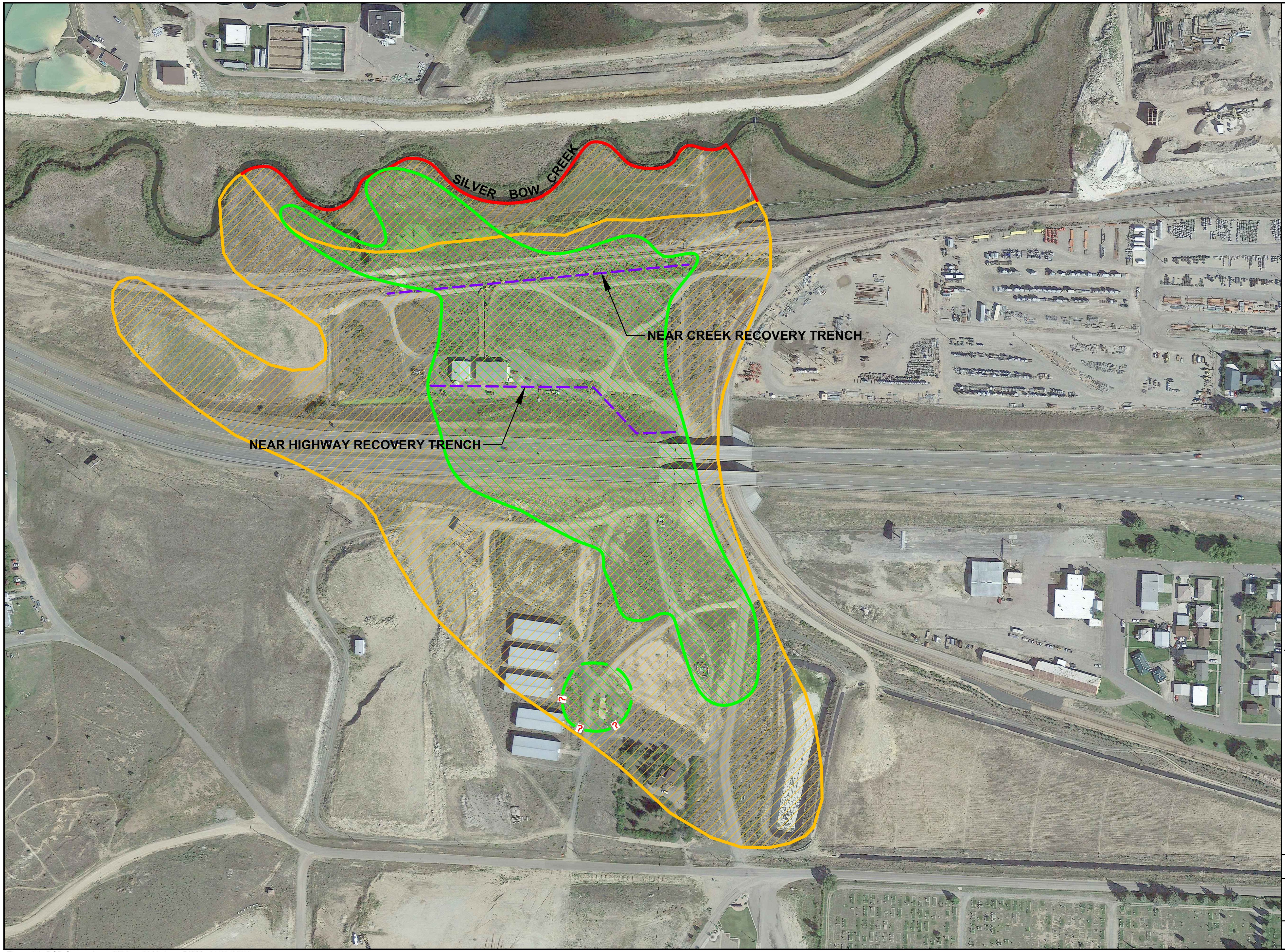
TETRA TECH

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 - 03/27/2017



LEGEND

- AUGUST 2016 PCP PLUME CONTOUR (1 µg/L)
- 1993 PCP PLUME CONTOUR (1 µg/L) FROM ROD
- EXTENSION OF 1993 PLUME CONTOUR (1 µg/L) TO CURRENT LOCATION OF SILVER BOW CREEK
- APPROXIMATE AUGUST 2016 PCP PLUME AREA (16.0 acres) - DASHED WHERE INFERRED, ? WHERE UNKNOWN
- 1993 PCP PLUME AREA (41.70 acres) (INCLUDES AREA BETWEEN HISTORIC SILVER BOW CREEK (1993) AND CURRENT LOCATION OF SILVER BOW CREEK (2016))

PCP PENTACHLOROPHENOL

ROD RECORD OF DECISION

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

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 AUGUST 8, 2016

TETRA TECH

Figure 4.8_PCP Comparison_1993 vs 2016.dwg - DWH - 03/27/2017

APPENDIX A

Microsoft Access 2010 Database

(Separate CD)

APPENDIX B

2016 Sampling Results and Data

APPENDIX B-1

Water Treatment Plant – PCP

MPTP 2016Q1 - PCP RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
1/4/2016	Plant	BABB	BABB010416	0.931			
1/11/2016	Plant	BABB	BABB011116	0.74			
1/18/2016	Plant	BABB	BABB011816	0.449			
1/25/2016	Plant	BABB	BABB012516	0.269			
2/1/2016	Plant	BABB	BABB020116	0.256			
2/8/2016	Plant	BABB	BABB020816	0.546		0.29	
2/15/2016	Plant	BABB	BABB021516	0.335			
2/22/2016	Plant	BABB	BABB022216	0.327			
2/29/2016	Plant	BABB	BABB022916	0.314			
3/7/2016	Plant	BABB	BABB030716	0.271			
3/14/2016	Plant	BABB	BABB031416	0.2	U		
3/21/2016	Plant	BABB	BABB032116	0.23			
3/28/2016	Plant	BABB	BABB032816	0.2	U		
1/4/2016	Plant	EFF	EFF010416	0.633			
1/11/2016	Plant	EFF	EFF011116	0.355			
1/18/2016	Plant	EFF	EFF011816	0.2	U		
1/25/2016	Plant	EFF	EFF012516	0.2	U		
2/1/2016	Plant	EFF	EFF020116	0.2	U		
2/8/2016	Plant	EFF	EFF020816	0.284			
2/15/2016	Plant	EFF	EFF021516	0.214			
2/22/2016	Plant	EFF	EFF022216	0.22			
2/29/2016	Plant	EFF	EFF022916	0.247			
3/7/2016	Plant	EFF	EFF030716	0.2	U		
3/14/2016	Plant	EFF	EFF031416	0.2	U		
3/21/2016	Plant	EFF	EFF032116	0.2	U	0.2	U
3/28/2016	Plant	EFF	EFF032816	0.2	U		
1/4/2016	Plant	IN	IN010416	24.7			
1/11/2016	Plant	IN	IN011116	25.6			
1/18/2016	Plant	IN	IN011816	22.3			
1/25/2016	Plant	IN	IN012516	27.9		26.1	
2/1/2016	Plant	IN	IN020116	32.8			
2/8/2016	Plant	IN	IN020816	30.5			
2/15/2016	Plant	IN	IN021516	29.7			
2/22/2016	Plant	IN	IN022216	27.9			
2/29/2016	Plant	IN	IN022916	28.1		29	
3/7/2016	Plant	IN	IN030716	26.8			
3/14/2016	Plant	IN	IN031416	30.4			

MPTP 2016Q1 - PCP RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
3/21/2016	Plant	IN	IN032116	23.2			
3/28/2016	Plant	IN	IN032816	25.8			
1/4/2016	Plant	NCRTEFF	NCRTEFF010416	3.58			
2/1/2016	Plant	NCRTEFF	NCRTEFF020116	5.88			
3/7/2016	Plant	NCRTEFF	NCRTEFF030716	5.6		5.74	
1/4/2016	Plant	NHRTEFF	NHRTEFF010416	128	D	131	D
2/1/2016	Plant	NHRTEFF	NHRTEFF020116	144	D		
3/7/2016	Plant	NHRTEFF	NHRTEFF030716	125	D		
1/18/2016	QC-Field blank	OPOQVS	OPOQVS011816	0.2	U		
2/22/2016	QC-Field blank	OPOQVS	OPOQVS022216	0.2	U		
1/11/2016	QC-Field blank	WTPVS	WTPVS011116	0.2	U		
2/15/2016	QC-Field blank	WTPVS	WTPVS0215516	0.2	U		
3/14/2016	QC-Field blank	WTPVS	WTPVS031416	0.2	U		
3/28/2016	QC-Field blank	WTPVS	WTPVS032816	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

MPTP 2016Q2 - PCP RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
4/4/2016	Plant	BABB	BABB040416	0.2	U		
4/11/2016	Plant	BABB	BABB041116	0.2	U	0.2	U
4/18/2016	Plant	BABB	BABB041816	0.2	U		
4/25/2016	Plant	BABB	BABB042516	0.2	U		
5/2/2016	Plant	BABB	BABB050216	0.2	U		
5/9/2016	Plant	BABB	BABB050916	0.21			
5/16/2016	Plant	BABB	BABB051616	0.272			
5/23/2016	Plant	BABB	BABB052316	0.469			
5/31/2016	Plant	BABB	BABB053116	0.287			
6/6/2016	Plant	BABB	BABB060616	0.342			
6/13/2016	Plant	BABB	BABB061316	0.318			
6/20/2016	Plant	BABB	BABB062016	0.31			
6/27/2016	Plant	BABB	BABB062716	0.398			
4/4/2016	Plant	EFF	EFF040416	0.2	U		
4/11/2016	Plant	EFF	EFF041116	0.2	U		
4/18/2016	Plant	EFF	EFF041816	0.2	U		
4/25/2016	Plant	EFF	EFF042516	0.2	U		
5/2/2016	Plant	EFF	EFF050216	0.2	U		
5/9/2016	Plant	EFF	EFF050916	0.2	U		
5/16/2016	Plant	EFF	EFF051616	0.2	U		
5/23/2016	Plant	EFF	EFF052316	0.246			
5/31/2016	Plant	EFF	EFF053116	0.2	U		
6/6/2016	Plant	EFF	EFF060616	0.223			
6/13/2016	Plant	EFF	EFF061316	0.266		0.243	
6/20/2016	Plant	EFF	EFF062016	0.211			
6/27/2016	Plant	EFF	EFF062716	0.221			
4/4/2016	Plant	IN	IN040416	22.8			
4/11/2016	Plant	IN	IN041116	23.8			
4/18/2016	Plant	IN	IN041816	23.7		23.6	
4/25/2016	Plant	IN	IN042516	23.8			
5/2/2016	Plant	IN	IN050216	23.7			
5/9/2016	Plant	IN	IN050916	41.3	D		
5/16/2016	Plant	IN	IN051616	37.1	D	38.9	D
5/23/2016	Plant	IN	IN052316	39.4	D		
5/31/2016	Plant	IN	IN053116	34.3	D		
6/6/2016	Plant	IN	IN060616	38.5	D		
6/13/2016	Plant	IN	IN061316	37.5	D		

MPTP 2016Q2 - PCP RESULTS FOR
WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
6/20/2016	Plant	IN	IN062016	36.4	D		
6/27/2016	Plant	IN	IN062716	37.7	D		
5/2/2016	Plant	LTUDIS	LTUDIS050216	975	D	1114	D
4/4/2016	Plant	NCRTEFF	NCRTEFF040416	5.53			
5/2/2016	Plant	NCRTEFF	NCRTEFF050216	5.77			
6/6/2016	Plant	NCRTEFF	NCRTEFF060616	5.58			
4/4/2016	Plant	NHRTEFF	NHRTEFF040416	100	D		
5/2/2016	Plant	NHRTEFF	NHRTEFF050216	121	D		
6/6/2016	Plant	NHRTEFF	NHRTEFF060616	112	D	91.6	D
4/4/2016	QC-Field blank	OPOQVS	OPOQVS040416	0.2	U		
5/31/2016	QC-Field blank	OPOQVS	OPOQVS053116	0.2	U		
6/27/2016	QC-Field blank	OPOQVS	OPOQVS062716	0.2	U		
4/25/2016	QC-Field blank	WTPVS	WTPVS042516	0.2	U		
5/9/2016	QC-Field blank	WTPVS	WTPVS050916	0.2	U		
5/23/2016	QC-Field blank	WTPVS	WTPVS052316	0.2	U		
6/20/2016	QC-Field blank	WTPVS	WTPVS062016	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

MPTP 2016Q3 - PCP RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
7/5/2016	Plant	BABB	BABB070516	0.274		0.286	
7/11/2016	Plant	BABB	BABB071116	0.436			
7/18/2016	Plant	BABB	BABB071816	0.293			
7/25/2016	Plant	BABB	BABB072516	0.35			
8/1/2016	Plant	BABB	BABB080116	0.311			
8/8/2016	Plant	BABB	BABB080816	0.302			
8/15/2016	Plant	BABB	BABB081516	0.556			
8/22/2016	Plant	BABB	BABB082216	0.338			
8/29/2016	Plant	BABB	BABB082916	0.588			
9/6/2016	Plant	BABB	BABB090616	0.373			
9/12/2016	Plant	BABB	BABB091216	0.32			
9/19/2016	Plant	BABB	BABB091916	0.274			
9/26/2016	Plant	BABB	BABB092616	0.242			
7/5/2016	Plant	EFF	EFF070516	0.25			
7/11/2016	Plant	EFF	EFF071116	0.206		0.23	
7/18/2016	Plant	EFF	EFF071816	0.24			
7/25/2016	Plant	EFF	EFF072516	0.215			
8/1/2016	Plant	EFF	EFF080116	0.245			
8/8/2016	Plant	EFF	EFF080816	0.302			
8/15/2016	Plant	EFF	EFF081516	0.328			
8/22/2016	Plant	EFF	EFF082216	0.314			
8/29/2016	Plant	EFF	EFF082916	0.294			
9/6/2016	Plant	EFF	EFF090616	0.242			
9/12/2016	Plant	EFF	EFF091216	0.22		0.245	
9/19/2016	Plant	EFF	EFF091916	0.216			
9/26/2016	Plant	EFF	EFF092616	0.313			
7/5/2016	Plant	IN	IN070516	35	D		
7/11/2016	Plant	IN	IN071116	35.6	D		
7/18/2016	Plant	IN	IN071816	35.7	D		
7/25/2016	Plant	IN	IN072516	37.2	D		
8/1/2016	Plant	IN	IN080116	44	D		
8/8/2016	Plant	IN	IN0800816	31.4	D		
8/15/2016	Plant	IN	IN081516	38.7	D	40	D
8/22/2016	Plant	IN	IN082216	36.1	D		
8/29/2016	Plant	IN	IN082916	36.5	D		
9/6/2016	Plant	IN	IN090616	30	D		
9/12/2016	Plant	IN	IN091216	31.8	D		

MPTP 2016Q3 - PCP RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
9/19/2016	Plant	IN	IN091916	39	D		
9/26/2016	Plant	IN	IN092616	46.9	D		
8/8/2016	Plant	LTUDIS	LTUDIS080816	16.7	D		
8/8/2016	Plant	LTUDIS*	LTUDIS080816	17.4	D		
7/5/2016	Plant	NCRTEFF	NCRTEFF070516	5.08			
8/8/2016	Plant	NCRTEFF	NCRTEFF080816	6.83			
9/6/2016	Plant	NCRTEFF	NCRTEFF090616	5.68		4.15	
7/5/2016	Plant	NHRTEFF	NHRTEFF070516	97	D		
8/8/2016	Plant	NHRTEFF	NHRTEFF080816	153	D		
9/6/2016	Plant	NHRTEFF	NHRTEFF090616	116	D		
8/8/2016	Surface Water	RETPOND	RetPond080816	3.51	D		
8/29/2016	QC-Field blank	OPOQVS	OPOQVS082916	0.1	U		
9/26/2016	QC-Field blank	OPOQVS	OPOQVS092616	0.1	U		
7/18/2016	QC-Field blank	WTPVS	WTPVS071816	0.2	U		
8/1/2016	QC-Field blank	WTPVS	WTPVS080116	0.1	U		
8/22/2016	QC-Field blank	WTPVS	WTPVS082216	0.1	U		
9/19/2016	QC-Field blank	WTPVS	WTPVS091916	0.1	U		

MPTP 2016Q3 - PCP 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
*	Filtered

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 2016Q4 - PCP RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
10/3/2016	Plant	BABB	BABB100316	0.238			
10/10/2016	Plant	BABB	BABB101016	0.376		0.27	
10/17/2016	Plant	BABB	BABB101716	0.43			
10/24/2016	Plant	BABB	BABB102416	0.283			
10/31/2016	Plant	BABB	BABB103116	0.245			
11/7/2016	Plant	BABB	BABB110716	0.366			
11/14/2016	Plant	BABB	BABB111416	0.224			
11/21/2016	Plant	BABB	BABB112116	0.51			
11/28/2016	Plant	BABB	BABB112816	0.473			
12/5/2016	Plant	BABB	BABB120516	0.58			
12/12/2016	Plant	BABB	BABB121216	0.56		0.515	
12/19/2016	Plant	BABB	BABB121916	0.274			
12/27/2016	Plant	BABB	BABB122716	0.437			
10/3/2016	Plant	EFF	EFF100316	0.191			
10/10/2016	Plant	EFF	EFF101016	0.153			
10/17/2016	Plant	EFF	EFF101716	0.21			
10/24/2016	Plant	EFF	EFF102416	0.201		0.175	
10/31/2016	Plant	EFF	EFF103116	0.22			
11/7/2016	Plant	EFF	EFF110716	0.18			
11/14/2016	Plant	EFF	EFF111416	0.184			
11/21/2016	Plant	EFF	EFF112116	0.312			
11/28/2016	Plant	EFF	EFF112816	0.32			
12/5/2016	Plant	EFF	EFF120516	0.495			
12/12/2016	Plant	EFF	EFF121216	0.458			
12/19/2016	Plant	EFF	EFF121916	0.164			
12/27/2016	Plant	EFF	EFF122716	0.333			
10/3/2016	Plant	IN	IN100316	52.5	D		
10/10/2016	Plant	IN	IN101016	44.5	D		
10/17/2016	Plant	IN	IN101716	35.4	D		
10/24/2016	Plant	IN	IN102416	37.8	D		
10/31/2016	Plant	IN	IN103116	40.6	D		
11/7/2016	Plant	IN	IN110716	32.6	D		
11/14/2016	Plant	IN	IN111416	42.2	D		
11/21/2016	Plant	IN	IN112116	33.8	D		
11/28/2016	Plant	IN	IN112816	41.4	D	49.9	D
12/5/2016	Plant	IN	IN120516	41.2	D		
12/12/2016	Plant	IN	IN121216	47.2	D		

MPTP 2016Q4 - PCP RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
12/19/2016	Plant	IN	IN121916	35.9	D	41.3	D
12/27/2016	Plant	IN	IN122716	30.5	D		
10/3/2016	Plant	NCRTEFF	NCRTEFF100316	5			
11/7/2016	Plant	NCRTEFF	NCRTEFF110716	4.73		4.56	
12/5/2016	Plant	NCRTEFF	NCRTEFF120516	5.36			
10/3/2016	Plant	NHRTEFF	NHRTEFF100316	140	D	120	D
11/7/2016	Plant	NHRTEFF	NHRTEFF110716	186	D		
12/5/2016	Plant	NHRTEFF	NHRTEFF120516	144	D		
11/21/2016	QC-Field blank	OPOQVS	OPOQVS112116	0.1	U		
12/5/2016	QC-Field blank	OPOQVS	OPOQVS120516	0.1	U		
10/17/2016	QC-Field blank	WTPVS	WTPVS101716	0.1	U		
10/31/2016	QC-Field blank	WTPVS	WTPVS103116	0.1	U		
11/14/2016	QC-Field blank	WTPVS	WTPVS111416	0.1	U		
12/27/2016	QC-Field blank	WTPVS	WTPVS122716	0.1	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

APPENDIX B-2

Groundwater and Surface Water – PCP

MPTP 2016Q1 - PCP RESULTS FOR GROUNDWATER SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifie	Duplicate Result	Duplicate
2/2/2016	Groundwater	10-01	10-01020216	**5.72**			
2/2/2016	Groundwater	10-02	10-02020216	0.2	U	0.2	U
2/1/2016	Groundwater	10-04	10-04020116	0.2	U		
2/2/2016	Groundwater	10-05	10-05020216	0.2	U		
2/2/2016	Groundwater	10-07	10-07020216	0.2	U		
2/2/2016	Groundwater	10-09	10-09020216	**24.1**			
2/3/2016	Groundwater	10-11	10-11020316	0.263			
2/1/2016	Groundwater	10-12	10-12020116	0.2	U		
2/2/2016	Groundwater	10-13	10-13020216	**2.68**			
2/2/2016	Groundwater	10-14	10-14020216	**3.9**			
2/2/2016	Groundwater	10-15	10-15020216	**38.2**			
2/2/2016	Groundwater	10-18	10-18020216	0.2	U		
2/2/2016	Groundwater	10-19	10-19020216	**14.4**			
2/2/2016	Groundwater	10-20	10-20020216	**21**			
2/2/2016	Groundwater	10-21	10-21020216	**35.3**			
2/2/2016	Groundwater	BMW-9A	BMW-9A020216	0.2	U		
2/2/2016	Groundwater	BMW-9B	BMW-9B020216	**1.19**			
2/2/2016	Groundwater	GS-18-R	GS-18-R020216	**10.4**			
2/2/2016	Groundwater	GS-25	GS-25020216	**3.69**			
2/2/2016	Groundwater	GS-34-D	GS-34-D020216	0.413			
2/2/2016	Groundwater	GS-34-S	GS-34-S020216	**10.2**			
2/4/2016	Groundwater	GW-05	GW-05020416	**60.1**	D		
2/2/2016	Groundwater	GW-14R-98	GW-14R-98020216	0.903			
2/3/2016	Groundwater	GW-21	GW-21020316	0.2	U		
2/2/2016	Groundwater	HCA-21	HCA-21020216	0.212			
2/4/2016	Groundwater	INF-02	INF-02020416	**7.11**			
2/4/2016	Groundwater	INF-04	INF-04020416	**109**	D		
2/4/2016	Groundwater	INF-08	INF-08020416	**58.4**	D		
2/4/2016	Groundwater	INF-10	INF-10020416	**30.3**			
2/4/2016	Groundwater	INF-13	INF-13020416	**165**	D		
2/4/2016	Groundwater	INF-16	INF-16020416	**47.6**	D		
2/3/2016	Groundwater	MW-09	MW-09020316	0.2	U		
1/29/2016	Groundwater	MW-11-01	MW-11-01012916	**142**	D		
1/29/2016	Groundwater	MW-11-02	MW-11-02012916	**269**	D		
1/29/2016	Groundwater	MW-11-03	MW-11-03012916	**71.8**	D		
2/4/2016	Groundwater	MW-11-04	MW-11-04020416	**1220**	D	**1230**	D
2/3/2016	Groundwater	MW-14	MW-14020316	0.2	U		

