DESIGNATION OF A CORRECTIVE ACTION MANAGEMENT UNIT
Montana Pole Treating Plant, Butte, Montana
EPA ID No. MTD986073583

Date: April 5, 2019

Summary

The Montana Department of Environmental Quality (DEQ) is designating an approximately 9-acre portion of the Montana Pole and Treating Plant site (Montana Pole site) as a Corrective Action Management Unit (CAMU), in accordance with 40 CFR §264.552 as incorporated by reference in ARM 17.53.801.

Regulatory Background

The Resource Conservation and Recovery Act (RCRA), a federal statute, governs the identification, generation, transportation, treatment, storage and disposal of hazardous waste, and environmental cleanup at certain regulated facilities. The Montana Hazardous Waste Act (MHWA) grants authority to DEQ to adopt and administer a hazardous waste program pursuant to RCRA. DEQ is authorized by EPA under RCRA as the lead agency for the hazardous waste program. The Administrative Rules of Montana (ARM) Title 17, Chapter 53 incorporates by reference the relevant federal hazardous waste management standards found at 40 CFR Parts 260 through 279.

The main goal of RCRA and the MHWA is to prevent the release of hazardous waste and constituents through appropriate management and disposal, and to minimize the generation of process-related hazardous waste while promoting recycling and reuse. During a Superfund cleanup of contaminated sites, RCRA and MHWA substantive regulations also apply to cleanup waste and contaminated media that meet the regulatory definition of hazardous waste when those regulations are identified in a Superfund decision document.

Corrective Action Management Units (CAMUs) are special units created to facilitate treatment, storage, and disposal of hazardous wastes managed during cleanup, and to remove the disincentives to cleanup that hazardous waste regulations can sometimes impose. A CAMU is used only for managing CAMU-eligible wastes as part of implementing corrective action or cleanup at a facility. A CAMU must be located within the contiguous property where wastes to be managed in the CAMU originated.

A CAMU is designated by EPA or a state authorized to implement a RCRA-equivalent hazardous waste program (in this case Montana DEQ). The CAMU designation for the Montana Pole site is based upon an analysis of whether the Montana Pole Site CAMU and CAMU-eligible wastes meet the requirements set out in 40 CFR § 264.552 as incorporated by reference in ARM 17.53.801. DEQ's CAMU analysis is discussed in detail below. For ease of reading, where the federal rule under the CFR is incorporated by reference into ARM, only the federal citation is used in this document.

Regulatory Evaluation

Per 40 CFR § 264.552 as incorporated by reference in ARM 17.53.801, the DEQ Director shall designate a CAMU after an analysis of, and in accordance with the following:

1. 40 CFR § 264.552(a) states that the CAMU must be located within the contiguous property under the control of the owner or operator where the wastes to be managed in the CAMU originated.

> The CAMU is located within the contiguous property where the F032 wastes to be managed originated. The contaminated soils were treated in a land treatment unit (LTU) within the contiguous property. The treated soils were off-loaded from the LTU back into the area where the waste was originally excavated, also within the contiguous property. DEQ, as lead agency, controls the property currently.

2. 40 CFR § 264.552(a)(1) states that the wastes to be disposed of must be CAMU-eligible.

> The treated F032 soil located within the Montana Pole site is a CAMU-eligible waste because it is a solid (i.e., non-liquid) hazardous remediation waste being managed as a part of cleanup. The treated soils are part of a remedial action and meet the treatment standards for waste placed in a CAMU.

3. 40 CFR § 264.552(a)(3) prohibits the placement of liquids in CAMUs.

> The waste to be placed on the CAMU is soils containing F032 hazardous waste. No liquids are present in the soils.

4. 40 CFR § 264.552(c)(1) requires that the CAMU facilitate the implementation of a reliable, effective, protective and cost-effective remedy.

> The EPA-approved remedy, as reflected in the proposed 2019 Explanation of Significant Difference and anticipated in the 1994 Record of Decision, for this treated F032 contaminated soil is to place it in an approved location. The consolidation of the treated F032 contaminated soil is a reliable, effective, protective and cost-effective remedy:
>
> - The proposed final remedy reflected in the 2019 ESD includes covering and capping the treated F032 contaminated soil. This facilitates a reliable remedy element, since the designated section will be managed as a CAMU for perpetuity.
> - The CAMU, with an engineered cover that will be incorporated into the final cover, will support the effective long-term management of the contaminated soil.
> - Excavation of the soils will eliminate the potential exposure risk currently posed to human health in an industrial area and placement of the soils in the CAMU will further contribute to the protectiveness of human health and the environment because the material will be protectively managed under an engineered cover.