MPTP 2016Q1 - PCP RESULTS FOR GROUNDWATER SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifie	Duplicate Result	Duplicat e
2/3/2016	QC-Field blank	MW-21	MW-21020316	0.2	U		
2/1/2016	Groundwater	MW-87-03	MW-87-03020116	**1.17**			
2/3/2016	Groundwater	MW-A-95	MW-A-95020316	0.2	U		
2/3/2016	Groundwater	MW-A-99	MW-A-99020316	0.2	U		
2/3/2016	Groundwater	MW-B-98	MW-B-98020316	0.2	U		
2/3/2016	Groundwater	MW-C-01	MW-C-01020316	0.2	U		
2/2/2016	QC-Field blank	MW-E-98	MW-E-98020216	0.2	U		
2/3/2016	Groundwater	MW-F-01	MW-F-01020316	0.2	U		
2/3/2016	Groundwater	MW-G-01	MW-G-01020316	0.279			
2/4/2016	QC-Field blank	MW-G-98	MW-G-98020416	0.2	U		
2/1/2016	Groundwater	MW-H-01	MW-H-01020116	**9.35**			
2/4/2016	Groundwater	MW-H-95	MW-H-95020416	**64.6**	D		
2/1/2016	Groundwater	MW-I-01	MW-I-01020116	**140**	D		
2/3/2016	Groundwater	MW-I-96	MW-I-96020316	0.755			
2/1/2016	Groundwater	MW-J-01	MW-J-01020116	**2.08**			
2/3/2016	Groundwater	MW-J-96	MW-J-96020316	0.2	U		
2/1/2016	Groundwater	MW-K-01	MW-K-01020116	**2**		**1.9**	
2/3/2016	Groundwater	MW-L-01	MW-L-01020316	0.2	U		
2/3/2016	Groundwater	MW-O-01	MW-O-01020316	0.2	U	0.2	U
2/3/2016	Groundwater	MW-S-01	MW-S-01020316	0.2	U		
2/3/2016	Groundwater	MW-V-01	MW-V-01020316	0.2	U		
2/4/2016	Groundwater	MW-X-01	MW-X-01020416	**21.9**			
2/3/2016	Groundwater	NC-06-S	NC-06-S020316	0.2	U		
2/4/2016	Groundwater	NCRT PZ-03	NCRTPZ-03020416	**30.4**			
2/4/2016	Groundwater	NCRT-2010	NCRT-2010020416	**1.7**			
2/4/2016	Groundwater	NHRT PZ-04	NHRTPZ-04020416	**4.07**			
2/4/2016	Groundwater	PZ-N5-03	PZ-N5-03020416	**46.2**	D		
2/4/2016	Groundwater	PZ-N9-03	PZ-N9-03020416	**303**	D		
2/3/2016	Groundwater	PZ-S2-02	PZ-S2-02020316	0.41			
2/4/2016	Groundwater	PZ-S3-02	PZ-S3-02020416	**2.41**			
2/3/2016	Groundwater	PZ-S4-01	PZ-S4-01020316	0.221			
2/4/2016	Groundwater	PZ-S4-02	PZ-S4-02020416	0.556			
2/4/2016	Groundwater	PZ-S5-01	PZ-S5-01020416	**1.73**			
2/4/2016	Groundwater	PZ-S6-01	PZ-S6-01020416	**1.94**			
2/3/2016	Groundwater	PZ-S7-01	PZ-S7-01020316	0.2	U		

MPTP 2016Q1 - PCP RESULTS FOR GROUNDWATER SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifie	Duplicate Result	Duplicat e

Notes:

Concentrations 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
U	Analyzed for but not detected above method detection limit (MDL)
D	Post extraction dilution
Plant	Water Treatment Plant

MPTP 2016Q1 - PCP RESULTS FOR SURFACE WATER SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
2/1/2016	Surface Water	SS-06A	SS-06A020116	0.2	U		
2/1/2016	Surface Water	SW-05	SW-05020116	0.2	U		
2/1/2016	QC-Field blank	SW-07	SW-07020116	0.2	U		
2/1/2016	Surface Water	SW-09	SW-09020116	0.2	U		

Notes:

Concentrations 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
U	Analyzed for but not detected above method detection limit (MDL)
D	Post extraction dilution

MPTP 2016Q3 - PCP RESULTS FOR GROUNDWATER SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
8/1/2016	Groundwater	10-01	10-01080116	**4.82**			
8/1/2016	Groundwater	10-02	10-02080116	**4.66**			
8/2/2016	Groundwater	10-04	10-04080216	0.119			
8/2/2016	Groundwater	10-05	10-05080216	0.33			
8/2/2016	Groundwater	10-07	10-07080216	0.1	U		
8/2/2016	Groundwater	10-09	10-09080216	**31.6**			
8/1/2016	Groundwater	10-11	10-11080116	0.1	U		
8/8/2016	Groundwater	10-12	10-12080816	0.1	U		
8/2/2016	Groundwater	10-13	10-13080216	0.921			
8/2/2016	Groundwater	10-14	10-14080216	0.878			
8/1/2016	Groundwater	10-15	10-15080116	**29.8**			
8/2/2016	Groundwater	10-18	10-18080216	0.1	U		
8/2/2016	Groundwater	10-19	10-19080216	**18**		**16.2**	
8/2/2016	Groundwater	10-20	10-20080216	**21.1**			
8/2/2016	Groundwater	10-21	10-21080216	**30.9**	D		
8/1/2016	Groundwater	BMW-9A	BMW-9A080116	0.233			
8/1/2016	Groundwater	BMW-9B	BMW-9B080116	**1.16**			
8/1/2016	Groundwater	GS-18-R	GS-18-R080116	**24.8**			
8/2/2016	Groundwater	GS-25	GS-25080216	**6.59**			
8/2/2016	Groundwater	GS-34-D	GS-34D080216	**1.34**			
8/2/2016	Groundwater	GS-34-S	GS-34S080216	**18.9**			
8/3/2016	Groundwater	GW-05	GW-05080316	**30.8**	D	**26.5**	D
8/8/2016	Groundwater	GW-14R-98	GW-14R-98080816	**1.28**			
8/1/2016	Groundwater	GW-21	GW-21080116	0.235			
8/8/2016	Groundwater	HCA-21	HCA-21080816	0.646			
8/3/2016	Groundwater	INF-02	INF-02080316	**33.1**	D		
8/8/2016	Groundwater	INF-04	INF-04080816	**83**	D		
8/3/2016	Groundwater	INF-08	INF-08080316	**98.4**	D		
8/3/2016	Groundwater	INF-10	INF-10080316	**40.9**	D		
8/3/2016	Groundwater	INF-13	INF-13080316	**28.5**	D		
8/3/2016	Groundwater	INF-16	INF-16080316	**52.8**	D		
8/3/2016	Groundwater	MW-09	MW-09080316	0.1	U		
8/1/2016	Groundwater	MW-11-01	MW-11-01080116	**151**	D		
8/1/2016	Groundwater	MW-11-02	MW-11-02080116	**263**	D		
8/1/2016	Groundwater	MW-11-03	MW-11-03080116	**44**	D		
8/8/2016	Groundwater	MW-11-04	MW-11-04080816	**1606**	D		
8/3/2016	Groundwater	MW-14	MW-14080316	0.19			

MPTP 2016Q3 - PCP RESULTS FOR GROUNDWATER SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
8/2/2016	QC-Field blank	MW-18	MW-18080216	0.1	U		
8/3/2016	QC-Field blank	MW-19	MW-19080316	0.1	U		
8/1/2016	Groundwater	MW-87-03	MW-87-03080116	**2.04**			
8/3/2016	Groundwater	MW-A-95	MW-A-95080316	0.283			
8/1/2016	Groundwater	MW-A-96	MW-A-96080116	0.1	U		
8/2/2016	Groundwater	MW-A-99	MW-A-99080216	0.269			
8/1/2016	Groundwater	MW-B-96	MW-B-96080116	0.1	U		
8/1/2016	Groundwater	MW-B-98	MW-B-98080116	0.1	U		
8/2/2016	Groundwater	MW-C-01	MW-C-01080216	0.235			
8/1/2016	Groundwater	MW-C-96	MW-C-96080116	0.1	U		
8/2/2016	QC-Field blank	MW-C-99	MW-C-99080216	0.1	U		
8/1/2016	Groundwater	MW-E-96	MW-E-96080116	0.1	U		
8/2/2016	Groundwater	MW-F-01	MW-F-01080216	0.165			
8/2/2016	Groundwater	MW-G-01	MW-G-01080216	0.396			
8/2/2016	Groundwater	MW-H-01	MW-H-01080216	**11.9**			
8/3/2016	Groundwater	MW-H-95	MW-H-95080316	**45.1**	D		
8/1/2016	Groundwater	MW-I-01	MW-I-01080116	**248**	D		
8/1/2016	Groundwater	MW-I-96	MW-I-96080116	**1.14**			
8/1/2016	Groundwater	MW-J-01	MW-J-01080116	0.697		0.837	
8/2/2016	Groundwater	MW-J-96	MW-J-96080216	0.315			
8/1/2016	Groundwater	MW-K-01	MW-K-01080116	**4.28**			
8/2/2016	Groundwater	MW-L-01	MW-L-01080216	0.17			
8/2/2016	Groundwater	MW-O-01	MW-O-01080216	0.1	U		
8/3/2016	Groundwater	MW-S-01	MW-S-01080316	0.272			
8/1/2016	Groundwater	MW-V-01	MW-V-01080116	0.1	U		
8/3/2016	Groundwater	MW-X-01	MW-X-01080316	**29.9**	D		
8/2/2016	Groundwater	NC-06-S	NC-06-S080216	0.176		0.168	
8/4/2016	Groundwater	NCRT PZ-01	NCRTPZ-01080416	0.269			
8/4/2016	Groundwater	NCRT PZ-02	NCRTPZ-02080416	0.1	U		
8/3/2016	Groundwater	NCRT PZ-03	NCRTPZ-03080316	**20.2**			
8/2/2016	Groundwater	NCRT PZ-04	NCRTPZ-04080216	0.437			
8/3/2016	Groundwater	NCRT-2010	NCRT-2010080316	**7.3**			
8/3/2016	Groundwater	NHRT PZ-04	NHRTPZ-04080316	**1.4**			
8/3/2016	Groundwater	PZ-N5-03	PZ-N5-03080316	**15.5**	D		
8/3/2016	Groundwater	PZ-N9-03	PZ-N9-03080316	**113**	D		
8/3/2016	Groundwater	PZ-S2-02	PZ-S2-02080316	0.507			
8/3/2016	Groundwater	PZ-S3-02	PZ-S3-02080316	**25.6**	D		

MPTP 2016Q3 - PCP RESULTS FOR GROUNDWATER SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
8/3/2016	Groundwater	PZ-S4-01	PZ-S4-01080316	0.308			
8/3/2016	Groundwater	PZ-S4-02	PZ-S4-02080316	0.359			
8/3/2016	Groundwater	PZ-S5-01	PZ-S5-01080316	**2.99**	D		
8/3/2016	Groundwater	PZ-S6-01	PZ-S6-01080316	**143**	D		
8/3/2016	Groundwater	PZ-S7-01	PZ-S7-01080316	0.229			

Notes:

Concentrations 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
U	Analyzed for but not detected above method detection limit (MDL)
D	Post extraction dilution
Plant	Water Treatment Plant

MPTP 2016Q3 - PCP RESULTS FOR SURFACE WATER SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
8/8/2016	Surface Water	SS-06A	SS-06A080816	0.1	U		
8/8/2016	Surface Water	SW-05	SW-05080816	0.1	U	0.172	
8/8/2016	QC-Field blank	SW-07	SW-07080816	0.1	U		
8/8/2016	Surface Water	SW-09	SW-09080816	0.1	U		

Notes:

Concentrations 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
U	Analyzed for but not detected above method detection limit (MDL)
D	Post extraction dilution

APPENDIX B-3

DIOXIN (TEQ) - 2011 TO 2016

MPTP ROD METHODOLOGY VS. DEQ-7 METHODOLOGY

DIOXIN (TEQ) - 2011 TO 2016

MPTP ROD METHODOLOGY VS. DEQ-7 METHODOLOGY

STATION	ANALYTE	SAMPLE	DATE	MPTP ROD METHODOLOGY	DEQ-7 METHODOLOGY	UNITS	MPTP ROD METHODOLOGY	DEQ-7 METHODOLOGY	UNITS
10-12	Dioxin (TEQ)	10-12081213	8/12/2013	4.50E-08	1.41E-06	µg/L	0.05	1.41	pg/L
10-12	Dioxin (TEQ)	10-12081114	8/11/2014	2.70E-08	1.98E-06	µg/L	0.03	1.98	pg/L
10-12	Dioxin (TEQ)	10-12081015	8/10/2015	1.04E-07	1.03E-06	µg/L	0.10	1.03	pg/L
10-12	Dioxin (TEQ)	10-12080816	8/8/2016	2.30E-08	7.37E-07	µg/L	0.02	0.74	pg/L
BMW-01A	Dioxin (TEQ)	BMW-1A081213	8/12/2013	8.81E-08	1.33E-06	µg/L	0.09	1.33	pg/L
BMW-01A	Dioxin (TEQ)	BMW-1A081114	8/11/2014	2.08E-08	1.31E-06	µg/L	0.02	1.31	pg/L
BMW-01A	Dioxin (TEQ)	BMW-1A081015	8/10/2015	7.50E-09	1.04E-06	µg/L	0.01	1.04	pg/L
BMW-01A	Dioxin (TEQ)	BMW-1A080816	8/8/2016	4.40E-08	8.14E-07	µg/L	0.04	0.81	pg/L
BMW-01B	Dioxin (TEQ)	BMW-1B081213	8/12/2013	1.12E-07	1.17E-06	µg/L	0.11	1.17	pg/L
BMW-01B	Dioxin (TEQ)	BMW-1B081114	8/11/2014	1.83E-08	1.15E-06	µg/L	0.02	1.15	pg/L
BMW-01B	Dioxin (TEQ)	BMW-1B081015	8/10/2015	2.70E-08	1.05E-06	µg/L	0.03	1.05	pg/L
BMW-01B	Dioxin (TEQ)	BMW-1B080816	8/8/2016	1.94E-08	6.71E-07	µg/L	0.02	0.67	pg/L
GW-14R-98	Dioxin (TEQ)	GW14R081511	8/15/2011	1.05E-06	1.82E-06	µg/L	1.05	1.82	pg/L
GW-14R-98	Dioxin (TEQ)	GW-14R-98081312	8/13/2012	1.18E-07	1.27E-06	µg/L	0.12	1.27	pg/L
GW-14R-98	Dioxin (TEQ)	GW-14R-98081213	8/12/2013	6.70E-07	1.54E-06	µg/L	0.67	1.54	pg/L
GW-14R-98	Dioxin (TEQ)	GW-14R-98081114	8/11/2014	1.42E-07	1.49E-06	µg/L	0.14	1.49	pg/L
GW-14R-98	Dioxin (TEQ)	GW-14R-98081015	8/10/2015	9.03E-06	7.49E-06	µg/L	9.03	7.49	pg/L
GW-14R-98	Dioxin (TEQ)	GW-14R-98080816	8/8/2016	4.13E-07	1.07E-06	µg/L	0.41	1.07	pg/L
HCA-21	Dioxin (TEQ)	HCA-21081213	8/12/2013	8.04E-08	1.23E-06	µg/L	0.08	1.23	pg/L
HCA-21	Dioxin (TEQ)	HCA-21081114	8/11/2014	7.77E-07	1.69E-06	µg/L	0.78	1.69	pg/L
HCA-21	Dioxin (TEQ)	HCA-21081015	8/10/2015	4.23E-07	1.59E-06	µg/L	0.42	1.59	pg/L
HCA-21	Dioxin (TEQ)	HCA-21080816	8/8/2016	2.02E-07	7.55E-07	µg/L	0.20	0.75	pg/L
INF-04	Dioxin (TEQ)	INF-04081511	8/15/2011	4.09E-06	4.13E-06	µg/L	4.09	4.13	pg/L
INF-04	Dioxin (TEQ)	INF-04081312	8/13/2012	2.75E-05	2.00E-05	µg/L	27.49	20.03	pg/L
INF-04	Dioxin (TEQ)	INF-04081213	8/12/2013	5.59E-06	5.55E-06	µg/L	5.59	5.55	pg/L
INF-04	Dioxin (TEQ)	INF-04081114	8/11/2014	**1.38E-04**	**9.93E-05**	µg/L	**138**	**99.33**	pg/L
INF-04	Dioxin (TEQ)	INF-04081015	8/10/2015	6.31E-07	1.35E-06	µg/L	0.63	1.35	pg/L
INF-04	Dioxin (TEQ)	INF-04080816	8/8/2016	7.76E-07	1.18E-06	µg/L	0.78	1.18	pg/L
MW-11-04	Dioxin (TEQ)	MW-11-04081213	8/12/2013	9.91E-06	9.30E-06	µg/L	9.91	9.30	pg/L
MW-11-04	Dioxin (TEQ)	MW-11-04081114	8/11/2014	7.15E-06	8.42E-06	µg/L	7.15	8.42	pg/L
MW-11-04	Dioxin (TEQ)	MW-11-04081015	8/10/2015	6.46E-06	5.76E-06	µg/L	6.46	5.76	pg/L
MW-11-04	Dioxin (TEQ)	MW-11-04080816	8/8/2016	1.56E-05	1.21E-05	µg/L	15.60	12.11	pg/L
MW-B-98	Dioxin (TEQ)	MW-B-98081511	8/15/2011	9.30E-09	1.48E-06	µg/L	0.01	1.48	pg/L
MW-B-98	Dioxin (TEQ)	MW-B98081312	8/13/2012	1.04E-07	1.16E-06	µg/L	0.10	1.16	pg/L
MW-V-01	Dioxin (TEQ)	MW-V-01081511	8/15/2011	2.82E-08	1.71E-06	µg/L	0.03	1.71	pg/L
MW-V-01	Dioxin (TEQ)	MW-V-01081312	8/13/2012	3.30E-08	1.12E-06	µg/L	0.03	1.12	pg/L

DIOXIN (TEQ) - 2011 TO 2016
MPTP ROD METHODOLOGY VS. DEQ-7 METHODOLOGY

STATION	ANALYTE	SAMPLE	DATE	MPTP ROD METHODOLOGY	DEQ-7 METHODOLOGY	UNITS	MPTP ROD METHODOLOGY	DEQ-7 METHODOLOGY	UNITS
NWW	Dioxin (TEQ)	NWW081511	8/15/2011	1.70E-08	1.45E-06	µg/L	0.02	1.45	pg/L
NWW	Dioxin (TEQ)	NWW081312	8/13/2012	7.40E-08	1.84E-06	µg/L	0.07	1.84	pg/L
EFF	Dioxin (TEQ)	EFF081511	8/15/2011	7.60E-08	4.69E-06	µg/L	0.08	4.69	pg/L
EFF	Dioxin (TEQ)	EFF081312	8/13/2012	4.44E-07	1.43E-06	µg/L	0.44	1.43	pg/L
EFF	Dioxin (TEQ)	EFF081213	8/12/2013	3.69E-07	1.23E-06	µg/L	0.37	1.23	pg/L
EFF	Dioxin (TEQ)	EFF081114	8/11/2014	7.99E-07	2.03E-06	µg/L	0.80	2.03	pg/L
EFF	Dioxin (TEQ)	EFF081015	8/10/2015	4.02E-07	1.71E-06	µg/L	0.40	1.71	pg/L
EFF	Dioxin (TEQ)	EFF080816	8/8/2016	3.08E-07	9.51E-07	µg/L	0.31	0.95	pg/L
IN	Dioxin (TEQ)	IN081511	8/15/2011	3.91E-07	4.44E-06	µg/L	0.39	4.44	pg/L
IN	Dioxin (TEQ)	IN081312	8/13/2012	7.26E-06	6.18E-06	µg/L	7.26	6.18	pg/L
IN	Dioxin (TEQ)	IN081213	8/12/2013	3.58E-05	2.79E-05	µg/L	35.80	27.92	pg/L
IN	Dioxin (TEQ)	IN081114	8/11/2014	6.75E-06	8.31E-06	µg/L	6.75	8.31	pg/L
IN	Dioxin (TEQ)	IN0801015	8/10/2015	4.48E-06	5.34E-06	µg/L	4.48	5.34	pg/L
IN	Dioxin (TEQ)	IN080816	8/8/2016	2.80E-06	2.89E-06	µg/L	2.80	2.89	pg/L
LTUDIS	Dioxin (TEQ)	LTUDIS080816	8/8/2016	3.85E-05	3.08E-05	µg/L	38.49	30.78	pg/L
NCRTEFF	Dioxin (TEQ)	NCRTEFF081511	8/15/2011	1.90E-07	6.28E-06	µg/L	0.19	6.28	pg/L
NCRTEFF	Dioxin (TEQ)	NCRTEFF081312	8/13/2012	1.21E-05	9.79E-06	µg/L	12.07	9.79	pg/L
NCRTEFF	Dioxin (TEQ)	NCRTEFF081213	8/12/2013	7.72E-06	6.94E-06	µg/L	7.72	6.94	pg/L
NCRTEFF	Dioxin (TEQ)	NCRTEFF081114	8/11/2014	3.07E-06	3.29E-06	µg/L	3.07	3.29	pg/L
NCRTEFF	Dioxin (TEQ)	NCRTEFF081015	8/10/2015	7.72E-06	6.59E-06	µg/L	7.72	6.59	pg/L
NCRTEFF	Dioxin (TEQ)	NCRTEFF080816	8/8/2016	2.12E-06	2.14E-06	µg/L	2.12	2.14	pg/L
NHRTEFF	Dioxin (TEQ)	NHRTEFF081511	8/15/2011	1.91E-07	6.67E-06	µg/L	0.19	6.67	pg/L
NHRTEFF	Dioxin (TEQ)	NHRTEFF081312	8/13/2012	2.27E-05	1.83E-05	µg/L	22.68	18.31	pg/L
NHRTEFF	Dioxin (TEQ)	NHRTEFF081213	8/12/2013	1.27E-04	9.75E-05	µg/L	127.00	97.46	pg/L
NHRTEFF	Dioxin (TEQ)	NHRTEFF081114	8/11/2014	1.06E-05	1.19E-05	µg/L	10.64	11.94	pg/L
NHRTEFF	Dioxin (TEQ)	NHRTEFF081015	8/10/2015	5.68E-06	5.64E-06	µg/L	5.68	5.64	pg/L
NHRTEFF	Dioxin (TEQ)	NHRTEFF080816	8/8/2016	4.95E-06	4.66E-06	µg/L	4.95	4.66	pg/L
SS-06A	Dioxin (TEQ)	SW06A081511	8/15/2011	1.09E-07	8.95E-07	µg/L	0.11	0.89	pg/L
SS-06A	Dioxin (TEQ)	SS-06A081312	8/13/2012	4.10E-08	1.14E-06	µg/L	0.04	1.14	pg/L
SS-06A	Dioxin (TEQ)	SS-06A081213	8/12/2013	1.90E-07	1.37E-06	µg/L	0.19	1.37	pg/L
SS-06A	Dioxin (TEQ)	SS-06A081114	8/11/2014	4.13E-08	1.14E-06	µg/L	0.04	1.14	pg/L
SS-06A	Dioxin (TEQ)	SS-06A081015	8/10/2015	3.94E-08	1.11E-06	µg/L	0.04	1.11	pg/L
SS-06A	Dioxin (TEQ)	SS-06A080816	8/8/2016	2.17E-07	7.39E-07	µg/L	0.22	0.74	pg/L
SW-03	Dioxin (TEQ)	SW03081511	8/15/2011	3.80E-08	1.44E-06	µg/L	0.04	1.44	pg/L

STATION	ANALYTE	SAMPLE	DATE	MPTP ROD METHODOLOGY	DEQ-7 METHODOLOGY	UNITS	MPTP ROD METHODOLOGY	DEQ-7 METHODOLOGY	UNITS
SW-05	Dioxin (TEQ)	SW05081511	8/15/2011	8.10E-08	1.16E-06	µg/L	0.08	1.16	pg/L
SW-05	Dioxin (TEQ)	SW-05081312	8/13/2012	3.47E-07	1.38E-06	µg/L	0.35	1.38	pg/L
SW-05	Dioxin (TEQ)	SW-05081213	8/12/2013	4.56E-07	1.87E-06	µg/L	0.46	1.87	pg/L
SW-05	Dioxin (TEQ)	SW-05081114	8/11/2014	5.84E-08	1.24E-06	µg/L	0.06	1.24	pg/L
SW-05	Dioxin (TEQ)	SW-05081015	8/10/2015	2.30E-08	1.01E-06	µg/L	0.02	1.01	pg/L
SW-05	Dioxin (TEQ)	SW-05080816	8/8/2016	2.15E-07	7.55E-07	µg/L	0.22	0.75	pg/L
SW-09	Dioxin (TEQ)	SW09081511	8/15/2011	1.70E-08	9.51E-07	µg/L	0.02	0.95	pg/L
SW-09	Dioxin (TEQ)	SW-09081312	8/13/2012	3.40E-08	1.37E-06	µg/L	0.03	1.37	pg/L
SW-09	Dioxin (TEQ)	SW-09081213	8/12/2013	1.86E-06	2.14E-06	µg/L	1.86	2.14	pg/L
SW-09	Dioxin (TEQ)	SW-09081114	8/11/2014	1.90E-08	1.25E-06	µg/L	0.02	1.25	pg/L
SW-09	Dioxin (TEQ)	SW-09081015	8/10/2015	5.14E-08	7.80E-07	µg/L	0.05	0.78	pg/L
SW-09	Dioxin (TEQ)	SW-09080816	8/8/2016	7.88E-08	1.06E-06	µg/L	0.08	1.06	pg/L
LTU Zone 1_0	Dioxin (TEQ)	LTU Zone 1 091	9/19/2011	0.27	3.46	µg/Kg	-	-	-
LTU Zone 1_0	Dioxin (TEQ)	LTUZ01 092612	9/26/2012	3.55	2.67	µg/Kg	-	-	-
LTU Zone 10_0	Dioxin (TEQ)	LTU Zone 10 09	9/19/2011	0.08	6.09	µg/Kg	-	-	-
LTU Zone 10_0	Dioxin (TEQ)	LTUZ10 092612	9/26/2012	1.61	2.79	µg/Kg	-	-	-
LTU Zone 2_0	Dioxin (TEQ)	LTU Zone 2 091	9/19/2011	0.25	2.74	µg/Kg	-	-	-
LTU Zone 2_0	Dioxin (TEQ)	LTUZ02 092612	9/26/2012	2.75	5.55	µg/Kg	-	-	-
LTU Zone 3_0	Dioxin (TEQ)	LTU Zone 3 091	9/19/2011	0.98	10.23	µg/Kg	-	-	-
LTU Zone 3_0	Dioxin (TEQ)	LTUZ03 092612	9/26/2012	1.85	5.29	µg/Kg	-	-	-
LTU Zone 4_0	Dioxin (TEQ)	LTU Zone 4 091	9/19/2011	0.63	5.47	µg/Kg	-	-	-
LTU Zone 4_0	Dioxin (TEQ)	LTUZ04 092612	9/26/2012	2.84	4.01	µg/Kg	-	-	-
LTU Zone 5_0	Dioxin (TEQ)	LTU Zone 5 091	9/19/2011	0.38	8.22	µg/Kg	-	-	-
LTU Zone 5_0	Dioxin (TEQ)	LTUZ05 092612	9/26/2012	3.69	2.82	µg/Kg	-	-	-
LTU Zone 6_0	Dioxin (TEQ)	LTU Zone 6 091	9/19/2011	0.40	4.71	µg/Kg	-	-	-
LTU Zone 6_0	Dioxin (TEQ)	LTUZ06 092612	9/26/2012	2.55	40.37	µg/Kg	-	-	-
LTU Zone 7_0	Dioxin (TEQ)	LTU Zone 7 091	9/19/2011	0.35	10.50	µg/Kg	-	-	-
LTU Zone 7_0	Dioxin (TEQ)	LTUZ07 092612	9/26/2012	5.99	4.44	µg/Kg	-	-	-
LTU Zone 8_0	Dioxin (TEQ)	LTU Zone 8 091	9/19/2011	0.59	5.29	µg/Kg	-	-	-
LTU Zone 8_0	Dioxin (TEQ)	LTUZ08 092612	9/26/2012	1.95	1.45	µg/Kg	-	-	-
LTU Zone 9_0	Dioxin (TEQ)	LTU Zone 9 091	9/19/2011	0.11	2.44	µg/Kg	-	-	-
LTU Zone 9_0	Dioxin (TEQ)	LTUZ09 092612	9/26/2012	1.00	3.03	µg/Kg	-	-	-
SP-01_0	Dioxin (TEQ)	LTU Zone 11 09	9/19/2011	0.28	2.91	µg/Kg	-	-	-
SP-01_0	Dioxin (TEQ)	LTU Zone 12 09	9/19/2011	0.00	0.14	µg/Kg	-	-	-

Notes

All TEQ values compared to the applicable MPTP ROD cleanup level

Bold	Exceeds applicable MPTP ROD cleanup level
pg/L	Picograms per liter
µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter
MPTP	Montana Pole and Treating Plant
ROD	Record of decision
TEQ	Toxicity equivalence quotient

MPTP ROD Methodology

Dioxin (TEQ) is calculated using 0 for values qualified as "U" (analyzed for but not detected above the method detection level [MDL]) and ROD toxicity equivalency factors (TEF).

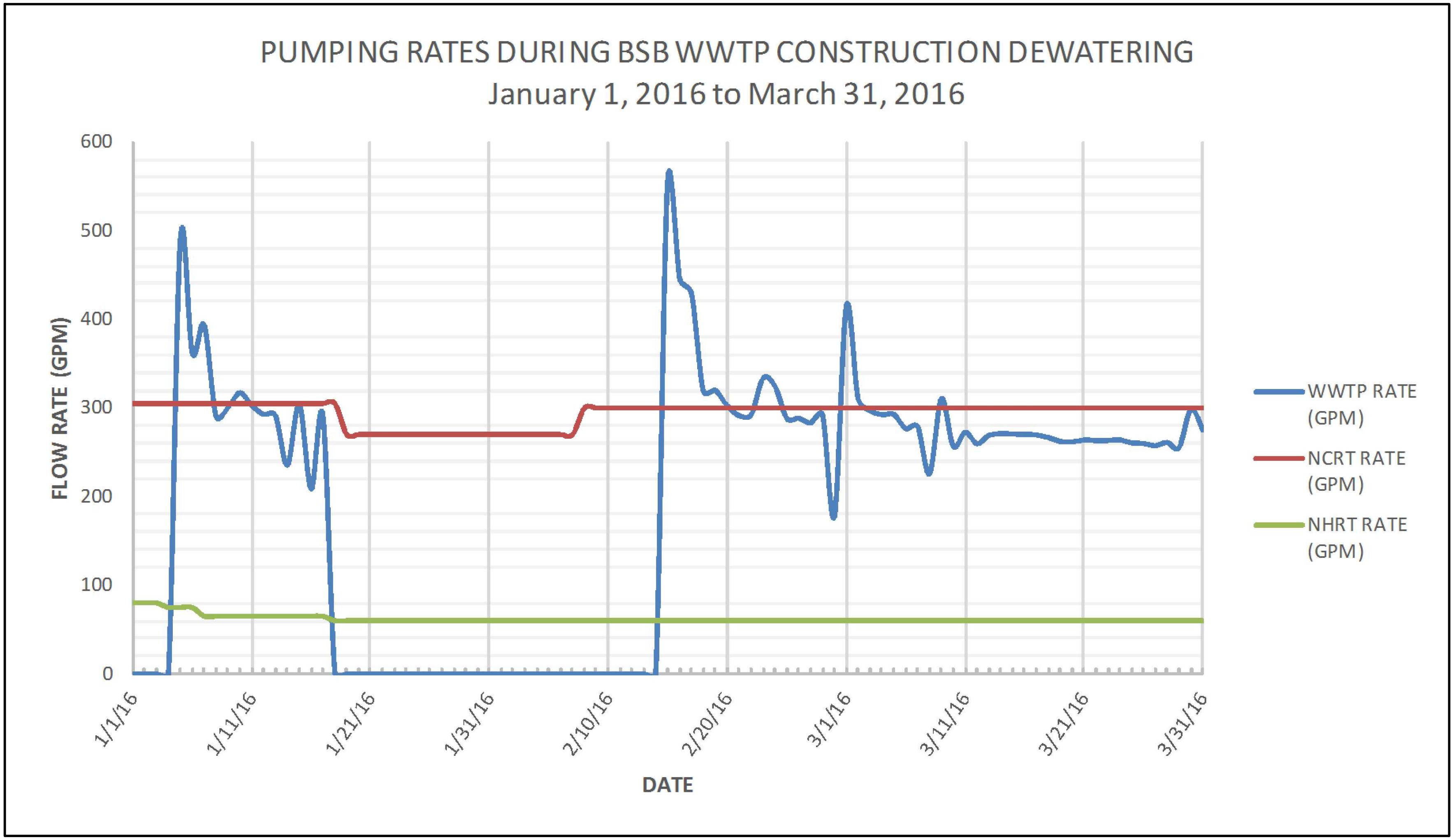
DEQ-7 Methodology

Dioxin (TEQ) is calculated using the 2005 World Health Organization methodology, using one-half the project reporting limit where not detected; using one-half the estimated maximum possible concentration when reported; and using 2005 TEFs as specified in DEQ-7 (DEQ 2012).

APPENDIX C

Pumping Rates

During WWTP Construction Dewatering



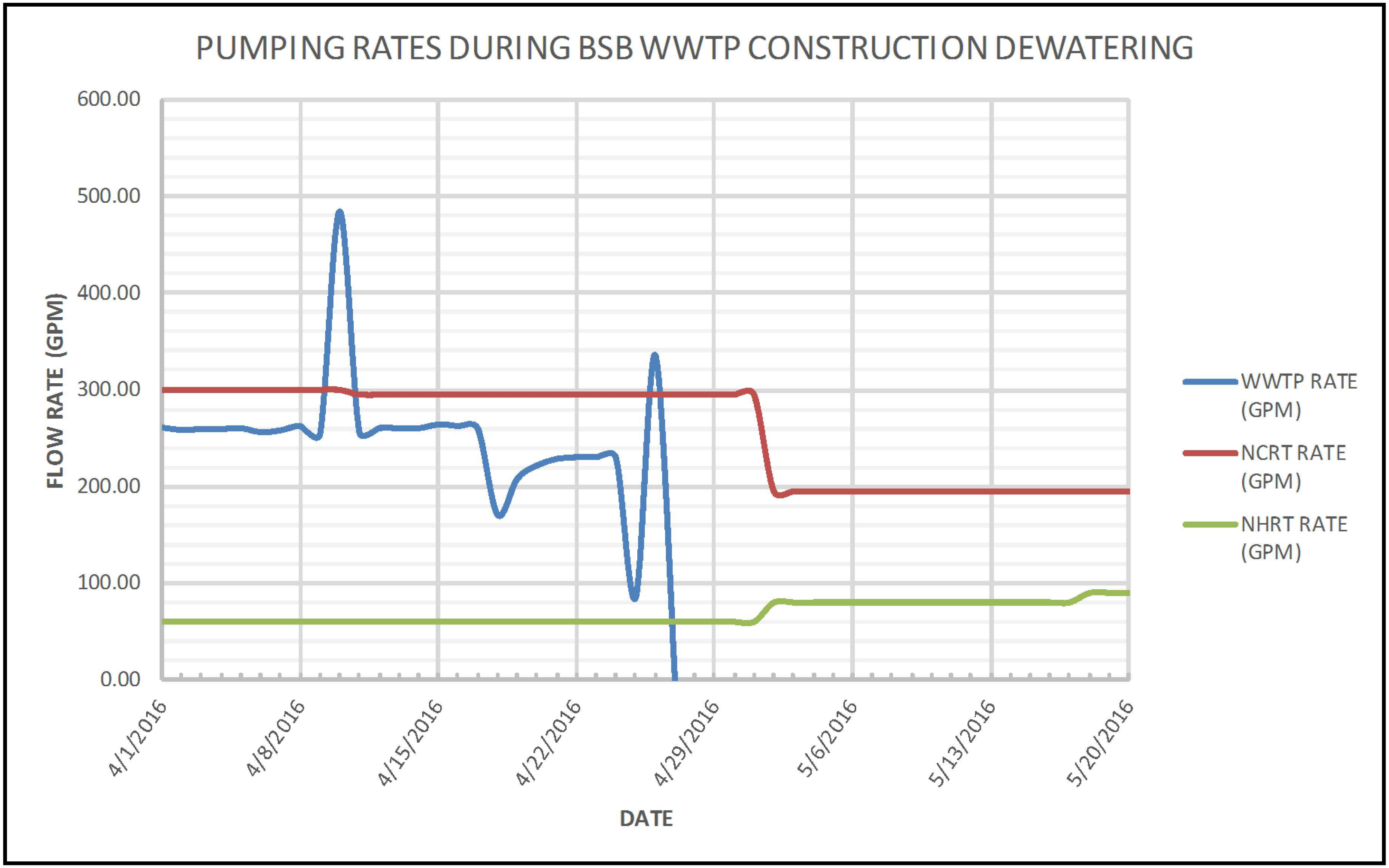
LEGEND

BSB	BUTTE-SILVER BOW
GPM	GALLONS PER MINUTE
NCRT	NEAR CREEK RECOVERY TRENCH
NHRT	NEAR HIGHWAY RECOVERY TRENCH
WWTP	WASTEWATER TREATMENT PLANT

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE C-1
PUMPING RATES
DURING CONSTRUCTION DEWATERING

TETRA TECH



LEGEND

BSB	BUTTE-SILVER BOW
GPM	GALLONS PER MINUTE
NCRT	NEAR CREEK RECOVERY TRENCH
NHRT	NEAR HIGHWAY RECOVERY TRENCH
WWTP	WASTEWATER TREATMENT PLANT

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE C-2
PUMPING RATES
DURING CONSTRUCTION DEWATERING

TETRA TECH

Figure C-2_Pumping Rates During Construction.dwg - DWH - 07/24/2017

APPENDIX D

Daily Summary Report – August 3, 2016 Power Outage

Montana Pole Power Outage (August 3, 2016)
Butte, MT

Project No.: 103S320338 **Date**: August 3, 2016

Tetra Tech Project Manager: Kathie Roos
DEQ Project Manager: Lisa DeWitt/David Bowers

Weather: Clear **Temperature**: 75 °F

PERSONNEL ON SITE	
Tetra Tech	**Arrival Time**
1. Travis Dunkle	7:00 AM

CONSTRUCTION ACTIVITIES

1. At 3:00 PM the power went out briefly and the plant systems shutdown. Once power returned the trench pumps (NCRT and NHRT) had a 5 minute window to restart automatically and were given the time for this to take place. The lift pump skid control panel was inspected to makes sure it booted up.
2. The lift pump skid control panel did not boot correctly and displayed several errors (numbers were not displayed but replaced with *). The lift pump however did return to service. The skid control panel was allowed to run and checked later see if the error persisted.
3. The NCRT rebooted without error and returned to service within the 5 minute window. The NHRT did not return to service but was communicating with the SCADA system in the plant office. It was inspected at the trench control panel. Upon inspection it was found that the system had rebooted but the pump had not restarted. The system start stop button, located on the trench control panel front cover, was depressed then pulled out and the pump returned to service.
4. The lift pump skid control panel continued to display errors. Power to the panel was turned off and turned back on, via the main power switch located on the control panel cover, to reboot the system. It rebooted with no issue the second time.
5. The trench flow rates and lift pump skid were monitored to ensure all components were working correctly. The plant returned to normal flows (195 gpm NCRT and 75 gpm NHRT) by 3:30 PM.

APPENDIX E

Daily Summary Report – August 11, 2016 Power Outage

Montana Pole Power Outage (August 11, 2016)
Butte, MT

Project No.: 103S320338 **Date**: August 11, 2016

Tetra Tech Project Manager: Kathie Roos
DEQ Project Manager: Lisa DeWitt/David Bowers

Weather: Clear **Temperature**: 75 °F

Contractor(s): 1. Trademark Electric

PERSONNEL ON SITE	
Tetra Tech	**Arrival Time**
1. Tom Bowler 2. Travis Dunkle	0700

Contractor	**Arrival Time**
1. Leon Shaffer	0800

EQUIPMENT ON SITE
1. Pick up with tools

CONSTRUCTION ACTIVITIES

1. We had a major power issue a bit ago, that knocked the plant offline and has put the NCRT out of commission.
   We have been in contact with Chris Cote and Trademark electric, it appears we may have both hardware and software problems with the Near Creek Pump.
   We visibly observed the power lines adjacent to the building slapping together when the problem occurred. Northwest Energy just came through and told us they had a fault somewhere in the system(which they indicated can cause the issue we observed if I understood them)
   We are working to get this fixed, but it may be a major problem, perhaps components have been damaged that will need replacing. For now, we have the Near Highway Trench running at maximum. (Tom Bowler email: 8/11/16)
2. We are currently waiting on the electrician to come and assess the NCRT control panel. Travis has been talking with Chris Cote, and Chris just told Travis that he cannot pursue anything further until we get the electrical problems resolved.
   Northwest Energy had a crew out and they did some work on the power lines at the BSB lift Station on site, which may be where the problem began. My brother also indicated that he saw the very same thing we noted with the power lines swaying over at his house on Centennial Avenue, and that there was also a Northwest Crew over there. In any case the problem very clearly looks to have originated with the utility lines supplying our facility, and very close to us.
   I was not here when the power surged last week, but Travis said it was a similar bump, and then things started back up again after he did some coaxing. That issue happened in the late afternoon of August 3rd. Most likely that was an initial hint of whatever took place today. In both instances, systems were erratic in re-starting; and today the NCRT system will not restart. I did note the power flicker at my house uptown when that problem happened.
   So far from our trouble shooting, it appears that the 24 volt power supply at the NCRT has been wrecked. The Variable speed drive may, or may not have damage – we cannot get it to run in manual, but that may be an artifact of the power supply issue. We have a spare variable

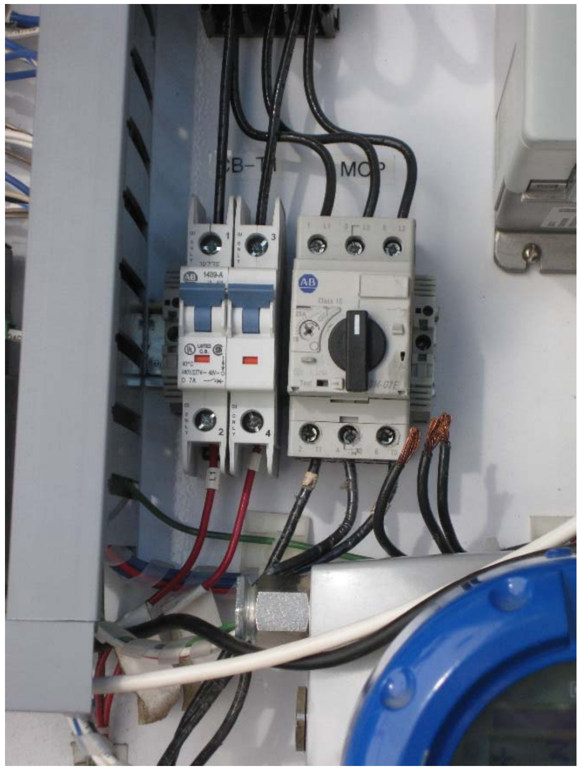
speed drive, we do not have a spare 24 volt power supply. The electrician should be able to find a suitable one locally when he gets here to investigate. When all the electrical problems are corrected, then we will have to see if any software issues have been introduced. (Tom Bowler email: 8/11/16)

3. Leon Shaffer of Tradmark Electric arrived at 0800 on 8/12/16.
4. The electrician was out this morning and confirmed that we have lost a 24 volt power supply at minimum. He is going to get one ordered, get a new outside light, and a replacement for the well level probe in the NCRT. It will surely be into next week before we can proceed on the trouble shooting to insure nothing else was damaged at the control panel.
   To get up and running again, the electrician wired the NCRT pump directly, and we have adjusted the flow physically using a valve in the plant. We will be burning some wasted electricity this way, and also do not have all the controls that are in the loop under the regular, system – but the alternative is to be shut down waiting for parts. I took some water levels this morning and the gradient was unfavorable beyond the NCRT, as expected. (Tom Bowler email: 8/12/16)
5. Leon departed the site at 0845 on 8/12/16.
6. Leon arrived on site at 1340 on 8/23/16.
7. We had a misfire yesterday on repairing the NCRT pump controls. The local electrical supplier ordered an insufficiently sized power supply, and Leon Shaffer only discovered the problem when he arrived to install the unit. So, we are back to ordering another and will try again when it arrives. As an aside, I watched Leon take a photo of what we needed, he wrote down the specifications, and passed those along to whoever did the ordering. (Tom Bowler email: 8/24/16)
8. Leon departed the site at 1350 on 8/23/16.
9. Leon arrived on site at 1055 on 8/24/16.
10. Power was shut down at the NCRT panel by the breaker inside the panel.
11. The 24 V power supply was replaced with a new one and wiring was returned to its original position.
12. Power was returned to the NCRT panel by turning the breaker back on and the system was tested. The wiring was switched causing the pump to run in reverse. The breaker was turned back off and the wiring positions were swapped.
13. Once power was turned back on, the 5 minute startup delay was bypassed by pressing the stop button, on the panel face, then pulling back out. The NCRT panel and pump returned to service correctly. Control valve in the plant was returned to the open position.
14. Leon departed the site at 1130 on 8/24/16

ISSUES/CONCERNS
1. There is no control for the NCRT pump and it will need to be monitored regularly.

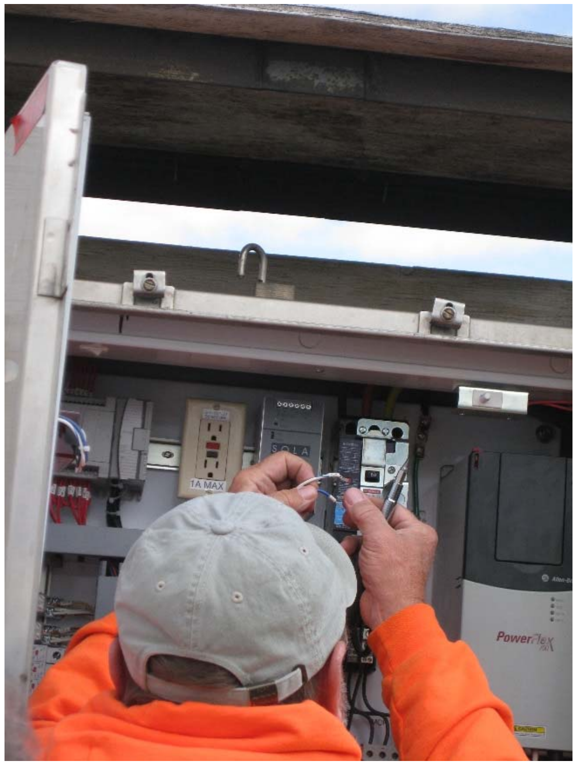
Date: 8/12/16	**Description:** Photo taken facing north. Leon checking the power to and from the 24 V power supply at the NCRT panel.

Date: 8/12/16	**Description:** Photo taken facing north. Checking the NCRT 24 V power supply for visiable damage.



Date: 8/12/16	**Description:** Photo taken facing north. Rerouted wiring to run the NCRT pump directly.

Date: 8/12/16	**Description:** Photo taken facing west. Valve positioning to reduce flow from the NCRT to close to 195 gpm.



Date: 8/24/16	**Description:** Photo taken facing north. Leon installing the new 24 V power supply.

APPENDIX F

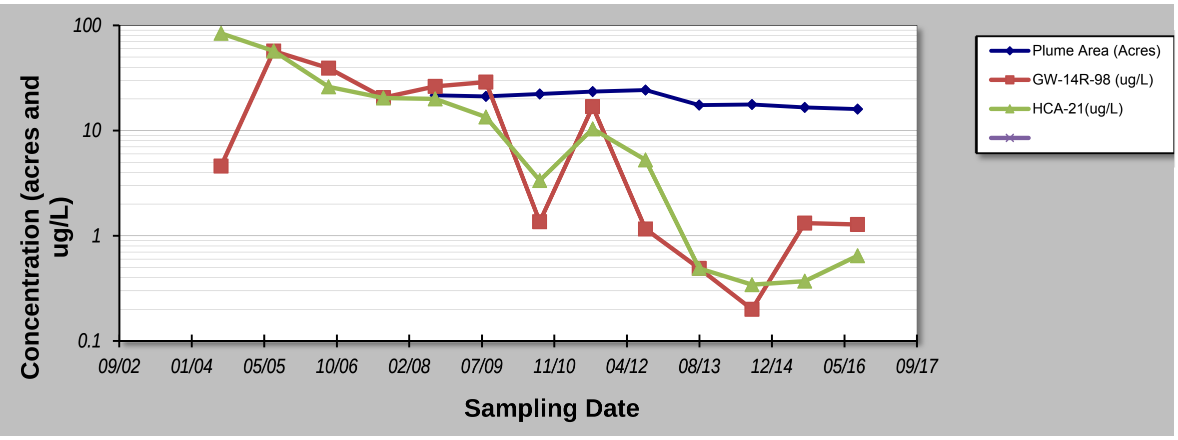
Mann-Kendall Tests

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **March 23, 2017**
Facility Name: **Montana Pole and Treating Plant**
Conducted By: **DB**

Job ID: **2016 Annual Report**
Constituent: **Pentachlorophenol - Plume Area and Well**
Concentration Units: **acres and ug/L**

Sampling Event	Sampling Date	Plume Area (Acres)	GW-14R-98 (ug/L)	HCA-21(ug/L)				Note: green: <RL
		PENTACHLOROPHENOL - PLUME AREA AND WELL CONCENTRATION (acres and ug/L)						
1	3-Aug-04		4.6	84				
2	1-Aug-05		57	57				
3	14-Aug-06		39.2	26.04				
4	27-Aug-07		20.6	20.4				
5	18-Aug-08	21.64	26.3	20				
6	3-Aug-09	21.14	28.9	13.45				
7	9-Aug-10	22.27	1.36	3.35				
8	9-Aug-11	23.48	16.9	10.37				
9	7-Aug-12	24.29	1.16	5.26				
10	12-Aug-13	17.47	0.49	0.49				
11	11-Aug-14	17.70	0.2	0.343				
12	10-Aug-15	16.60	1.32	0.37				
13	8-Aug-16	16.00	1.28	0.646				
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.16	1.19	1.36				
Mann-Kendall Statistic (S):		-16	-46	-66				
Confidence Factor:		94.0%	99.8%	>99.9%				
Concentration Trend:		Prob. Decreasing	Decreasing	Decreasing				



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.
4. 0.2 = PCP concentration below the 0.2 ug/L reporting limit (RL)

DISCLAIMER: The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.

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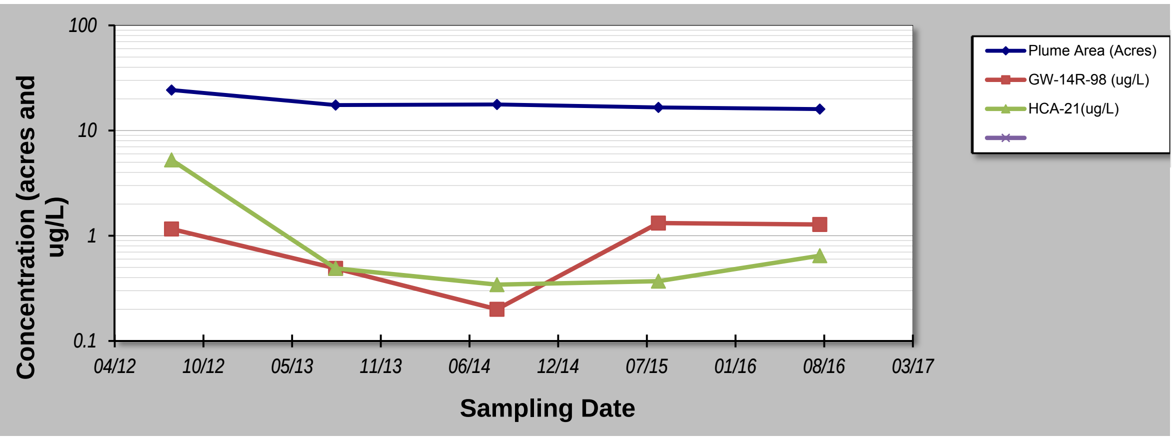
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 23, 2017	Job ID:	2016 Annual Report
Facility Name:	Montana Pole and Treating Plant	Constituent:	Pentachlorophenol - Plume Area and Well
Conducted By:	DB	Concentration Units:	acres and ug/L

Sampling Point ID:		Plume Area (Acres)	GW-14R-98 (ug/L)	HCA-21(ug/L)				Note: green: <RL
Sampling Event	Sampling Date	PENTACHLOROPHENOL - PLUME AREA AND WELL CONCENTRATION (acres and ug/L)						
1	7-Aug-12	24.29	1.16	5.26				
2	12-Aug-13	17.47	0.49	0.49				
3	11-Aug-14	17.70	0.2	0.343				
4	10-Aug-15	16.60	1.32	0.37				
5	8-Aug-16	16.00	1.28	0.646				
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.18	0.57	1.51				
Mann-Kendall Statistic (S):		-8	2	-2				
Confidence Factor:		95.8%	59.2%	59.2%				
Concentration Trend:		Decreasing	No Trend	No Trend				



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.
4. 0.2 = PCP concentration below the 0.2 ug/L reporting limit (RL)

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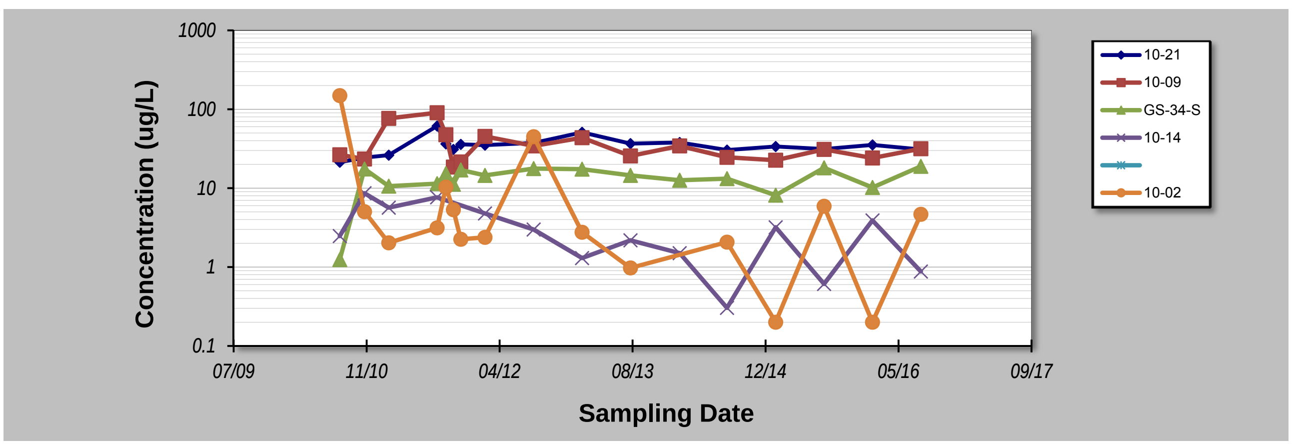
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **August 2010 to August 2016**
Facility Name: **MPTP trends post- 2009 to 2016 WWTP dewatering**
Conducted By: **DB**

Job ID:
Constituent: **PCP**
Concentration Units: **ug/L**

Sampling Event	Sampling Date	10-21	10-09	GS-34-S	10-14		10-02	GW-14R-98
		PCP CONCENTRATION (ug/L)						
1	8/9/2010	21.3	26.5	1.24	2.47		149	3.45
2	11/10/2010	24.4	23.4	17.5	8.62		5.03	2.28
3	2/9/2011	26.2	76.6	10.6	5.66		2.03	1.45
4	8/10/2011	61.3	90.4	11.4	7.65		3.14	0.6
5	9/12/2011	36.4	47.5	15.3			10.3	
6	10/10/2011	31	18.5	11.2			5.33	
7	11/7/2011	35.9	21.5	17			2.25	
8	2/6/2012	35.1	45.3	14.5	4.78		2.38	
9	8/7/2012	37.4	34.3	17.7	2.99		44.9	1.05
10	2/5/2013	51	43.6	17.4	1.3		2.76	
11	8/6/2013	36.7	25.6	14.5	2.181		0.975	0.297
12	2/7/2014	37.9	34.3	12.6	1.5			
13	8/4/2014	30.4	24.6	13.2	0.304		2.07	0.2
14	2/3/2015	33.7	22.6	8.14	3.19		0.2	0.2
15	8/4/2015	31.3	31	18.1	0.611		5.9	1.32
16	2/2/2016	35.3	24.1	10.2	3.9		0.2	0.903
17	8/2/2016	30.9	31.6	18.9	0.878		4.66	1.28
18								
19								
20								
Coefficient of Variation:		0.27	0.54	0.33	0.79		2.47	0.74
Mann-Kendall Statistic (S):		16	-27	23	-41		-37	-22
Confidence Factor:		72.9%	85.6%	81.5%	98.7%		94.7%	87.2%
Concentration Trend:		No Trend	Stable	No Trend	Decreasing		Prob. Decreasing	Stable



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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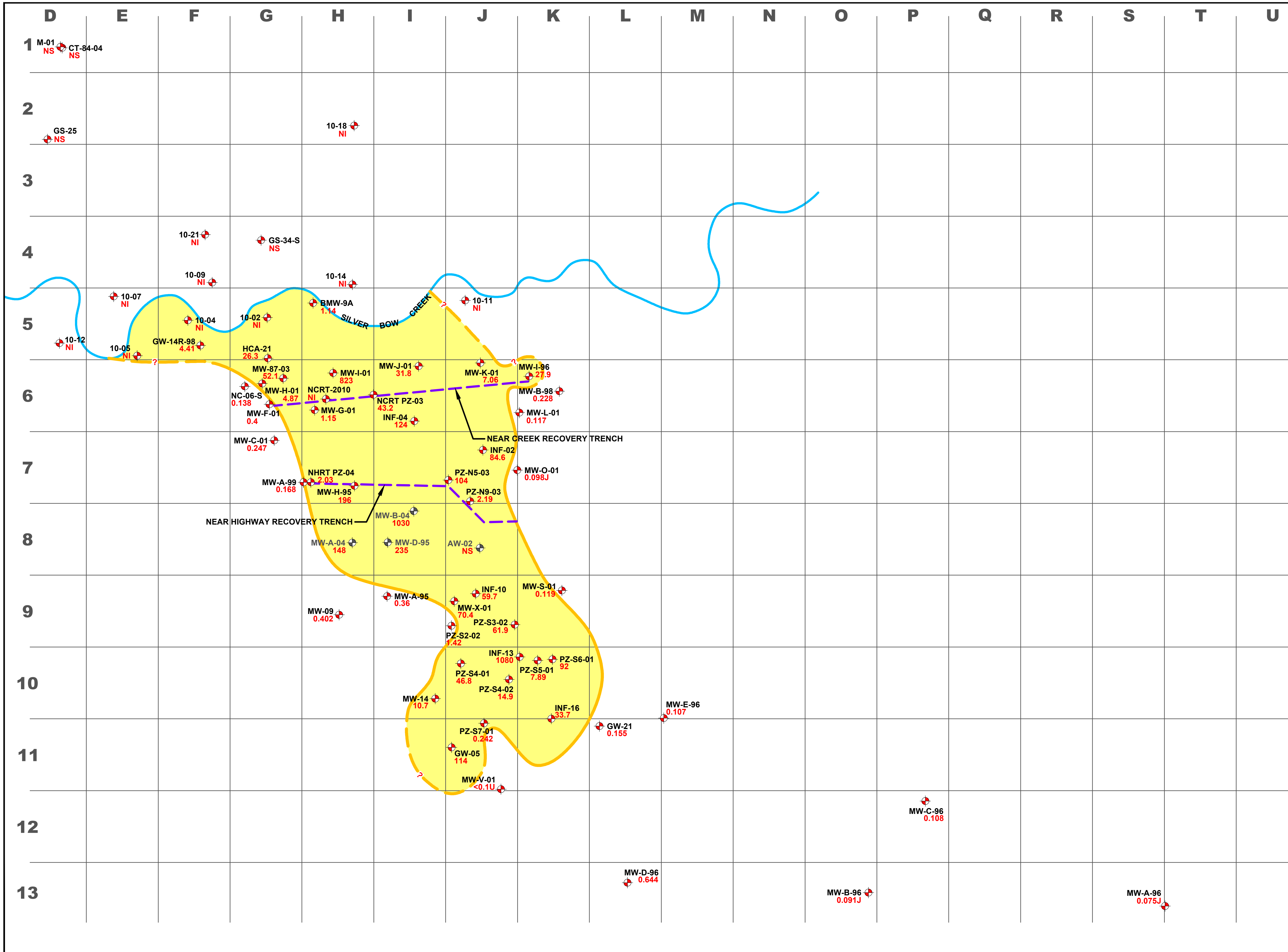
APPENDIX G

Plume Area Maps



LEGEND

	MONITORING WELL
	MONITORING WELL (ABANDONED IN 2009)
	APPROXIMATE AREA OF PLUME DEFINED BY 1 µg/L PCP ISOCONTOUR - DASHED WHERE INFERRED, ? WHERE UNKNOWN
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

NOTES:

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

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

3) PLUME AREA BASED ON 1 µg/L CONTOUR INTERVAL: 21.64 ACRES

N

150 0 150 300

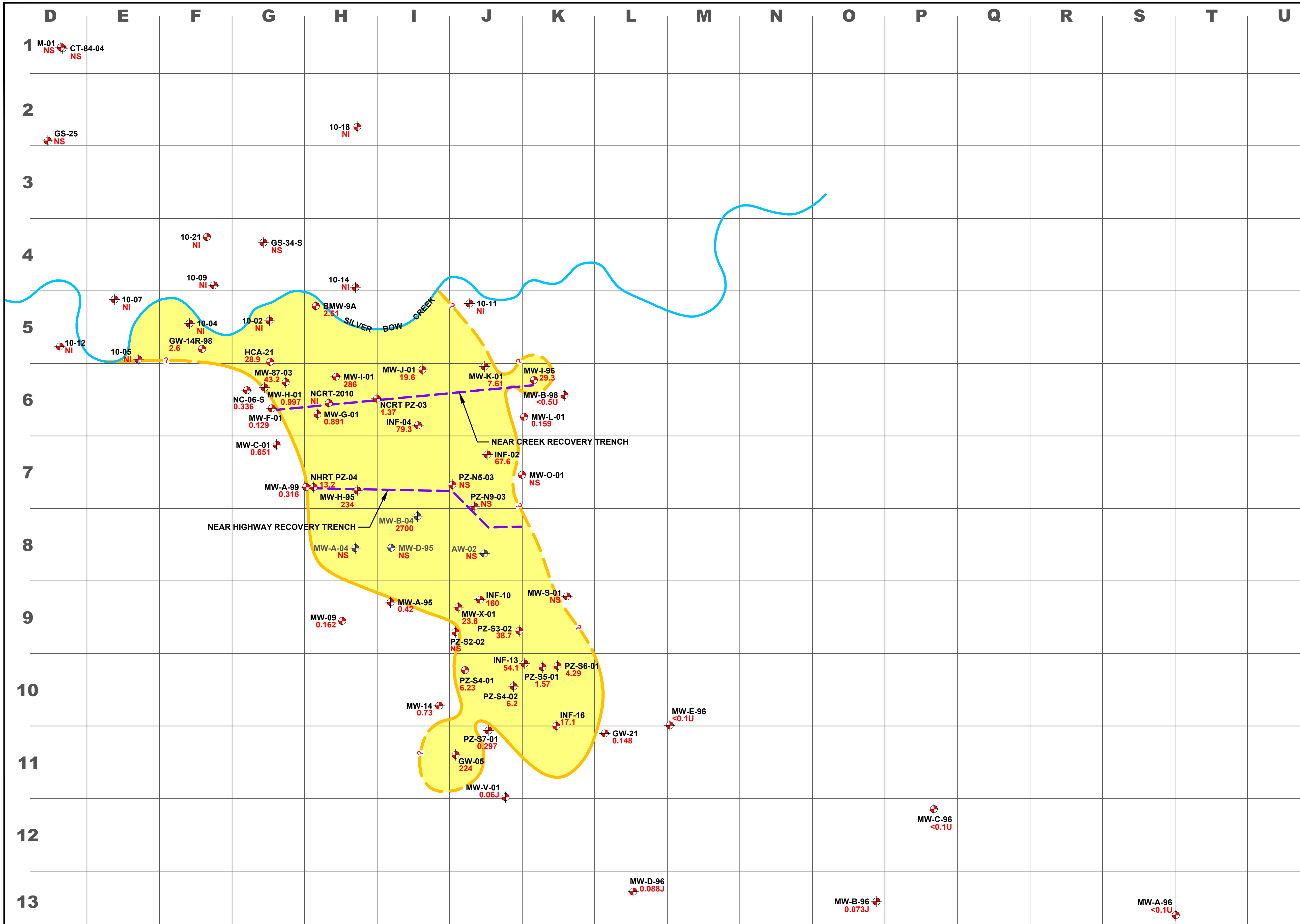
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE G1
PCP DATA - AUGUST 2008

TETRA TECH

Figure G1_PCP Area_August 2008.dwg - DWH - 03/16/2017



LEGEND

- MONITORING WELL
- MONITORING WELL (ABANDONED IN 2009)
- APPROXIMATE AREA OF PLUME DEFINED BY 1 µg/L PCP ISOCONTOUR - DASHED WHERE INFERRED, ? WHERE UNKNOWN

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

NOTES:

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

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

3) PLUME AREA BASED ON 1 µg/L CONTOUR INTERVAL: 21.14 ACRES

N

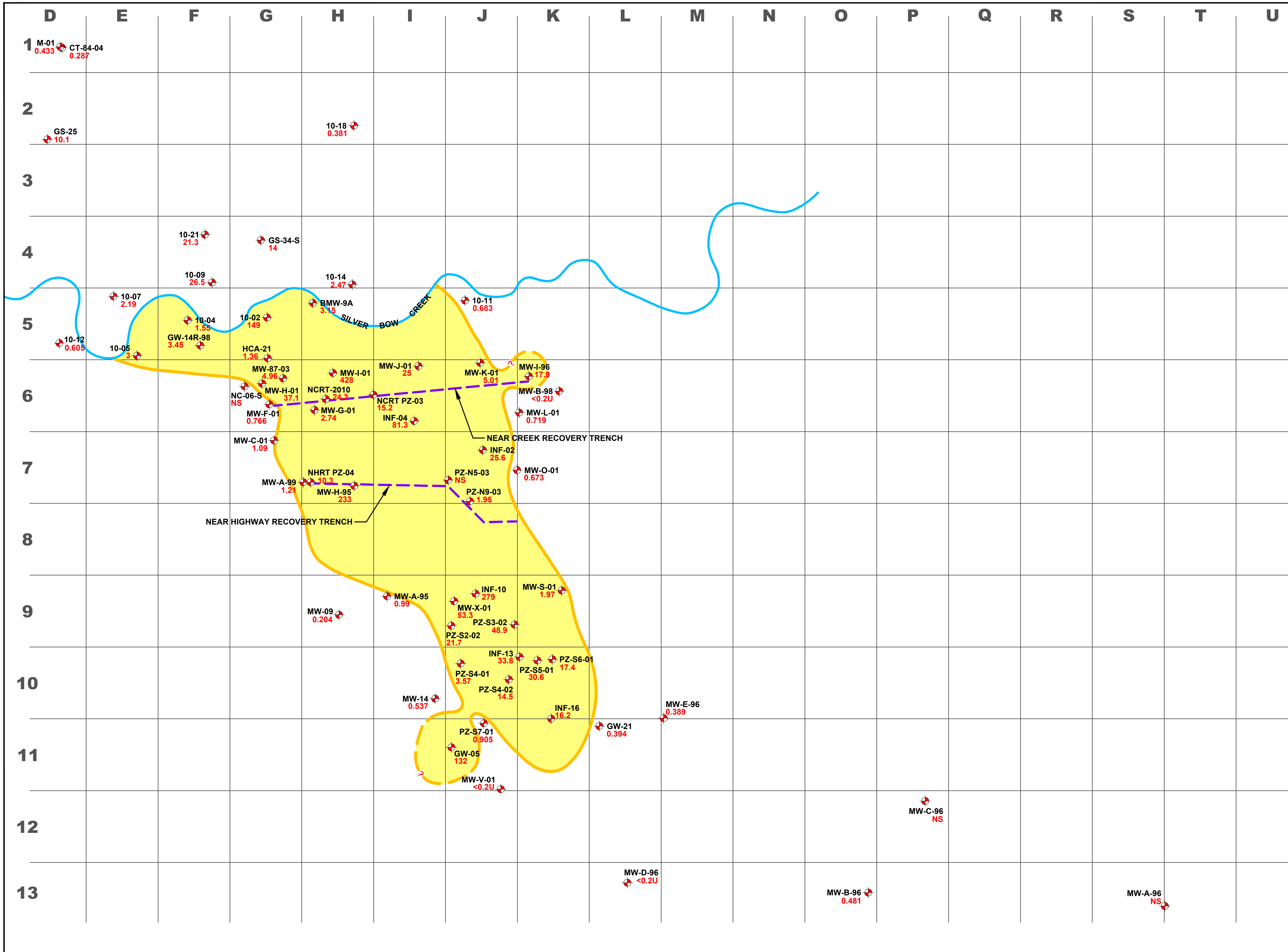
150 0 150 300

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE G2
PCP DATA - AUGUST 2009

TETRA TECH



LEGEND

- MONITORING WELL
- APPROXIMATE AREA OF PLUME DEFINED BY 1 µg/L PCP ISOCONTOUR - DASHED WHERE INFERRED, ? WHERE UNKNOWN
- µg/L MICROGAMS PER LITER
- NS NOT SAMPLED
- PCP PENTACHLOROPHENOL
- U NOT DETECTED AT LIMIT SHOWN
- < LESS THAN

NOTES:

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

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

3) PLUME AREA BASED ON 1 µg/L CONTOUR INTERVAL: 22.27 ACRES

N

150 0 150 300

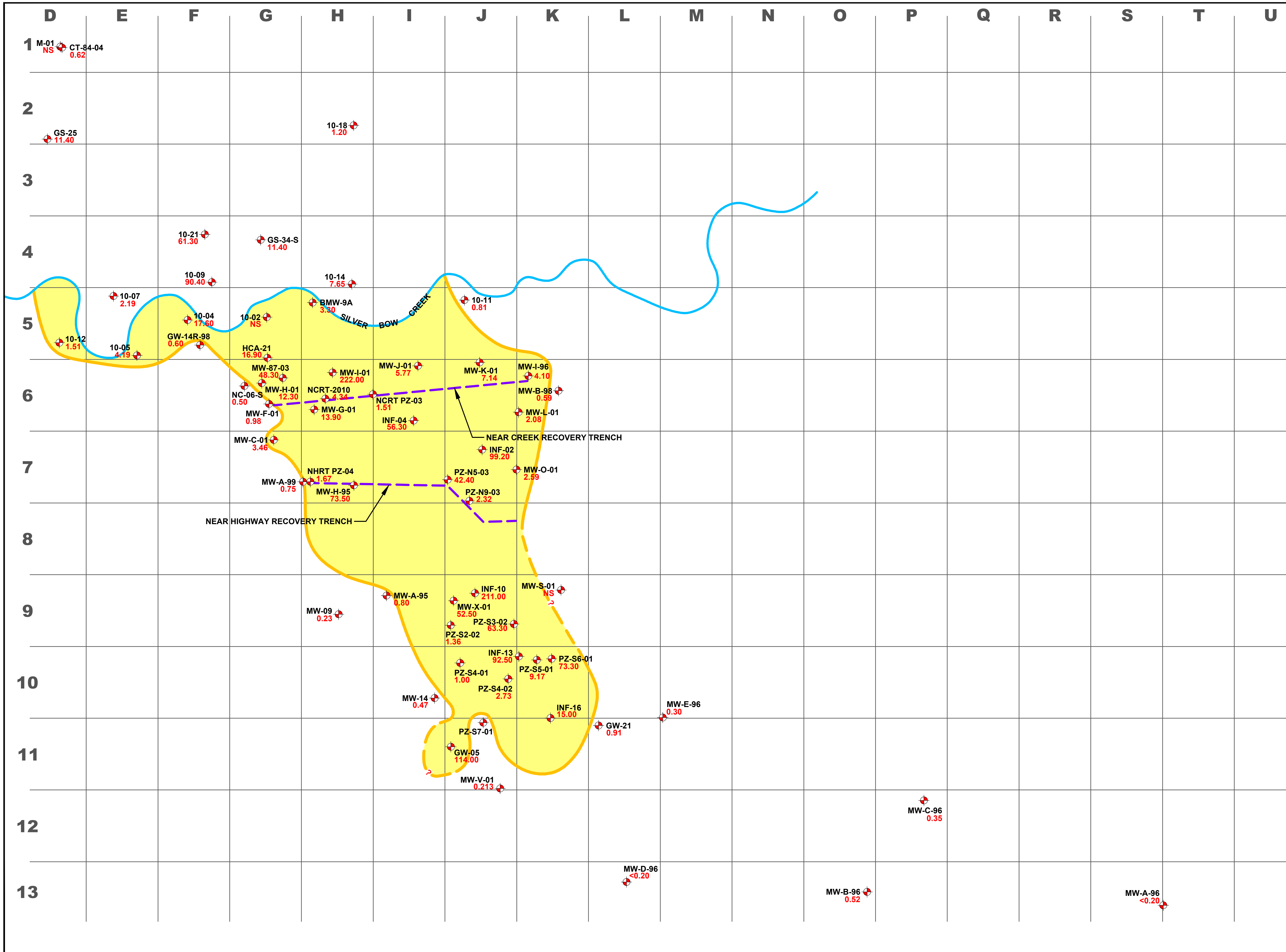
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE G3
PCP DATA - AUGUST 2010

TETRA TECH

Figure G3_PCP Area_August 2010.dwg - DWH - 03/16/2017



LEGEND

MONITORING WELL

APPROXIMATE AREA OF PLUME DEFINED BY 1 µg/L PCP ISOCONTOUR - DASHED WHERE INFERRED, ? WHERE UNKNOWN

µg/L MICROGAMS PER LITER

NS NOT SAMPLED

PCP PENTACHLOROPHENOL

< LESS THAN

NOTES:

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

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

3) PLUME AREA BASED ON 1 µg/L CONTOUR INTERVAL: 23.48 ACRES

N

150 0 150 300

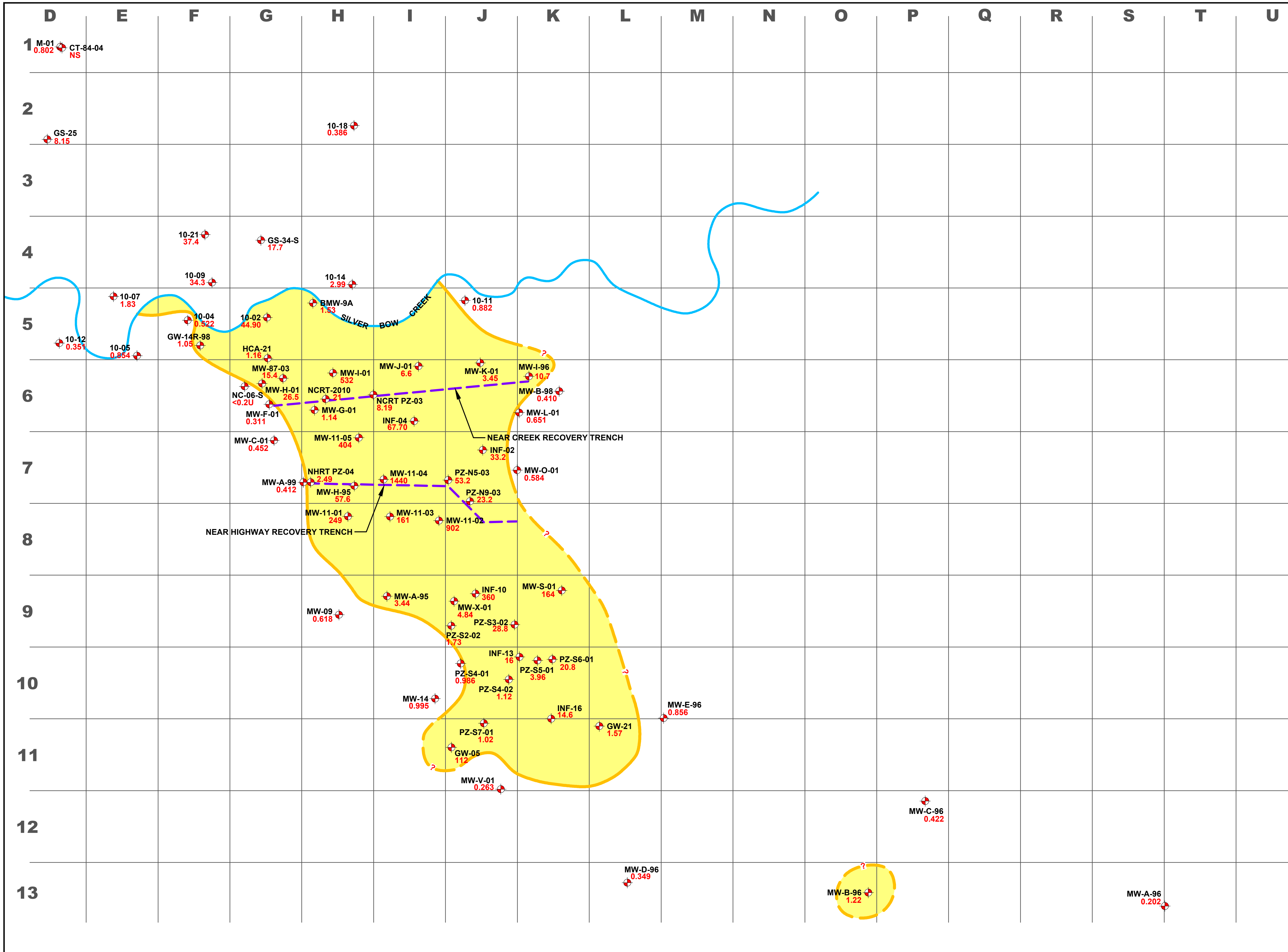
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE G4
PCP DATA - AUGUST 2011

TETRA TECH

Figure G4_PCP Area_August 2011.dwg - DWH - 03/16/2017



LEGEND

	MONITORING WELL
	APPROXIMATE AREA OF PLUME DEFINED BY 1 µg/L PCP ISOCONTOUR - DASHED WHERE INFERRED, ? WHERE UNKNOWN
µg/L	MICROGAMS PER LITER
NS	NOT SAMPLED
PCP	PENTACHLOROPHENOL
U	NOT DETECTED AT LIMIT SHOWN
<	LESS THAN

NOTES:

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

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

3) PLUME AREA BASED ON 1 µg/L CONTOUR INTERVAL: 24.29 ACRES

N

150 0 150 300

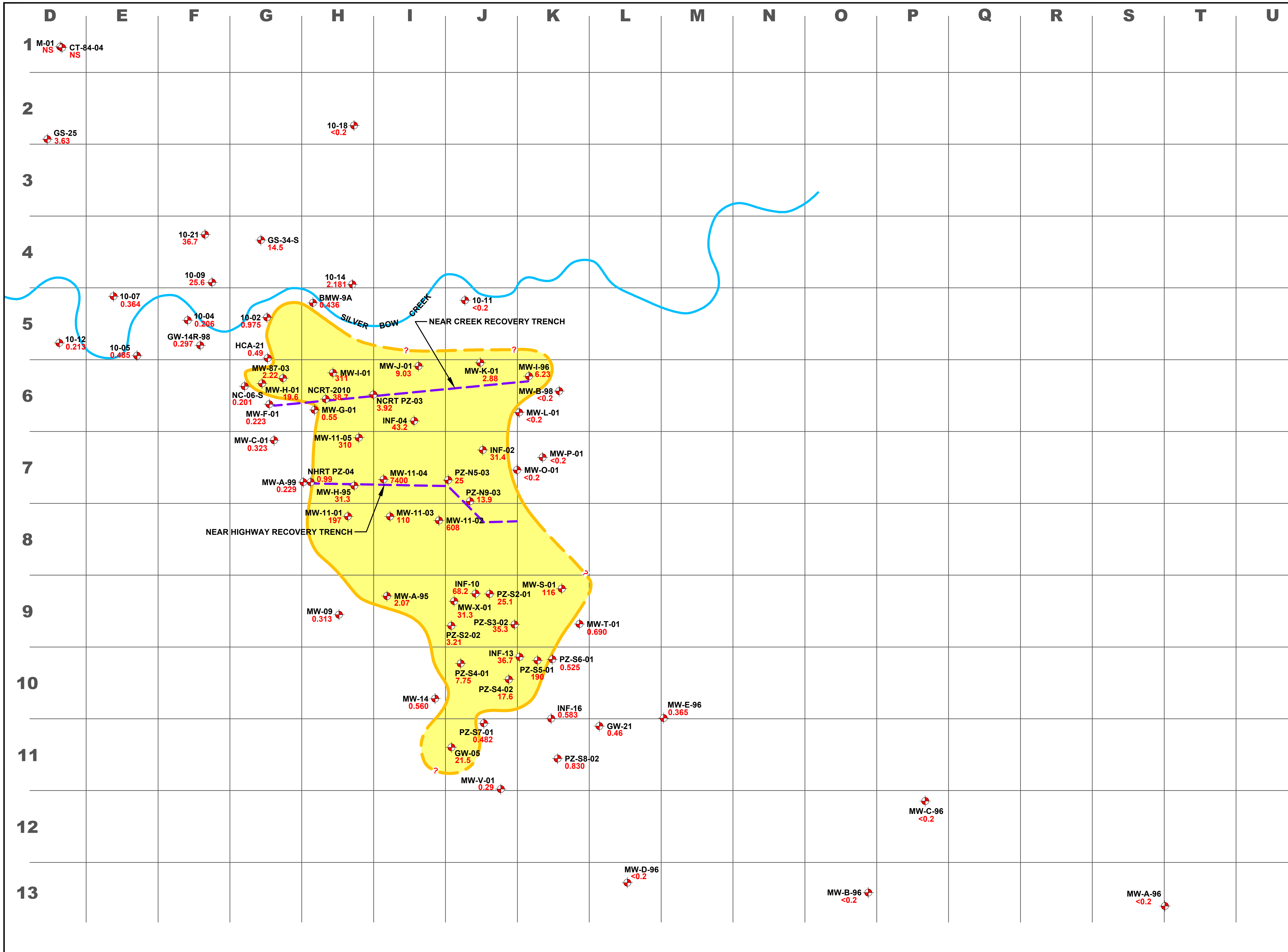
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE G5
PCP DATA - AUGUST 2012

TETRA TECH

Figure G5_PCP Area_August 2012.dwg - DWH - 03/16/2017



LEGEND

- MONITORING WELL
- APPROXIMATE AREA OF PLUME DEFINED BY 1 µg/L PCP ISOCONTOUR - DASHED WHERE INFERRED, ? WHERE UNKNOWN
- µg/L MICROGAMS PER LITER
- NS NOT SAMPLED
- PCP PENTACHLOROPHENOL
- < LESS THAN

NOTES:

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

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

3) PLUME AREA BASED ON 1 µg/L CONTOUR INTERVAL: 17.47 ACRES

N

150 0 150 300

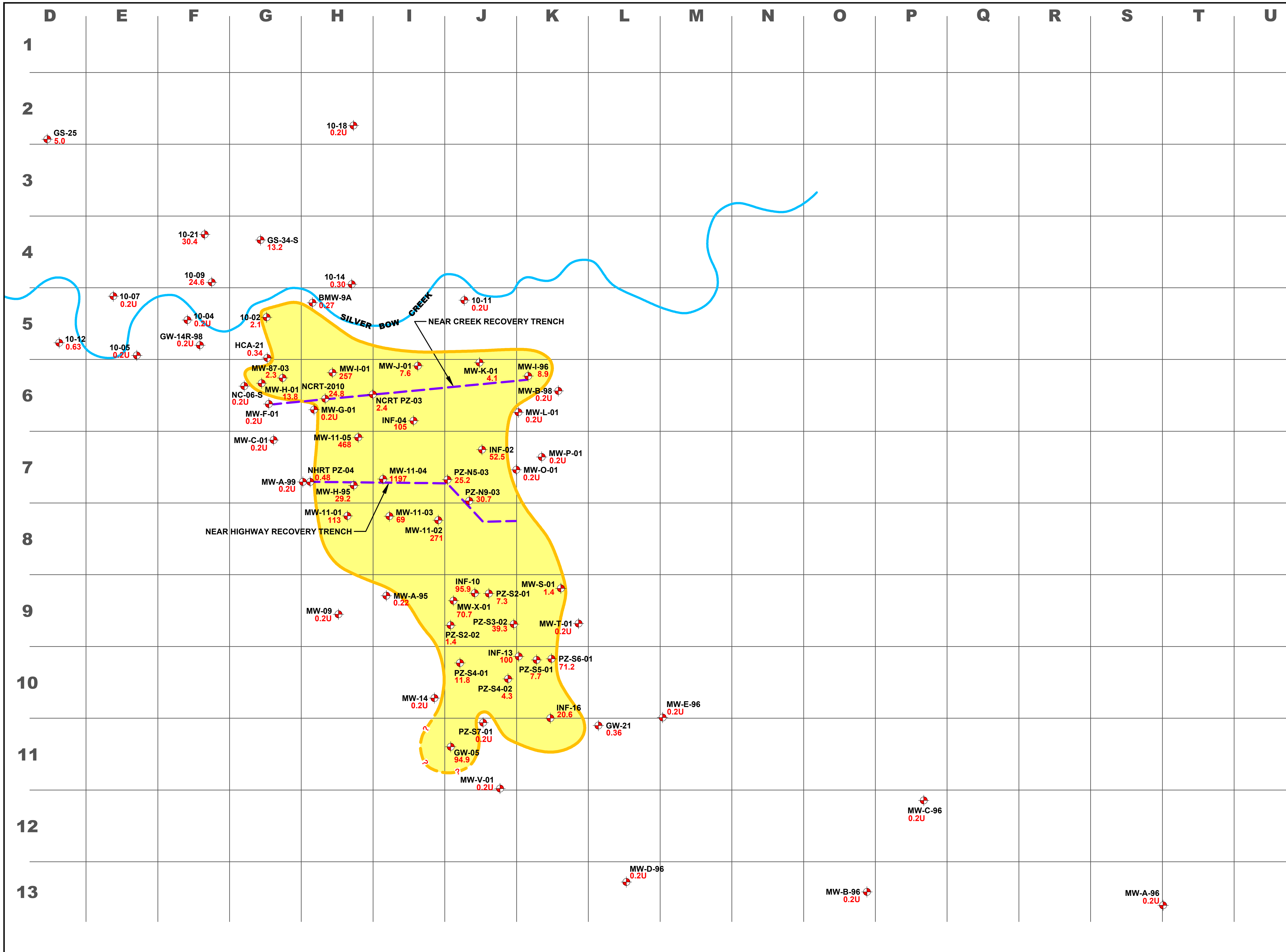
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE G6
PCP DATA - AUGUST 2013

TETRA TECH

Figure K6_PCP Area_August 2013.dwg - DWH - 02/26/2016



LEGEND

MONITORING WELL

APPROXIMATE AREA OF PLUME DEFINED BY 1 µg/L PCP ISOCONTOUR - DASHED WHERE INFERRED, ? WHERE UNKNOWN

U ANALYZED FOR BUT NOT DETECTED ABOVE THE METHOD DETECTION LIMIT

µg/L MICROGRAMS PER LITER

PCP PENTACHLOROPHENOL

NOTES:

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

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

3) PLUME AREA BASED ON 1 µg/L CONTOUR INTERVAL: 17.7 ACRES

N

150 0 150 300

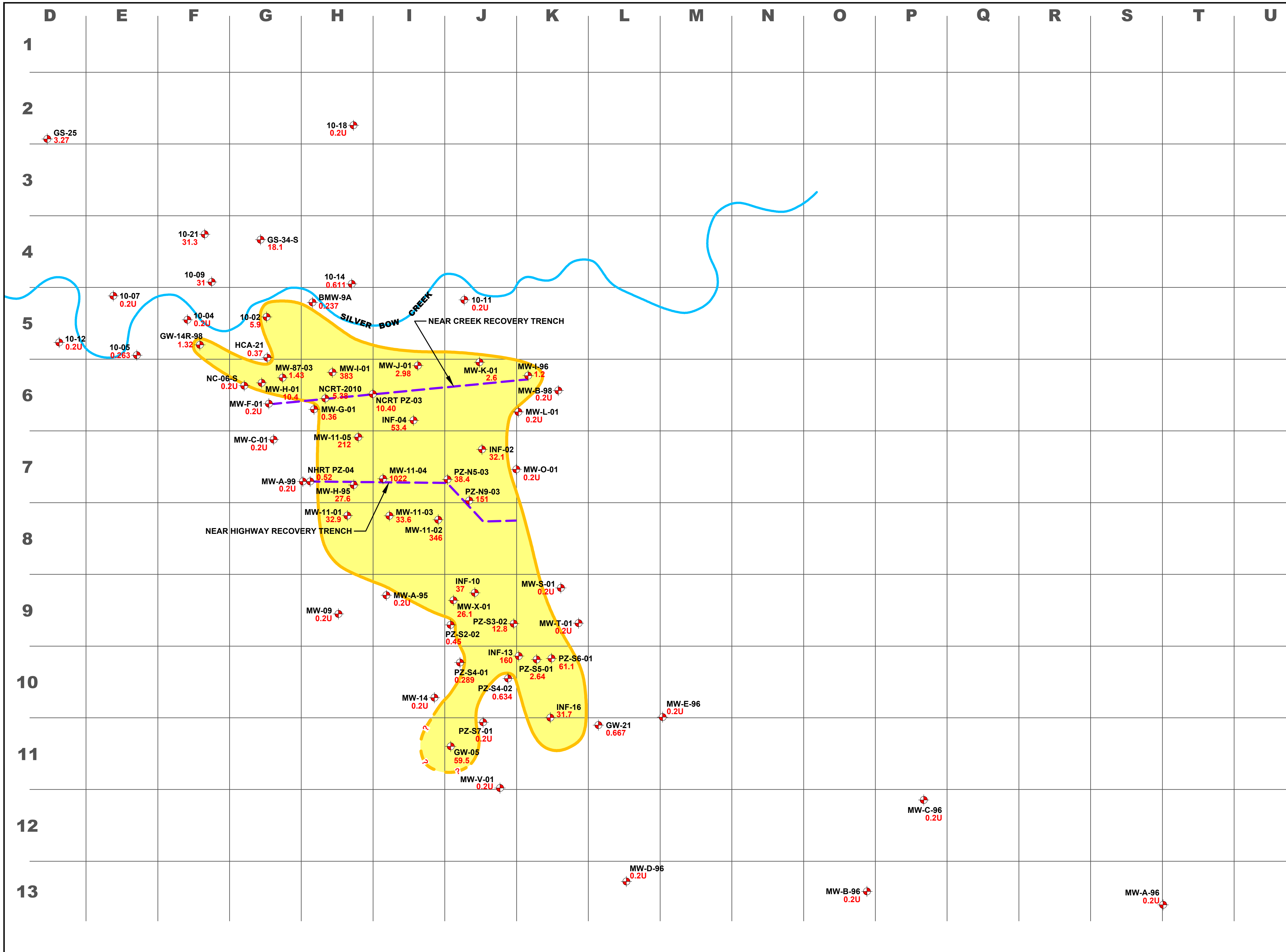
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE G7
PCP DATA - AUGUST 2014

TETRA TECH

Figure G7_PCP Area_August 2014.dwg - DWH - 03/16/2017



LEGEND

MONITORING WELL

APPROXIMATE AREA OF PLUME DEFINED BY 1 µg/L PCP ISOCONTOUR - DASHED WHERE INFERRED, ? WHERE UNKNOWN

U ANALYZED FOR BUT NOT DETECTED ABOVE THE METHOD DETECTION LIMIT

µg/L MICROGRAMS PER LITER

PCP PENTACHLOROPHENOL

NOTES:

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

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

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

N

150 0 150 300

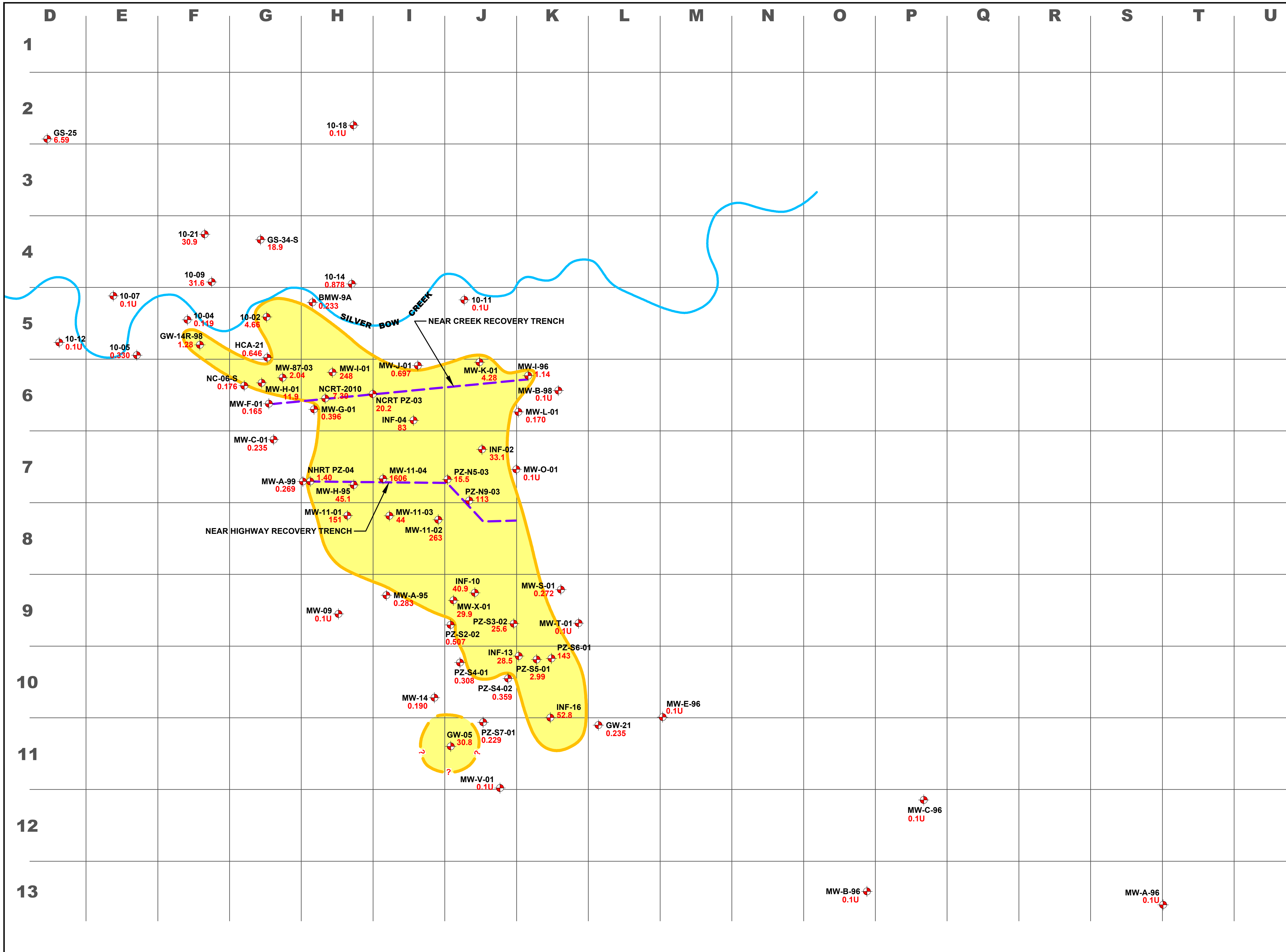
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE G8
PCP DATA - AUGUST 10, 2015

TETRA TECH

Figure G8_PCP Area_August 2015.dwg - DWH - 03/16/2017



LEGEND

MONITORING WELL

APPROXIMATE AREA OF PLUME DEFINED BY 1 µg/L PCP ISOCONTOUR - DASHED WHERE INFERRED, ? WHERE UNKNOWN

U ANALYZED FOR BUT NOT DETECTED ABOVE THE METHOD DETECTION LIMIT

µg/L MICROGRAMS PER LITER

PCP PENTACHLOROPHENOL

NOTES:

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

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

3) PLUME AREA BASED ON 1 µg/L CONTOUR INTERVAL: 16.0 ACRES

N

150 0 150 300

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE G9
PCP DATA - AUGUST 8, 2016

TETRA TECH

Figure G9_PCP Area_Aug 2016.dwg - DWH - 03/27/2017

APPENDIX H

Quality Control for Electronic Data Deliverables

SUMMARY OF QUALITY CONTROL
FOR
ELECTRONIC DATA DELIVERABLES - 2016

Year	MBMG Sample Delivery Group	Chain of Custody	Number of Pages	Date Minimum	Date Maximum	QC Completed?	Comment
2016	101590	2016_01_04_01_11_COC_Plant_101590	1 page	January 4, 2016	January 11, 2016	√	plant 1-04 and 1-11
2016	101591	2016_01_18_01_25_COC_Plant_101591	1 page	January 18, 2016	January 25, 2016	√	plant 1-18 and 1-25
2016	101592	2016_02_01_COC_Semiannual_plant_101592	2 pages	February 1, 2016	February 1, 2016	√	plant semi-annual 2-01
2016	101593	2016_02_02_COC_semiannual_101593	2 pages	February 2, 2016	February 2, 2016	√	semi-annual 2-02
2016	101594	2016_02_03_COC_semiannual_101594	2 pages	February 3, 2016	February 3, 2016	√	semi-annual 2-03
2016	101597	2016_02_04_COC_semiannual_101597	2 pages	February 4, 2016	February 4, 2016	√	semi-annual 2-04
2016	101605	2016_02_08_02_15_COC_Plant_101605	1 page	February 8, 2016	February 15, 2016	√	plant 2-08 and 2-15
2016	101606	2016_02_22_02_29_COC_Plant_101606	1 page	February 22, 2016	February 29, 2016	√	plant 2-22 and 2-29
2016	101619	2016_03_07_03_14_COC_Plant_101619	1 page	March 7, 2016	March 14, 2016	√	plant 3-07 and 3-14
2016	101622	2016_03_21_03_28_COC_Plant_101622	1 page	March 21, 2016	March 28, 2016	√	plant 3-21 and 3-28
2016	102628	2016_04_04_04_11_COC_plant_102628	1 page	April 4, 2016	April 11, 2016	√	Plant 4-4 and 4-11
2016	102632	2016_04_18_04_25_COC_Plant_102632	1 page	April 18, 2016	April 25, 2016	√	Plant 4-18 and 4-25
2016	102636	2016_05_02_05_09_COC_Plant_LTU Dis_102636	1 page	May 2, 2016	May 9, 2016	√	Plant 5-02 and 5-09
2016	104641	2016_05_16_05_23_COC_Plant_104641	1 page	May 16, 2016	May 23, 2016	√	plant 5-16 and 5-23
2016	105643	2016_05_31_06_06_COC_Plant_104643	1 page	May 31, 2016	June 6, 2016	√	plant 5-31 and 6-06
2016	107647	2016_06_13_06_20_COC_Plant_107647	1 page	June 13, 2016	June 20, 2016	√	plant 6-13 and 6-20
2016	108647	2016_06_27_07_05_COC_Plant_108647	1 page	June 27, 2016	July 5, 2016	√	plant 6-27 and 7-05
2016	109649	2016_07_11_07_18_COC_Plant_109649	1 page	July 11, 2016	July 18, 2016	√	plant 7-11 and 7-18
2016	109656	2016_07_25_08_01_COC_annual_109656	2 pages	July 25, 2016	August 1, 2016	√	plant 7-25 and annual 8/01
2016	110655	2016_08_01_08_02_COC_annual_110655	2 pages	August 1, 2016	August 2, 2016	√	annual 8-01 and 8-02
2016	110659	2016_08_02_08_03_COC_annual_110659	2 pages	August 2, 2016	August 3, 2016	√	annual 8-02 and 8-03
2016	111658	2016_08_03_08_04_COC_annual_111658	2 pages	August 3, 2016	August 4, 2016	√	annual 8-03 and 8-04
2016							
2016	111662 (organics)	2016_08_08_COC_annual_111662_Ext	2 pages	August 8, 2016	August 8, 2016	√	annual chlorophenols and PAHs
2016	111662 (PCP only; 2 samples)	2016_08_08_COC_annual_111662_Ext	2 pages	August 8, 2016	August 8, 2016	√	annual PCP (2 samples)
2016	111663 (metals and anions)	2016_08_08_COC_annual_111663_Ext	2 pages	August 8, 2016	August 8, 2016	√	annual-metals and anions
2016	10358557_8290_dfr (Pace)	2016_08_08_COC_annual_111662_Ext	2 pages	August 8, 2016	August 8, 2016	√	annual-dioxins
2016							
2016	111671	2016_08_15_08_22_COC_Plant_111671	1 page	August 15, 2016	August 22, 2016	√	plant 8-15 and 8-22
2016	111679	2016_08_29_09_06_COC_plant_111679	1 page	August 29, 2016	September 6, 2016	√	plant 8-29 and 9-6
2016	111686	2016_09_12_09_19_COC_plant_111686	1 page	September 12, 2016	September 19, 2016	√	plant 9-12 and 9-19
2016	111692	2016_09_26_10_03_COC_plant_111692	1 page	September 26, 2016	October 3, 2016	√	plant 9-26 and 10-03
2016	111699	2016_10_10_10_17_COC_Plant_111699	1 page	October 10, 2016	October 17, 2016	√	plant 10-10 and 10-17
2016	111707	2016_10_24_10_31_COC_Plant_111707	1 page	October 24, 2016	October 31, 2016	√	plant 10-24 and 10-31
2016	111715	2016_11_07_11_14_COC_Plant_111715	1 page	November 7, 2016	November 14, 2016	√	plant 11-07 and 11-14
2016	111718	2016_11_21_11_28_COC_Plant_111718	1 page	November 21, 2016	November 28, 2016	√	plant 11-21 and 11-28
2016	111723	2016_12_05_12_12_COC_Plant_111723	1 page	December 5, 2016	December 12, 2016	√	plant 12-05 and 12-12
2016	111724	2016_12_19_12_27_COC_Plant_111724	1 page	December 19, 2016	December 27, 2016	√	plant 12-19 and 12-27

Notes

MBMG Montana Bureau of Mines and Geology
Pace Pace Analytical Laboratory
PCP Pentachlorophenol

APPENDIX I

Climate Statistics

[Explanation of the Preliminary Monthly Climate Data (F6) Product](#)

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

000
CXUS55 KMSO 011610
CF6BTM
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: BUTTE MT
MONTH: JANUARY
YEAR: 2016
LATITUDE: 45 57 N
LONGITUDE: 112 30 W

TEMPERATURE IN F: :PCPN: SNOW: WIND :SUNSHINE: SKY :PK WND

1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
									12Z	AVG	MX	2MIN						
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR
1	5	-19	-7	-25	72	0	0.00	M	M	2.1	7	140	M	M	3	128	8	140
2	14	-13	1	-17	64	0	0.00	M	M	2.4	8	140	M	M	1	18	10	120
3	21	-5	8	-10	57	0	0.00	M	M	2.3	9	110	M	M	3		11	120
4	27	1	14	-4	51	0	0.00	M	M	1.5	8	140	M	M	6		10	140
5	32	10	21	2	44	0	0.00	M	M	2.1	8	170	M	M	8	18	9	160
6	31	17	24	5	41	0	T	M	M	1.1	8	130	M	M	8	1	10	130
7	29	17	23	4	42	0	0.13	M	M	2.2	9	330	M	M	10	18	11	280
8	22	16	19	0	46	0	T	M	M	0.4	7	180	M	M	10	18	8	180
9	29	9	19	0	46	0	0.00	M	M	2.3	10	320	M	M	10	18	12	320
10	23	-7	8	-11	57	0	T	M	M	4.4	9	320	M	M	2	1	12	330
11	13	-13	0	-20	65	0	0.00	M	M	2.0	8	130	M	M	5	128	9	130
12	33	8	21	1	44	0	0.00	M	M	1.7	8	130	M	M	7		10	130
13	35	10	23	3	42	0	T	M	M	2.3	14	160	M	M	7	8	14	160
14	34	15	25	5	40	0	T	M	M	5.4	20	300	M	M	9		26	300
15	26	-2	12	-8	53	0	0.00	M	M	2.0	8	300	M	M	8		9	300
16	23	1	12	-8	53	0	0.09	M	M	1.2	8	180	M	M	9	1	9	180
17	33	6	20	0	45	0	0.00	M	M	2.8	9	20	M	M	8	128	10	40
18	36	10	23	3	42	0	0.03	M	M	3.7	14	330	M	M	7	1	19	210
19	34	7	21	1	44	0	0.00	M	M	5.5	24	190	M	M	5	18	29	180
20	35	21	28	8	37	0	T	M	M	5.3	16	300	M	M	8		22	310
21	38	9	24	4	41	0	0.00	M	M	3.6	9	330	M	M	5	18	11	10
22	40	17	29	9	36	0	0.00	M	M	2.9	16	140	M	M	5		23	150
23	33	10	22	2	43	0	T	M	M	3.0	12	240	M	M	3	1	14	250
24	33	11	22	2	43	0	0.01	M	M	5.2	21	320	M	M	8	1	26	320
25	31	0	16	-4	49	0	0.00	M	M	2.5	8	270	M	M	3	18	10	290
26	31	-3	14	-6	51	0	0.00	M	M	1.6	9	170	M	M	2		10	170
27	40	17	29	9	36	0	0.00	M	M	2.8	10	60	M	M	5	18	12	50
28	46	13	30	10	35	0	0.00	M	M	4.8	16	300	M	M	5	128	23	320
29	38	24	31	11	34	0	0.02	M	M	9.3	22	310	M	M	8	1	32	280
30	27	3	15	-5	50	0	0.06	M	M	3.3	10	160	M	M	7	128	13	250

```
31  28   2  15  -5  50   0    T    M    M  2.5 15 300   M    M   6 18     20 290
================================================================================
SM  920  192      1453   0  0.34    M     94.2          M      191
================================================================================
AV 29.7  6.2                               3.0 FASTST   M    M   6    MAX(MPH)
                                MISC ---->  # 24 190                 # 32  280
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  BUTTE MT
                                          MONTH:    JANUARY
                                          YEAR:     2016
                                          LATITUDE:   45 57 N
                                          LONGITUDE: 112 30 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 17.9   TOTAL FOR MONTH:   0.34    1 = FOG OR MIST
DPTR FM NORMAL:  -1.7   DPTR FM NORMAL:   -0.13    2 = FOG REDUCING VISIBILITY
HIGHEST:    46 ON 28    GRTST 24HR  0.13 ON  7- 7      TO 1/4 MILE OR LESS
LOWEST:    -19 ON  1                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:    M          5 = HAIL
                        GRTST 24HR    M  ON   M    6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:  M  ON   M    7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:  17    0.01 INCH OR MORE:   6
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:   1
MIN 32 OR BELOW:  31    0.50 INCH OR MORE:   0
MIN  0 OR BELOW:   8    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.  1453    CLEAR  (SCALE 0-3)   5
DPTR FM NORMAL    46    PTCLDY (SCALE 4-7)  19
TOTAL FM JUL 1  5332    CLOUDY (SCALE 8-10)  7
DPTR FM NORMAL   -39

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL     0    [PRESSURE DATA]
TOTAL FM JAN 1     0    HIGHEST SLP 30.92 ON  1
DPTR FM NORMAL     0    LOWEST  SLP 29.64 ON 29

[REMARKS]
#FINAL-01-16#
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Explanation of the Preliminary Monthly Climate Data (F6) Product

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

000
CXUS55 KMSO 011536 CCA
CF6BTM

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: BUTTE MT
MONTH: FEBRUARY
YEAR: 2016
LATITUDE: 45 57 N
LONGITUDE: 112 30 W

TEMPERATURE IN F:							:PCPN:	SNOW:		WIND			:SUNSHINE:		SKY		:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
									12Z	AVG	MX	2MIN						
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR
1	24	2	13	-7	52	0	0.03	M	M	2.3	10	270	M	M	8	1	14	280
2	19	-11	4	-16	61	0	T	M	M	2.6	9	170	M	M	7	128	10	170
3	26	-12	7	-13	58	0	T	M	M	2.7	10	300	M	M	3	18	13	320
4	33	16	25	5	40	0	T	M	M	5.9	17	290	M	M	7		23	280
5	39	7	23	3	42	0	0.00	M	M	3.5	16	210	M	M	2	8	21	210
6	38	22	30	9	35	0	T	M	M	10.9	26	270	M	M	4	128	40	270
7	36	2	19	-2	46	0	0.00	M	M	3.6	13	310	M	M	2	1	18	310
8	48	19	34	13	31	0	0.00	M	M	2.7	9	340	M	M	4		13	330
9	40	11	26	5	39	0	0.00	M	M	2.8	8	150	M	M	2	12	10	310
10	38	6	22	1	43	0	0.00	M	M	2.4	8	180	M	M	0	18	10	190
11	48	23	36	15	29	0	0.00	M	M	2.3	9	310	M	M	5		12	280
12	46	30	38	17	27	0	0.01	M	M	2.0	9	160	M	M	5	1	12	200
13	42	23	33	12	32	0	0.02	M	M	11.1	25	310	M	M	5	1	34	330
14	42	29	36	14	29	0	0.01	M	M	8.0	26	310	M	M	8		34	310
15	44	34	39	17	26	0	T	M	M	9.8	28	310	M	M	10		35	300
16	45	34	40	18	25	0	0.00	M	M	5.3	17	270	M	M	8		24	260
17	42	24	33	11	32	0	0.00	M	M	3.3	17	190	M	M	2		20	190
18	43	30	37	15	28	0	0.02	M	M	8.3	29	310	M	M	7	8	39	220
19	42	25	34	11	31	0	T	M	M	8.4	25	250	M	M	5	1	37	250
20	35	15	25	2	40	0	T	M	M	8.0	24	300	M	M	2	8	32	300
21	39	7	23	0	42	0	0.00	M	M	2.3	9	270	M	M	1		12	10
22	35	21	28	4	37	0	0.00	M	M	9.0	22	280	M	M	8		30	290
23	37	8	23	-1	42	0	0.00	M	M	3.4	12	310	M	M	1		14	310
24	42	8	25	1	40	0	0.00	M	M	1.8	7	140	M	M	2		9	170
25	49	13	31	6	34	0	0.00	M	M	2.7	12	310	M	M	0		15	300
26	51	16	34	9	31	0	0.00	M	M	2.4	10	120	M	M	0		15	110
27	46	25	36	11	29	0	T	M	M	6.1	22	310	M	M	6	1	27	300
28	49	25	37	11	28	0	0.02	M	M	6.7	22	250	M	M	5	1	32	260
29	37	20	29	3	36	0	0.02	M	M	9.4	23	320	M	M	3	1	34	290

```
================================================================================
SM 1155  472      1065   0  0.13    M    149.7          M      122
================================================================================
AV 39.8 16.3                          5.2 FASTST   M    M   4    MAX(MPH)
                             MISC ---->  # 29 310              # 40  270
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  BUTTE MT
                                          MONTH:    FEBRUARY
                                          YEAR:     2016
                                          LATITUDE:   45 57 N
                                          LONGITUDE: 112 30 W

[TEMPERATURE DATA]       [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 28.1   TOTAL FOR MONTH:   0.13    1 = FOG OR MIST
DPTR FM NORMAL:   5.8   DPTR FM NORMAL:   -0.30    2 = FOG REDUCING VISIBILITY
HIGHEST:    51 ON 26    GRTST 24HR  0.04 ON 28-29      TO 1/4 MILE OR LESS
LOWEST:    -12 ON  3                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:    M          5 = HAIL
                        GRTST 24HR    M  ON   M    6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:  M  ON   M    7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]       [WEATHER - DAYS WITH]     9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   3    0.01 INCH OR MORE:   7
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:   0
MIN 32 OR BELOW:  27    0.50 INCH OR MORE:   0
MIN  0 OR BELOW:   2    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.  1065    CLEAR  (SCALE 0-3)  13
DPTR FM NORMAL  -173    PTCLDY (SCALE 4-7)  14
TOTAL FM JUL 1  6397    CLOUDY (SCALE 8-10)  2
DPTR FM NORMAL  -206

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL     0    [PRESSURE DATA]
TOTAL FM JAN 1     0    HIGHEST SLP 30.77 ON  7
DPTR FM NORMAL     0    LOWEST  SLP 29.27 ON 18

[REMARKS]
#FINAL-02-16#
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Explanation of the Preliminary Monthly Climate Data (F6) Product

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WFO Monthly/Daily Climate Data

992
CXUS55 KMSO 010900
CF6BTM
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: BUTTE MT
MONTH: MARCH
YEAR: 2016
LATITUDE: 45 57 N
LONGITUDE: 112 30 W

TEMPERATURE IN F:							:PCPN:	SNOW:		WIND			:SUNSHINE:		SKY		:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
									12Z	AVG	MX	2MIN						
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR
1	44	15	30	4	35	0	0.00	M	M	3.2	14	290	M	M	4		18	290
2	42	26	34	8	31	0	0.02	M	M	8.2	35	300	M	M	4	18	46	300
3	53	24	39	12	26	0	0.01	M	M	5.8	22	270	M	M	6	1	29	250
4	52	17	35	8	30	0	0.00	M	M	3.2	10	170	M	M	0		13	230
5	57	28	43	15	22	0	0.00	M	M	5.2	16	180	M	M	5		20	180
6	50	30	40	12	25	0	0.10	M	M	8.0	23	180	M	M	5	1	28	180
7	45	22	34	6	31	0	0.00	M	M	4.0	10	260	M	M	3		14	260
8	36	22	29	0	36	0	0.01	M	M	4.2	21	330	M	M	8	18	25	330
9	43	23	33	4	32	0	0.00	M	M	5.6	17	190	M	M	8		23	190
10	53	34	44	14	21	0	T	M	M	12.9	31	180	M	M	6	1	37	190
11	49	29	39	9	26	0	0.04	M	M	5.9	20	150	M	M	4	1	24	140
12	49	27	38	8	27	0	0.04	M	M	4.3	21	250	M	M	6		28	260
13	50	25	38	7	27	0	0.08	M	M	5.8	24	180	M	M	9	1	28	180
14	37	27	32	1	33	0	0.03	M	M	8.2	30	300	M	M	5	1	41	320
15	36	22	29	-2	36	0	T	M	M	8.1	26	310	M	M	5		32	320
16	35	20	28	-4	37	0	0.01	M	M	6.3	20	310	M	M	5	18	25	290
17	29	12	21	-11	44	0	0.06	M	M	3.4	13	350	M	M	9	128	17	340
18	32	0	16	-16	49	0	0.00	M	M	4.8	10	130	M	M	1		11	190
19	48	9	29	-4	36	0	0.00	M	M	5.3	16	160	M	M	0		19	160
20	59	21	40	7	25	0	0.00	M	M	4.3	16	180	M	M	0		22	170
21	53	30	42	9	23	0	T	M	M	6.2	21	290	M	M	5		26	280
22	39	28	34	0	31	0	T	M	M	8.0	20	320	M	M	8	1	25	340
23	43	25	34	0	31	0	T	M	M	7.1	21	330	M	M	6		26	290
24	43	28	36	2	29	0	0.05	M	M	8.1	33	310	M	M	7	128	44	310
25	37	23	30	-4	35	0	T	M	M	7.2	18	330	M	M	6	8	22	320
26	45	17	31	-4	34	0	0.00	M	M	4.1	17	280	M	M	2		22	290
27	49	18	34	-1	31	0	T	M	M	5.7	25	310	M	M	5	1	32	300
28	41	20	31	-4	34	0	0.00	M	M	5.8	16	10	M	M	3		21	330
29	39	31	35	0	30	0	T	M	M	14.4	26	10	M	M	10		30	340
30	48	28	38	2	27	0	0.00	M	M	8.4	20	340	M	M	6		25	20

```
31  43  31  37   1  28   0    T    M    M  6.1 16 310   M    M  10 1      23 300
================================================================================
SM 1379  712       962   0  0.45    M    197.8          M      161
================================================================================
AV 44.5 23.0                               6.4 FASTST   M    M   5    MAX(MPH)
                                 MISC ---->  # 35 300               # 46  300
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  BUTTE MT
                                          MONTH:    MARCH
                                          YEAR:     2016
                                          LATITUDE:   45 57 N
                                          LONGITUDE: 112 30 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 33.7   TOTAL FOR MONTH:   0.45    1 = FOG OR MIST
DPTR FM NORMAL:   2.3   DPTR FM NORMAL:   -0.31    2 = FOG REDUCING VISIBILITY
HIGHEST:    59 ON 20    GRTST 24HR  0.10 ON  6- 6      TO 1/4 MILE OR LESS
LOWEST:      0 ON 18                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:    M          5 = HAIL
                        GRTST 24HR    M  ON   M    6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:  M  ON   M    7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   2    0.01 INCH OR MORE:  11
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:   1
MIN 32 OR BELOW:  30    0.50 INCH OR MORE:   0
MIN  0 OR BELOW:   1    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.   962    CLEAR  (SCALE 0-3)   6
DPTR FM NORMAL   -80    PTCLDY (SCALE 4-7)  20
TOTAL FM JUL 1  7359    CLOUDY (SCALE 8-10)  5
DPTR FM NORMAL  -252

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL     0    [PRESSURE DATA]
TOTAL FM JAN 1     0    HIGHEST SLP M ON M
DPTR FM NORMAL     0    LOWEST  SLP 29.42 ON  6

[REMARKS]
#FINAL-03-16#
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Explanation of the Preliminary Monthly Climate Data (F6) Product

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

000
CXUS55 KMSO 010900
CF6BTM
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: BUTTE MT
MONTH: APRIL
YEAR: 2016
LATITUDE: 45 57 N
LONGITUDE: 112 30 W

TEMPERATURE IN F:							:PCPN:	SNOW:		WIND			:SUNSHINE:		SKY		:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
									12Z	AVG	MX	2MIN						
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR
1	57	22	40	4	25	0	0.00	M	M	4.3	16	310	M	M	3		21	310
2	63	23	43	7	22	0	0.00	M	M	6.0	20	290	M	M	1		26	300
3	63	33	48	12	17	0	T	M	M	5.7	15	310	M	M	1		21	310
4	60	25	43	7	22	0	0.05	M	M	8.0	33	310	M	M	3	128	50	300
5	44	27	36	-1	29	0	0.00	M	M	14.0	29	310	M	M	5		37	320
6	59	29	44	7	21	0	0.00	M	M	7.9	23	310	M	M	4		31	280
7	66	24	45	8	20	0	0.00	M	M	5.8	18	360	M	M	0		23	10
8	73	24	49	12	16	0	0.00	M	M	3.2	12	170	M	M	0		16	140
9	69	27	48	10	17	0	0.00	M	M	6.9	23	300	M	M	0		30	320
10	56	31	44	6	21	0	0.00	M	M	6.2	18	160	M	M	3		25	130
11	64	26	45	7	20	0	0.00	M	M	5.3	18	310	M	M	0		24	300
12	66	28	47	9	18	0	0.11	M	M	5.0	25	180	M	M	5	1	32	220
13	50	32	41	3	24	0	0.35	M	M	7.0	21	270	M	M	7	1	26	340
14	43	29	36	-2	29	0	0.35	M	M	4.6	18	250	M	M	7	12	25	260
15	39	26	33	-6	32	0	0.06	M	M	7.4	20	20	M	M	8	12	24	20
16	50	20	35	-4	30	0	0.00	M	M	3.8	10	20	M	M	3		13	10
17	57	23	40	1	25	0	0.00	M	M	5.8	20	140	M	M	0		23	130
18	58	23	41	2	24	0	0.00	M	M	5.1	17	130	M	M	0		22	140
19	67	26	47	7	18	0	0.00	M	M	5.4	17	310	M	M	0		28	290
20	71	27	49	9	16	0	0.00	M	M	5.9	22	140	M	M	0		29	150
21	73	40	57	17	8	0	0.00	M	M	6.8	21	160	M	M	0		25	170
22	73	40	57	17	8	0	0.00	M	M	9.2	29	170	M	M	0		36	160
23	52	38	45	4	20	0	0.13	M	M	4.3	15	10	M	M	8		18	20
24	48	39	44	3	21	0	0.01	M	M	9.3	16	330	M	M	10	1	21	330
25	48	38	43	2	22	0	T	M	M	12.2	22	320	M	M	10		27	340
26	51	34	43	1	22	0	T	M	M	4.6	16	20	M	M	9		23	20
27	44	27	36	-6	29	0	0.00	M	M	5.8	20	20	M	M	9		24	20
28	37	31	34	-8	31	0	0.06	M	M	4.9	16	170	M	M	10	18	18	170
29	49	31	40	-2	25	0	0.04	M	M	5.9	18	270	M	M	9	1	24	270
30	46	35	41	-2	24	0	T	M	M	4.9	17	70	M	M	10		22	20

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================================================================================
SM 1696  878       656   0  1.16    M    191.2         M      125
================================================================================
AV 56.5 29.3                           6.4 FASTST   M    M    4    MAX(MPH)
                                 MISC ---->  # 33 310              # 50  300
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  BUTTE MT
                                          MONTH:    APRIL
                                          YEAR:     2016
                                          LATITUDE:   45 57 N
                                          LONGITUDE: 112 30 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 42.9   TOTAL FOR MONTH:   1.16    1 = FOG OR MIST
DPTR FM NORMAL:   3.9   DPTR FM NORMAL:   -0.01    2 = FOG REDUCING VISIBILITY
HIGHEST:    73 ON 22,21 GRTST 24HR  0.46 ON 12-13      TO 1/4 MILE OR LESS
LOWEST:     20 ON 16                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:    M          5 = HAIL
                        GRTST 24HR    M  ON   M    6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:  M  ON   M    7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:   9
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:   4
MIN 32 OR BELOW:  22    0.50 INCH OR MORE:   0
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.   656    CLEAR  (SCALE 0-3)  14
DPTR FM NORMAL  -124    PTCLDY (SCALE 4-7)   9
TOTAL FM JUL 1  8015    CLOUDY (SCALE 8-10)  7
DPTR FM NORMAL  -376

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL     0    [PRESSURE DATA]
TOTAL FM JAN 1     0    HIGHEST SLP M ON M
DPTR FM NORMAL     0    LOWEST  SLP 29.56 ON 22

[REMARKS]
#FINAL-04-16#
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Explanation of the Preliminary Monthly Climate Data (F6) Product

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

000
CXUS55 KMSO 011227
CF6BTM
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: BUTTE MT
MONTH: MAY
YEAR: 2016
LATITUDE: 45 57 N
LONGITUDE: 112 30 W

TEMPERATURE IN F:							:PCPN:	SNOW:		WIND			:SUNSHINE:		SKY		:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
									12Z	AVG	MX	2MIN						
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR
1	60	27	44	1	21	0	0.00	M	M	8.0	21	130	M	M	1		29	140
2	69	26	48	5	17	0	0.00	M	M	4.6	13	150	M	M	0		14	150
3	74	30	52	8	13	0	0.00	M	M	4.0	15	120	M	M	0		21	130
4	73	33	53	9	12	0	0.00	M	M	5.1	21	180	M	M	1		34	180
5	75	39	57	13	8	0	T	M	M	5.8	26	160	M	M	1		47	210
6	55	44	50	5	15	0	T	M	M	5.0	14	60	M	M	8		21	70
7	69	44	57	12	8	0	0.00	M	M	6.9	20	120	M	M	5		28	110
8	71	34	53	8	12	0	0.00	M	M	8.6	22	320	M	M	1		32	290
9	50	32	41	-5	24	0	0.09	M	M	11.2	21	10	M	M	9	1	28	20
10	39	30	35	-11	30	0	0.12	M	M	6.4	17	340	M	M	9	12	22	310
11	52	25	39	-7	26	0	0.00	M	M	4.3	14	270	M	M	6	12	17	280
12	67	27	47	1	18	0	T	M	M	6.0	17	270	M	M	2	8	24	290
13	53	35	44	-3	21	0	T	M	M	8.8	22	140	M	M	7		26	140
14	54	37	46	-1	19	0	T	M	M	9.8	22	160	M	M	7		29	140
15	44	36	40	-7	25	0	0.08	M	M	4.8	16	150	M	M	10	1	19	140
16	52	38	45	-3	20	0	T	M	M	4.7	16	140	M	M	10		22	140
17	65	32	49	1	16	0	0.00	M	M	5.6	15	310	M	M	6		20	270
18	71	34	53	5	12	0	T	M	M	5.4	17	210	M	M	3	3	21	200
19	53	40	47	-2	18	0	0.28	M	M	5.6	24	290	M	M	6	1	32	300
20	54	40	47	-2	18	0	0.09	M	M	6.8	29	130	M	M	9	1	39	120
21	54	35	45	-4	20	0	0.26	M	M	7.1	24	260	M	M	8	13	34	250
22	54	32	43	-6	22	0	0.01	M	M	9.7	35	260	M	M	8		44	270
23	49	39	44	-6	21	0	0.02	M	M	8.4	18	230	M	M	10		29	220
24	53	36	45	-5	20	0	0.17	M	M	4.0	15	290	M	M	7	1	20	290
25	62	30	46	-4	19	0	0.00	M	M	7.6	22	310	M	M	3	12	27	320
26	62	36	49	-1	16	0	T	M	M	4.6	16	50	M	M	5		20	160
27	53	37	45	-6	20	0	0.33	M	M	5.8	25	270	M	M	7	13	34	270
28	59	33	46	-5	19	0	0.00	M	M	5.3	15	150	M	M	4		22	290
29	67	32	50	-1	15	0	T	M	M	4.9	18	330	M	M	3		23	330
30	62	35	49	-2	16	0	0.00	M	M	8.6	22	340	M	M	2		29	310

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31  64  31  48  -4  17   0 0.00    M    M  5.5 18 130   M    M   3        22 130
================================================================================
SM 1839 1059       558   0  1.45    M    198.9          M      161
================================================================================
AV 59.3 34.2                              6.4 FASTST   M    M   5    MAX(MPH)
                                 MISC ---->  # 35 260              # 47  210
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  BUTTE MT
                                          MONTH:    MAY
                                          YEAR:     2016
                                          LATITUDE:   45 57 N
                                          LONGITUDE: 112 30 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 46.7   TOTAL FOR MONTH:   1.45    1 = FOG OR MIST
DPTR FM NORMAL:  -0.9   DPTR FM NORMAL:   -0.63    2 = FOG REDUCING VISIBILITY
HIGHEST:    75 ON  5    GRTST 24HR  0.33 ON 27-27      TO 1/4 MILE OR LESS
LOWEST:     25 ON 11                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:    M          5 = HAIL
                        GRTST 24HR    M  ON   M    6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:  M  ON   M    7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:  10
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:   5
MIN 32 OR BELOW:  12    0.50 INCH OR MORE:   0
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.   558    CLEAR  (SCALE 0-3)  11
DPTR FM NORMAL    17    PTCLDY (SCALE 4-7)  12
TOTAL FM JUL 1  8573    CLOUDY (SCALE 8-10)  8
DPTR FM NORMAL  -359

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL     0    [PRESSURE DATA]
TOTAL FM JAN 1     0    HIGHEST SLP 30.39 ON 11
DPTR FM NORMAL     0    LOWEST  SLP 29.51 ON  8

[REMARKS]
#FINAL-05-16#
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Explanation of the Preliminary Monthly Climate Data (F6) Product

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WFO Monthly/Daily Climate Data

000
CXUS55 KMSO 011334
CF6BTM
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: BUTTE MT
MONTH: JUNE
YEAR: 2016
LATITUDE: 45 57 N
LONGITUDE: 112 30 W

TEMPERATURE IN F:							:PCPN:	SNOW:		WIND			:SUNSHINE:		SKY		:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
									12Z	AVG	MX	2MIN						
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR
1	74	33	54	2	11	0	T	M	M	5.7	26	270	M	M	2		36	290
2	65	45	55	3	10	0	T	M	M	9.8	24	270	M	M	4		33	280
3	75	38	57	5	8	0	0.00	M	M	6.0	18	320	M	M	2		22	320
4	81	40	61	8	4	0	0.00	M	M	4.1	14	290	M	M	0		17	280
5	86	43	65	12	0	0	0.00	M	M	4.0	20	120	M	M	0		24	110
6	86	46	66	13	0	1	0.00	M	M	4.8	17	130	M	M	1		21	130
7	85	51	68	15	0	3	0.37	M	M	5.8	25	340	M	M	2	3	37	330
8	85	47	66	12	0	1	T	M	M	5.6	28	170	M	M	1	3	32	170
9	74	50	62	8	3	0	0.04	M	M	6.9	20	300	M	M	1		26	320
10	84	43	64	10	1	0	T	M	M	8.8	31	170	M	M	1	3	40	150
11	59	49	54	0	11	0	0.09	M	M	8.1	17	290	M	M	7	3	27	310
12	69	37	53	-2	12	0	0.00	M	M	5.5	13	270	M	M	2		16	270
13	73	34	54	-1	11	0	0.00	M	M	5.4	17	140	M	M	2		23	140
14	64	43	54	-1	11	0	0.01	M	M	9.4	23	160	M	M	5	3	30	180
15	55	41	48	-7	17	0	0.41	M	M	7.3	18	290	M	M	10	1	25	130
16	61	36	49	-7	16	0	T	M	M	6.7	23	330	M	M	5	1	30	280
17	69	30	50	-6	15	0	0.00	M	M	3.4	16	160	M	M	3		21	150
18	81	43	62	6	3	0	T	M	M	10.9	31	190	M	M	2		41	200
19	70	39	55	-1	10	0	0.00	M	M	7.5	22	330	M	M	0		25	330
20	85	35	60	3	5	0	0.00	M	M	4.8	21	180	M	M	0		26	160
21	76	43	60	3	5	0	0.00	M	M	10.7	30	300	M	M	0		39	300
22	79	35	57	0	8	0	0.00	M	M	5.1	16	280	M	M	0		21	270
23	85	41	63	5	2	0	0.00	M	M	7.4	24	330	M	M	1		30	340
24	73	44	59	1	6	0	0.01	M	M	10.4	30	310	M	M	3		39	320
25	70	42	56	-2	9	0	0.00	M	M	7.9	16	320	M	M	3		23	280
26	78	36	57	-2	8	0	0.00	M	M	5.4	15	290	M	M	0		23	320
27	85	39	62	3	3	0	T	M	M	5.9	21	100	M	M	1		29	110
28	88	58	73	14	0	8	0.00	M	M	5.2	16	310	M	M	0		22	340
29	88	49	69	9	0	4	0.00	M	M	4.7	16	160	M	M	3		22	90
30	84	57	71	11	0	6	T	M	M	6.3	18	230	M	M	3	3	28	220

```
================================================================================
SM 2287 1267       189  23  0.93    M    199.5         M       64
================================================================================
AV 76.2 42.2                              6.6 FASTST   M    M   2    MAX(MPH)
                                MISC ---->  # 31 170               # 41  200
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  BUTTE MT
                                          MONTH:    JUNE
                                          YEAR:     2016
                                          LATITUDE:   45 57 N
                                          LONGITUDE: 112 30 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 59.2   TOTAL FOR MONTH:   0.93    1 = FOG OR MIST
DPTR FM NORMAL:   3.5   DPTR FM NORMAL:   -1.33    2 = FOG REDUCING VISIBILITY
HIGHEST:    88 ON 29,28 GRTST 24HR  0.41 ON 15-15      TO 1/4 MILE OR LESS
LOWEST:     30 ON 17                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:    M          5 = HAIL
                        GRTST 24HR    M  ON   M    6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:  M  ON   M    7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:   6
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:   2
MIN 32 OR BELOW:   1    0.50 INCH OR MORE:   0
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.   189    CLEAR  (SCALE 0-3)  23
DPTR FM NORMAL   -98    PTCLDY (SCALE 4-7)   6
TOTAL FM JUL 1  8762    CLOUDY (SCALE 8-10)  1
DPTR FM NORMAL  -457

[CDD (BASE 65) ]
TOTAL THIS MO.    23
DPTR FM NORMAL    16    [PRESSURE DATA]
TOTAL FM JAN 1    23    HIGHEST SLP 30.32 ON 20
DPTR FM NORMAL    16    LOWEST  SLP 29.58 ON 14

[REMARKS]
#FINAL-06-16#
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Explanation of the Preliminary Monthly Climate Data (F6) Product

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

000
CXUS55 KMSO 011205
CF6BTM
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: BUTTE MT
MONTH: JULY
YEAR: 2016
LATITUDE: 45 57 N
LONGITUDE: 112 30 W

TEMPERATURE IN F:							:PCPN:	SNOW:		WIND			:SUNSHINE:		SKY		:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	12Z DPTH	AVG SPD	MX SPD	2MIN DIR	MIN	PSBL	S-S	WX	SPD	DR
1	87	47	67	7	0	2	0.00	M	M	4.5	16	300	M	M	0	3	20	280
2	84	50	67	7	0	2	0.00	M	M	6.7	29	310	M	M	2		36	300
3	79	43	61	0	4	0	T	M	M	8.1	20	320	M	M	3	3	31	240
4	78	43	61	0	4	0	0.00	M	M	9.7	30	330	M	M	0		35	320
5	71	37	54	-7	11	0	0.00	M	M	7.8	21	300	M	M	1		27	330
6	65	42	54	-8	11	0	0.09	M	M	8.2	23	330	M	M	4		30	330
7	76	32	54	-8	11	0	0.00	M	M	5.9	18	190	M	M	0		24	280
8	83	42	63	1	2	0	0.04	M	M	7.2	28	140	M	M	3	3	36	130
9	75	49	62	0	3	0	T	M	M	9.1	25	320	M	M	4	3	31	310
10	54	43	49	-13	16	0	0.72	M	M	6.0	22	270	M	M	9	13	29	260
11	61	41	51	-12	14	0	0.07	M	M	6.2	16	280	M	M	8	1	22	290
12	68	34	51	-12	14	0	T	M	M	5.7	24	290	M	M	1	3	34	290
13	69	41	55	-8	10	0	0.00	M	M	5.5	14	320	M	M	3		18	320
14	77	38	58	-5	7	0	0.00	M	M	5.6	16	310	M	M	0		19	310
15	80	43	62	-2	3	0	T	M	M	5.4	25	340	M	M	2	3	32	290
16	72	44	58	-6	7	0	T	M	M	7.4	16	330	M	M	3	3	22	270
17	77	41	59	-5	6	0	T	M	M	5.3	24	180	M	M	1	3	29	190
18	88	43	66	2	0	1	0.00	M	M	7.5	29	150	M	M	0		35	140
19	90	45	68	4	0	3	0.00	M	M	6.0	35	170	M	M	0		51	200
20	84	49	67	3	0	2	0.00	M	M	6.0	16	330	M	M	0		22	340
21	89	44	67	3	0	2	0.00	M	M	5.4	17	200	M	M	0		21	200
22	89	50	70	6	0	5	0.00	M	M	10.0	28	340	M	M	0		41	220
23	77	44	61	-3	4	0	0.00	M	M	8.8	20	330	M	M	0		24	320
24	84	40	62	-2	3	0	0.00	M	M	3.7	12	310	M	M	0		16	300
25	85	45	65	0	0	0	T	M	M	4.9	20	330	M	M	1	3	25	310
26	83	43	63	-2	2	0	0.02	M	M	5.9	22	210	M	M	1	3	33	210
27	86	41	64	-1	1	0	0.00	M	M	4.6	17	20	M	M	1		20	20
28	84	46	65	0	0	0	0.00	M	M	6.1	16	330	M	M	0		22	310
29	87	47	67	2	0	2	0.00	M	M	4.2	15	40	M	M	1		20	40
30	89	49	69	5	0	4	0.00	M	M	7.3	18	290	M	M	0		27	260

```
31  84  48  66   2   0   1 0.00    M    M 10.0 25 320   M    M   0 8      39 290
================================================================================
SM 2455 1344       133  24  0.94    M    204.7          M       48
================================================================================
AV 79.2 43.4                            6.6 FASTST   M    M   2    MAX(MPH)
                                  MISC ---->  # 35 170              # 51  200
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  BUTTE MT
                                          MONTH:    JULY
                                          YEAR:     2016
                                          LATITUDE:   45 57 N
                                          LONGITUDE: 112 30 W

[TEMPERATURE DATA]       [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 61.3   TOTAL FOR MONTH:   0.94    1 = FOG OR MIST
DPTR FM NORMAL:  -1.9   DPTR FM NORMAL:   -0.41    2 = FOG REDUCING VISIBILITY
HIGHEST:    90 ON 19    GRTST 24HR  0.78 ON 10-11      TO 1/4 MILE OR LESS
LOWEST:     32 ON  7                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:    M          5 = HAIL
                        GRTST 24HR    M  ON   M    6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:  M  ON   M    7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]       [WEATHER - DAYS WITH]     9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:   5
MAX 90 OR ABOVE:   1    0.10 INCH OR MORE:   1
MIN 32 OR BELOW:   1    0.50 INCH OR MORE:   1
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.   133    CLEAR  (SCALE 0-3)  27
DPTR FM NORMAL    33    PTCLDY (SCALE 4-7)   3
TOTAL FM JUL 1   133    CLOUDY (SCALE 8-10)  1
DPTR FM NORMAL    33

[CDD (BASE 65) ]
TOTAL THIS MO.    24
DPTR FM NORMAL   -20     [PRESSURE DATA]
TOTAL FM JAN 1    47    HIGHEST SLP 30.23 ON 14
DPTR FM NORMAL    -4    LOWEST  SLP 29.65 ON 30

[REMARKS]
#FINAL-07-16#
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Explanation of the Preliminary Monthly Climate Data (F6) Product

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

000
CXUS55 KMSO 011207
CF6BTM
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: BUTTE MT
MONTH: AUGUST
YEAR: 2016
LATITUDE: 45 57 N
LONGITUDE: 112 30 W

TEMPERATURE IN F:							:PCPN:	SNOW:		WIND			:SUNSHINE:		SKY		:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
									12Z	AVG	MX	2MIN						
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR
1	82	39	61	-3	4	0	0.00	M	M	4.9	12	360	M	M	0		15	10
2	92	40	66	2	0	1	0.00	M	M	8.1	24	180	M	M	0		30	170
3	72	47	60	-4	5	0	0.00	M	M	11.1	24	310	M	M	0	8	32	320
4	80	37	59	-5	6	0	0.00	M	M	5.1	15	150	M	M	3		24	130
5	84	47	66	2	0	1	0.00	M	M	5.8	18	140	M	M	0		23	140
6	80	46	63	-1	2	0	0.03	M	M	6.8	24	290	M	M	2	3	37	170
7	76	40	58	-6	7	0	0.42	M	M	7.1	31	260	M	M	2	13	45	270
8	77	38	58	-6	7	0	T	M	M	4.7	22	210	M	M	2	3	30	210
9	72	43	58	-6	7	0	0.02	M	M	7.3	20	330	M	M	2	3	26	280
10	67	35	51	-12	14	0	0.00	M	M	7.6	20	320	M	M	0		26	330
11	73	37	55	-8	10	0	0.00	M	M	5.5	17	320	M	M	1		22	330
12	78	41	60	-3	5	0	0.00	M	M	6.1	16	330	M	M	2		22	20
13	82	41	62	-1	3	0	0.00	M	M	4.4	12	330	M	M	0		15	10
14	82	47	65	3	0	0	0.00	M	M	6.1	26	190	M	M	0		33	200
15	85	43	64	2	1	0	0.00	M	M	3.6	16	330	M	M	0		20	320
16	88	43	66	4	0	1	0.00	M	M	5.1	17	330	M	M	0		20	320
17	87	45	66	4	0	1	0.03	M	M	4.6	24	190	M	M	2	3	32	210
18	81	46	64	2	1	0	0.16	M	M	8.6	32	30	M	M	3	13	41	40
19	68	44	56	-5	9	0	0.00	M	M	5.6	16	150	M	M	5		22	340
20	80	34	57	-4	8	0	0.00	M	M	4.1	13	320	M	M	0		19	20
21	86	38	62	1	3	0	0.00	M	M	6.1	18	270	M	M	0		25	270
22	78	40	59	-2	6	0	0.00	M	M	9.3	25	340	M	M	1	8	34	250
23	69	36	53	-7	12	0	0.00	M	M	5.5	17	320	M	M	0		22	300
24	64	36	50	-10	15	0	0.00	M	M	5.9	18	10	M	M	4		24	10
25	67	30	49	-11	16	0	0.00	M	M	4.8	17	80	M	M	1		22	80
26	71	34	53	-6	12	0	0.00	M	M	4.5	15	310	M	M	1		19	320
27	79	39	59	0	6	0	0.00	M	M	5.1	18	230	M	M	1		28	220
28	78	46	62	3	3	0	0.00	M	M	6.2	20	220	M	M	2		32	280
29	85	38	62	4	3	0	0.00	M	M	6.4	20	90	M	M	0	8	26	80
30	87	45	66	8	0	1	0.00	M	M	4.8	21	100	M	M	2	8	25	80

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31  87  46  67   9   0   2    T    M    M  6.9 32 260   M    M   1 8      49 250
================================================================================
SM 2437 1261       165   7  0.66    M    187.7         M       37
================================================================================
AV 78.6 40.7                              6.1 FASTST   M    M   1    MAX(MPH)
                                 MISC ---->  # 32  30              # 49  250
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  BUTTE MT
                                          MONTH:    AUGUST
                                          YEAR:     2016
                                          LATITUDE:   45 57 N
                                          LONGITUDE: 112 30 W

[TEMPERATURE DATA]       [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 59.6   TOTAL FOR MONTH:   0.66    1 = FOG OR MIST
DPTR FM NORMAL:  -2.1   DPTR FM NORMAL:   -0.70    2 = FOG REDUCING VISIBILITY
HIGHEST:    92 ON  2    GRTST 24HR  0.42 ON  7- 7      TO 1/4 MILE OR LESS
LOWEST:     30 ON 25                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:    M          5 = HAIL
                        GRTST 24HR    M  ON   M    6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:  M  ON   M    7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]       [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:   5
MAX 90 OR ABOVE:   1    0.10 INCH OR MORE:   2
MIN 32 OR BELOW:   1    0.50 INCH OR MORE:   0
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.   165    CLEAR  (SCALE 0-3)  28
DPTR FM NORMAL    37    PTCLDY (SCALE 4-7)   3
TOTAL FM JUL 1   298    CLOUDY (SCALE 8-10)  0
DPTR FM NORMAL    70

[CDD (BASE 65) ]
TOTAL THIS MO.     7
DPTR FM NORMAL   -21    [PRESSURE DATA]
TOTAL FM JAN 1    54    HIGHEST SLP 30.31 ON 25
DPTR FM NORMAL   -25    LOWEST  SLP 29.73 ON 22

[REMARKS]
#FINAL-08-16#
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Explanation of the Preliminary Monthly Climate Data (F6) Product

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WFO Monthly/Daily Climate Data

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000
CXUS55 KMSO 011326
CF6BTM
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                           STATION:   BUTTE MT
                                           MONTH:     SEPTEMBER
                                           YEAR:      2016
                                           LATITUDE:   45 57 N
                                           LONGITUDE: 112 30 W
```

TEMPERATURE IN F:							:PCPN:	SNOW:		WIND			:SUNSHINE:		SKY		:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	12Z DPTH	AVG SPD	MX SPD	2MIN DIR	MIN	PSBL	S-S	WX	SPD	DR
1	83	52	68	10	0	3	0.01	M	M	7.6	39	170	M	M	3	38	47	170
2	68	45	57	0	8	0	0.11	M	M	5.0	17	310	M	M	5	1	24	310
3	65	39	52	-5	13	0	0.00	M	M	5.0	20	80	M	M	3		26	80
4	50	42	46	-10	19	0	0.19	M	M	6.7	18	190	M	M	10	1	25	190
5	52	34	43	-13	22	0	0.25	M	M	5.4	12	290	M	M	6	1	17	280
6	64	31	48	-8	17	0	T	M	M	5.1	17	280	M	M	5		23	280
7	63	42	53	-2	12	0	0.02	M	M	5.1	14	290	M	M	6		18	270
8	64	44	54	-1	11	0	T	M	M	12.0	28	280	M	M	5		36	290
9	64	33	49	-5	16	0	0.00	M	M	3.7	15	330	M	M	2	12	19	330
10	75	31	53	-1	12	0	0.00	M	M	5.9	20	270	M	M	0		27	290
11	68	37	53	-1	12	0	0.00	M	M	9.9	28	30	M	M	4		35	280
12	45	37	41	-12	24	0	0.00	M	M	8.5	17	20	M	M	10		22	30
13	57	32	45	-8	20	0	0.00	M	M	5.7	20	160	M	M	4	8	22	170
14	48	35	42	-11	23	0	0.26	M	M	2.3	10	150	M	M	6	1	12	150
15	67	37	52	0	13	0	0.00	M	M	4.7	18	290	M	M	5	12	24	320
16	70	32	51	-1	14	0	0.00	M	M	3.5	10	310	M	M	0		14	250
17	68	34	51	0	14	0	T	M	M	8.3	25	240	M	M	6		35	260
18	65	46	56	5	9	0	T	M	M	10.5	25	280	M	M	6		36	280
19	70	41	56	5	9	0	0.00	M	M	6.0	25	270	M	M	2		34	280
20	66	34	50	0	15	0	0.03	M	M	5.3	23	290	M	M	5	3	30	280
21	57	41	49	-1	16	0	0.02	M	M	8.7	21	160	M	M	7		27	140
22	49	44	47	-2	18	0	0.22	M	M	6.8	21	160	M	M	10	1	30	170
23	52	38	45	-4	20	0	0.11	M	M	7.9	15	310	M	M	8	1	19	300
24	55	33	44	-5	21	0	T	M	M	9.2	23	290	M	M	7		33	280
25	64	27	46	-2	19	0	0.00	M	M	5.0	20	310	M	M	2		26	320
26	74	33	54	6	11	0	0.00	M	M	3.5	10	340	M	M	0		14	320
27	78	34	56	9	9	0	0.00	M	M	3.8	14	300	M	M	0		17	310
28	75	36	56	9	9	0	0.00	M	M	7.2	17	170	M	M	0		21	170
29	77	37	57	10	8	0	0.08	M	M	4.8	17	170	M	M	2	3	25	150
30	73	40	57	11	8	0	0.02	M	M	4.3	14	260	M	M	1	3	22	150

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================================================================================
SM 1926 1121       422   3  1.32    M    187.4          M      130
================================================================================
AV 64.2 37.4                               6.2 FASTST   M    M   4    MAX(MPH)
                                 MISC ---->  # 39 170              # 47  170
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  BUTTE MT
                                          MONTH:    SEPTEMBER
                                          YEAR:     2016
                                          LATITUDE:   45 57 N
                                          LONGITUDE: 112 30 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 50.8   TOTAL FOR MONTH:   1.32    1 = FOG OR MIST
DPTR FM NORMAL:  -1.1   DPTR FM NORMAL:    0.32    2 = FOG REDUCING VISIBILITY
HIGHEST:    83 ON  1    GRTST 24HR  0.40 ON  4- 5      TO 1/4 MILE OR LESS
LOWEST:     27 ON 25                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:    M          5 = HAIL
                        GRTST 24HR    M  ON   M    6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:  M  ON   M    7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:  12
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:   6
MIN 32 OR BELOW:   5    0.50 INCH OR MORE:   0
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.   422    CLEAR  (SCALE 0-3)  11
DPTR FM NORMAL    29    PTCLDY (SCALE 4-7)  16
TOTAL FM JUL 1   720    CLOUDY (SCALE 8-10)  3
DPTR FM NORMAL    99

[CDD (BASE 65) ]
TOTAL THIS MO.     3
DPTR FM NORMAL     1    [PRESSURE DATA]
TOTAL FM JAN 1    57    HIGHEST SLP 30.54 ON 25
DPTR FM NORMAL   -24    LOWEST  SLP 29.73 ON  1

[REMARKS]
#FINAL-09-16#
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Explanation of the Preliminary Monthly Climate Data (F6) Product

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

965
CXUS55 KMSO 011437
CF6BTM
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: BUTTE MT
MONTH: OCTOBER
YEAR: 2016
LATITUDE: 45 57 N
LONGITUDE: 112 30 W

TEMPERATURE IN F:							:PCPN:	SNOW:		WIND			:SUNSHINE:		SKY		:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
									12Z	AVG	MX	2MIN						
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR
1	61	39	50	4	15	0	0.16	M	M	5.3	22	170	M	M	6	13	26	170
2	52	33	43	-3	22	0	0.07	M	M	3.1	12	170	M	M	6	1	16	160
3	44	37	41	-4	24	0	0.31	M	M	8.2	20	290	M	M	10	1	25	340
4	41	35	38	-7	27	0	0.20	M	M	2.9	13	280	M	M	9	1	17	270
5	47	32	40	-4	25	0	0.08	M	M	3.7	18	330	M	M	8	12	23	330
6	48	28	38	-6	27	0	0.00	M	M	3.9	16	200	M	M	7	1	22	210
7	53	24	39	-5	26	0	0.00	M	M	4.5	20	240	M	M	7		29	240
8	65	38	52	8	13	0	T	M	M	2.9	14	300	M	M	3	3	20	300
9	68	32	50	7	15	0	0.00	M	M	5.8	23	230	M	M	1		32	240
10	59	26	43	0	22	0	0.29	M	M	7.9	22	230	M	M	8	12	34	240
11	35	21	28	-14	37	0	0.01	M	M	3.6	10	320	M	M	6	1	12	310
12	54	15	35	-7	30	0	0.00	M	M	2.6	12	160	M	M	0		12	160
13	61	24	43	1	22	0	0.00	M	M	2.5	13	160	M	M	4		17	190
14	59	36	48	6	17	0	0.04	M	M	11.5	33	280	M	M	3		45	270
15	56	32	44	3	21	0	0.00	M	M	7.9	23	180	M	M	7		29	210
16	51	32	42	1	23	0	0.17	M	M	6.9	26	280	M	M	4	1	37	290
17	48	31	40	0	25	0	0.10	M	M	8.3	20	270	M	M	9	1	30	260
18	49	31	40	0	25	0	T	M	M	4.0	17	310	M	M	7		23	320
19	45	25	35	-5	30	0	T	M	M	3.9	15	320	M	M	6		20	320
20	54	24	39	-1	26	0	0.00	M	M	3.9	17	220	M	M	7		25	220
21	61	36	49	10	16	0	0.00	M	M	5.7	16	260	M	M	5		23	240
22	51	30	41	2	24	0	0.02	M	M	5.6	16	310	M	M	2		21	320
23	62	26	44	6	21	0	0.00	M	M	2.7	8	130	M	M	0		9	120
24	59	29	44	6	21	0	0.29	M	M	2.6	24	280	M	M	3	1	33	270
25	57	31	44	6	21	0	0.00	M	M	3.7	12	240	M	M	4	1	15	210
26	60	36	48	11	17	0	0.00	M	M	2.3	13	180	M	M	4		15	180
27	63	33	48	11	17	0	T	M	M	6.1	24	170	M	M	2		31	180
28	55	41	48	11	17	0	T	M	M	5.8	15	310	M	M	6		19	310
29	51	36	44	8	21	0	0.00	M	M	5.9	20	150	M	M	4		25	140
30	55	30	43	7	22	0	0.57	M	M	3.0	12	130	M	M	5	18	15	130

```
31  46  38  42   7  23   0    T    M    M 11.2 24 250   M    M   7        36 250
================================================================================
SM 1670  961       692   0  2.31    M    157.9          M      160
================================================================================
AV 53.9 31.0                               5.1 FASTST   M    M   5    MAX(MPH)
                                  MISC ---->  # 33 280              # 45  270
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  BUTTE MT
                                          MONTH:    OCTOBER
                                          YEAR:     2016
                                          LATITUDE:   45 57 N
                                          LONGITUDE: 112 30 W

[TEMPERATURE DATA]       [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 42.4   TOTAL FOR MONTH:   2.31    1 = FOG OR MIST
DPTR FM NORMAL:   1.6   DPTR FM NORMAL:    1.53    2 = FOG REDUCING VISIBILITY
HIGHEST:    68 ON  9    GRTST 24HR  0.57 ON 30-30      TO 1/4 MILE OR LESS
LOWEST:     15 ON 12                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:    M          5 = HAIL
                        GRTST 24HR    M  ON   M    6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:  M  ON   M    7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]       [WEATHER - DAYS WITH]     9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:  13
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:   8
MIN 32 OR BELOW:  19    0.50 INCH OR MORE:   1
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.   692    CLEAR  (SCALE 0-3)   7
DPTR FM NORMAL   -58    PTCLDY (SCALE 4-7)  20
TOTAL FM JUL 1  1412    CLOUDY (SCALE 8-10)  4
DPTR FM NORMAL    41

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL     0     [PRESSURE DATA]
TOTAL FM JAN 1    57    HIGHEST SLP 30.49 ON 19
DPTR FM NORMAL   -24    LOWEST  SLP 29.38 ON 16

[REMARKS]
#FINAL-10-16#
```

Explanation of the Preliminary Monthly Climate Data (F6) Product

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

372
CXUS55 KMSO 010900
CF6BTM
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: BUTTE MT
MONTH: NOVEMBER
YEAR: 2016
LATITUDE: 45 57 N
LONGITUDE: 112 30 W

	TEMPERATURE IN F:						:PCPN:	SNOW:		WIND			:SUNSHINE:		SKY		:PK WND	
1 DY	2 MAX	3 MIN	4 AVG	5 DEP	6A HDD	6B CDD	7 WTR	8 SNW	9 12Z DPTH	10 AVG SPD	11 MX SPD	12 2MIN DIR	13 MIN	14 PSBL	15 S-S	16 WX	17 SPD	18 DR
1	46	28	37	2	28	0	T	M	M	4.3	12	240	M	M	7		16	270
2	51	25	38	3	27	0	0.00	M	M	2.5	9	30	M	M	3	8	10	200
3	60	24	42	8	23	0	0.00	M	M	2.8	9	140	M	M	0		10	150
4	62	22	42	8	23	0	0.00	M	M	1.6	8	140	M	M	0		9	160
5	63	23	43	10	22	0	0.00	M	M	2.0	8	270	M	M	0		10	200
6	56	25	41	8	24	0	0.00	M	M	5.3	20	240	M	M	3		28	270
7	56	22	39	7	26	0	0.00	M	M	2.8	12	170	M	M	0		13	170
8	64	24	44	12	21	0	0.00	M	M	2.6	9	180	M	M	0		10	180
9	67	26	47	16	18	0	0.00	M	M	2.5	10	260	M	M	0		13	300
10	60	23	42	11	23	0	0.00	M	M	4.1	15	170	M	M	0		17	180
11	64	23	44	14	21	0	0.00	M	M	1.8	7	140	M	M	0		8	140
12	61	25	43	13	22	0	0.00	M	M	5.0	17	250	M	M	3		25	210
13	54	37	46	17	19	0	0.00	M	M	5.1	18	260	M	M	5		25	260
14	54	38	46	17	19	0	0.00	M	M	7.1	23	240	M	M	5		32	230
15	50	32	41	13	24	0	0.34	M	M	5.7	23	330	M	M	9	1	30	160
16	36	23	30	2	35	0	T	M	M	5.1	18	320	M	M	6	1	23	310
17	33	18	26	-1	39	0	0.00	M	M	6.9	15	320	M	M	8		19	300
18	33	11	22	-4	43	0	T	M	M	4.2	14	160	M	M	2		15	150
19	44	23	34	8	31	0	0.00	M	M	3.9	17	190	M	M	6		22	190
20	50	26	38	13	27	0	0.00	M	M	3.7	14	170	M	M	4		16	170
21	43	22	33	8	32	0	0.00	M	M	4.1	14	320	M	M	1		18	320
22	42	20	31	7	34	0	0.00	M	M	2.1	10	330	M	M	3		13	190
23	39	23	31	7	34	0	0.02	M	M	4.4	26	300	M	M	8	1	37	290
24	37	13	25	2	40	0	0.00	M	M	5.1	12	200	M	M	2		16	210
25	43	20	32	9	33	0	0.00	M	M	4.6	14	180	M	M	0		18	200
26	48	16	32	10	33	0	0.00	M	M	3.3	12	200	M	M	1		17	200
27	42	21	32	10	33	0	T	M	M	5.8	20	300	M	M	3		26	320
28	31	26	29	8	36	0	0.10	M	M	6.3	15	290	M	M	10	12	20	290
29	31	15	23	2	42	0	0.01	M	M	4.2	16	300	M	M	8		19	290
30	27	3	15	-5	50	0	T	M	M	2.6	8	330	M	M	8	1	9	330

```
================================================================================
SM 1447  677       882   0  0.47    M    121.5          M      105
================================================================================
AV 48.2 22.6                               4.0 FASTST   M    M   4    MAX(MPH)
                                 MISC ---->  # 26 300                # 37  290
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  BUTTE MT
                                          MONTH:    NOVEMBER
                                          YEAR:     2016
                                          LATITUDE:   45 57 N
                                          LONGITUDE: 112 30 W

[TEMPERATURE DATA]       [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 35.4   TOTAL FOR MONTH:   0.47    1 = FOG OR MIST
DPTR FM NORMAL:   7.7   DPTR FM NORMAL:   -0.13    2 = FOG REDUCING VISIBILITY
HIGHEST:    67 ON  9    GRTST 24HR  0.34 ON 15-15      TO 1/4 MILE OR LESS
LOWEST:      3 ON 30                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:    M          5 = HAIL
                        GRTST 24HR    M  ON   M    6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:  M  ON   M    7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]       [WEATHER - DAYS WITH]     9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   3    0.01 INCH OR MORE:   4
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:   2
MIN 32 OR BELOW:  28    0.50 INCH OR MORE:   0
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.   882    CLEAR  (SCALE 0-3)  17
DPTR FM NORMAL  -237    PTCLDY (SCALE 4-7)   9
TOTAL FM JUL 1  2294    CLOUDY (SCALE 8-10)  4
DPTR FM NORMAL  -196

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL     0     [PRESSURE DATA]
TOTAL FM JAN 1    57    HIGHEST SLP M ON M
DPTR FM NORMAL   -24    LOWEST  SLP 29.53 ON 28

[REMARKS]
#FINAL-11-16#
```

Explanation of the Preliminary Monthly Climate Data (F6) Product

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

933
CXUS55 KMSO 021437
CF6BTM
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: BUTTE MT
MONTH: DECEMBER
YEAR: 2016
LATITUDE: 45 57 N
LONGITUDE: 112 30 W

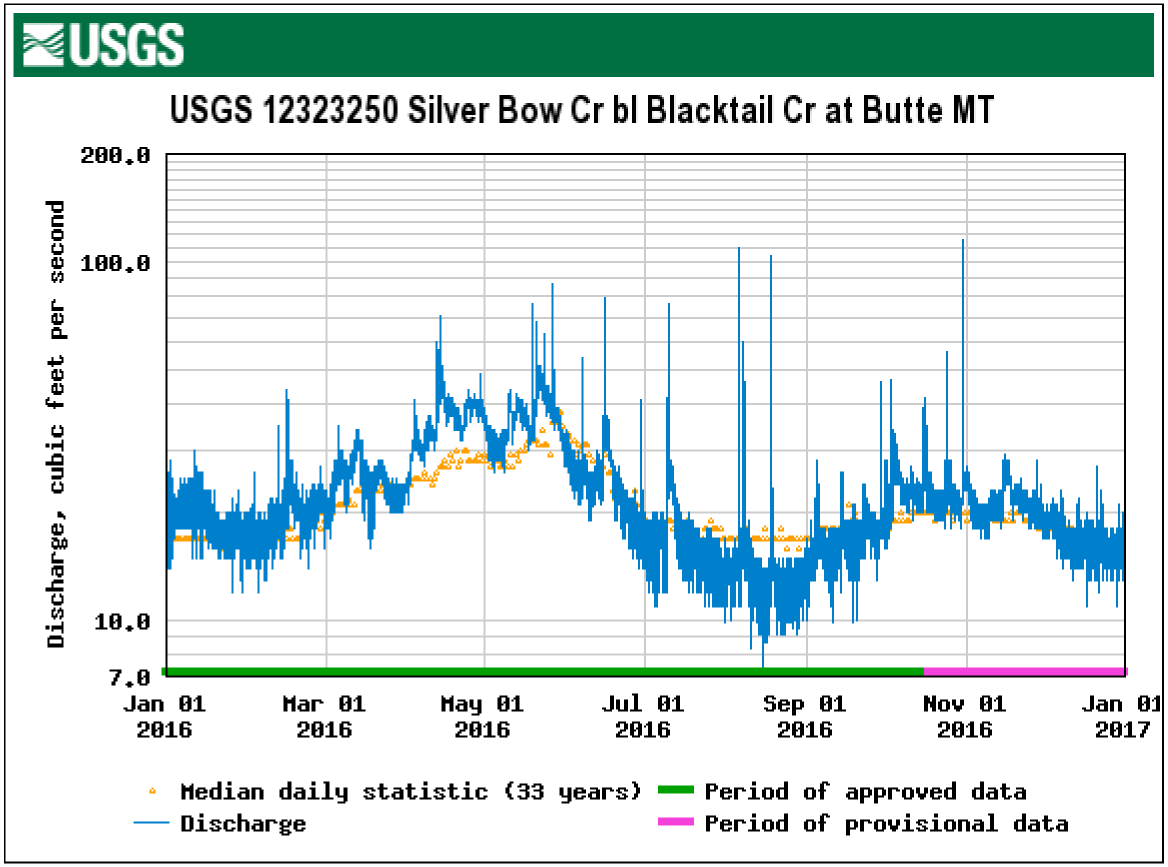
TEMPERATURE IN F: :PCPN: SNOW: WIND :SUNSHINE: SKY :PK WND

1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
									12Z	AVG	MX	2MIN						
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR
1	31	12	22	2	43	0	T	M	M	3.5	14	320	M	M	8	1	18	290
2	30	14	22	2	43	0	0.01	M	M	3.6	13	260	M	M	8	1	18	260
3	37	25	31	12	34	0	T	M	M	8.0	21	310	M	M	7	8	29	270
4	35	19	27	8	38	0	T	M	M	7.1	21	310	M	M	7	1	28	250
5	21	1	11	-7	54	0	0.00	M	M	7.3	21	310	M	M	7	8	33	310
6	12	-3	5	-13	60	0	T	M	M	7.7	22	160	M	M	6	18	26	150
7	7	-2	3	-15	62	0	T	M	M	2.1	14	160	M	M	10	8	15	160
8	12	-10	1	-17	64	0	T	M	M	4.1	18	170	M	M	3	18	21	170
9	21	0	11	-7	54	0	0.01	M	M	2.3	10	180	M	M	8	1	14	170
10	33	0	17	0	48	0	0.01	M	M	4.5	29	310	M	M	5	18	35	310
11	31	-1	15	-2	50	0	0.00	M	M	7.2	20	260	M	M	5		25	250
12	28	14	21	4	44	0	T	M	M	6.5	21	310	M	M	8		29	320
13	26	6	16	-1	49	0	T	M	M	7.7	20	270	M	M	8		25	280
14	17	-2	8	-9	57	0	0.05	M	M	1.4	7	170	M	M	3	1	8	170
15	20	4	12	-5	53	0	0.24	M	M	3.1	12	160	M	M	9	18	13	310
16	9	-27	-9	-26	74	0	0.02	M	M	6.6	13	290	M	M	9	18	17	290
17	-8	-37	-22	-39	87	0	0.00	M	M	2.2	7	160	M	M	3	18	9	180
18	19	-21	-1	-18	66	0	0.00	M	M	4.3	10	260	M	M	7	18	14	270
19	31	5	18	1	47	0	0.00	M	M	6.6	25	230	M	M	6	8	39	210
20	40	18	29	12	36	0	T	M	M	10.3	31	310	M	M	6	1	44	290
21	28	-6	11	-6	54	0	0.00	M	M	4.9	20	250	M	M	3		26	270
22	22	-15	4	-13	61	0	0.00	M	M	2.8	10	170	M	M	0		12	180
23	30	-8	11	-6	54	0	T	M	M	2.9	13	200	M	M	5	8	16	200
24	29	13	21	4	44	0	0.04	M	M	4.7	14	290	M	M	9	18	17	290
25	15	10	13	-4	52	0	0.06	M	M	4.2	10	300	M	M	10	18	14	280
26	21	-9	6	-11	59	0	T	M	M	2.7	12	330	M	M	3	128	13	330
27	27	6	17	0	48	0	T	M	M	7.7	20	190	M	M	7		24	190
28	26	-2	12	-5	53	0	T	M	M	8.3	20	270	M	M	3		28	240
29	27	-9	9	-9	56	0	0.00	M	M	2.4	9	260	M	M	3	8	17	100
30	42	8	25	7	40	0	0.00	M	M	9.5	24	280	M	M	5		37	300

```
31  22  -5   9  -9  56   0 0.00    M    M  4.0  9 170   M    M   0 18     11 320
================================================================================
SM  741   -2      1640   0  0.44    M    160.2          M      181
================================================================================
AV 23.9 -0.1                               5.2 FASTST   M    M   6    MAX(MPH)
                                 MISC ---->  # 31 310              # 44  290
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  BUTTE MT
                                          MONTH:    DECEMBER
                                          YEAR:     2016
                                          LATITUDE:   45 57 N
                                          LONGITUDE: 112 30 W

[TEMPERATURE DATA]       [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 11.9   TOTAL FOR MONTH:   0.44    1 = FOG OR MIST
DPTR FM NORMAL:  -5.5   DPTR FM NORMAL:   -0.07    2 = FOG REDUCING VISIBILITY
HIGHEST:    42 ON 30    GRTST 24HR  0.29 ON 14-15      TO 1/4 MILE OR LESS
LOWEST:    -37 ON 17                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:    M          5 = HAIL
                        GRTST 24HR    M  ON   M    6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:  M  ON   M    7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]       [WEATHER - DAYS WITH]     9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:  26    0.01 INCH OR MORE:   8
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:   1
MIN 32 OR BELOW:  31    0.50 INCH OR MORE:   0
MIN  0 OR BELOW:  17    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.  1640    CLEAR  (SCALE 0-3)   6
DPTR FM NORMAL   166    PTCLDY (SCALE 4-7)  19
TOTAL FM JUL 1  3934    CLOUDY (SCALE 8-10)  6
DPTR FM NORMAL   -30

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL     0     [PRESSURE DATA]
TOTAL FM JAN 1    57    HIGHEST SLP 30.67 ON 29
DPTR FM NORMAL   -24    LOWEST  SLP 29.60 ON 24

[REMARKS]
#FINAL-12-16#
```

APPENDIX J

Streamflow Statistics


USGS
USGS 12323250 Silver Bow Cr bl Blacktail Cr at Butte MT
Discharge, cubic feet per second
200.0
100.0
10.0
7.0
Jan 01 2016
Mar 01 2016
May 01 2016
Jul 01 2016
Sep 01 2016
Nov 01 2016
Jan 01 2017
Median daily statistic (33 years)
Discharge
Period of approved data
Period of provisional data