- The CAMU will support the cost-effectiveness of the selected remedy because of its proximity to the source of the contaminated soil (i.e., limited haul costs), and the avoidance of significant disposal costs at a permitted off-site disposal facility. The use of an engineered cover, when compared to hauling and disposing of over 200,000 cy of contaminated soil, is more cost effective.

5. 40 CFR § 264.552(c)(2) requires that waste management activities associated with the CAMU shall not create unacceptable risks to humans or to the environment from exposure to hazardous wastes or constituents.

> The CAMU will not create unacceptable risks to humans or to the environment from exposure to hazardous wastes or constituents because the CAMU design includes a cover which will be engineered to: reduce storm water infiltration and subsequent leaching, and eliminate direct contact by environmental receptors. In addition, the proposed location of the CAMU is and will remain restricted from public use.

6. 40 CFR § 264.552(c)(3) states that a CAMU shall be placed at a contaminated area of the facility unless placement of a CAMU at an uncontaminated area of the facility is more protective.

> The CAMU will be placed within the current footprint of the treated F032 contaminated soil, which is a contaminated area of the facility. This location is also the origin of the contaminated soils that were treated before placement back into the original source area.

7. 40 CFR § 264.552(c)(4) requires that areas of the CAMU where waste is to remain in place after the closure of the CAMU be managed and contained so as to minimize future releases, to the extent practicable.

> The CAMU will be located on approximately 9 acres at the Montana Pole site. The engineered cover for the CAMU will be designed and managed by DEQ according to Montana hazardous waste requirements, which will minimize future releases. The CAMU monitoring and maintenance requirements will be incorporated into the Operation and Maintenance Plan (O&M Plan) for the Facility.

8. 40 CFR § 264.552(c)(5) requires that the CAMU will expedite the timing of remedial activity implementation, when appropriate and practicable.

> The designation of a CAMU will expedite the timing of Phase 4 and Phase 6 in the Montana Pole Record of Decision (ROD) remedial activity implementation as the final off-load of treated F032 contaminated soil is available immediately and easily accessible. If a CAMU is not designated, this remedial activity will be delayed until a comparable, cost-effective and equally protective waste disposal option is identified which could take considerable time.

9. 40 CFR § 264.552(c)(7) states that the CAMU shall, to the extent practicable, minimize the land areas of the facility upon which wastes will remain in place after the closure of the CAMU.

> The CAMU will minimize the land areas of the facility upon which wastes will remain in place after the closure of the CAMU. Consolidation of the contaminated soil will amount to a 9-acre area within the footprint of the 36-acre southern portion of the Montana Pole site.

10. 40 CFR § 264.552(d) requires that sufficient information be provided to the DEQ Director:

a. on the origin of the waste and how it was subsequently managed.

   The pole plant treated wood for industrial uses, such as telephone poles, bridge timbers and mine structures. For most of the plant's lifetime, pentachlorophenol (PCP) mixed with petroleum oil was added to the wood products to slow decay. Plant activities and practices led to the uncontrolled release of the treatment materials. Per the ROD, the contaminated soil found at the site was treated through biological land treatment in the on-site LTU and lifts of the treated soils were off-loaded from the LTU back into the original excavation areas.

b. on whether the waste was listed or identified as hazardous at the time of disposal and/or release.

   EPA listed wood preserving wastes as hazardous waste on December 6, 1990. Contaminated soil at Montana Pole is the result of releases from wood treating operations that ran from 1946 to 1984. Releases from wood treating operations at Montana Pole are not considered a hazardous waste because the releases occurred prior to designation of the F032 listing. However, the F032 hazardous waste listing does apply to soils contaminated with wood treating wastes that were, or are, being actively managed and disposed during remedial activities after the date of the listing designation.

c. on whether the disposal and/or release of the waste occurred before or after the land disposal restrictions of 40 CFR Part 268 were in effect for the waste listing or characteristic.

   The effective date for land disposal restrictions for F032 was May 12, 1999 (40 CFR 268.30(b)). Releases of wood treating wastes at Montana Pole occurred prior to the effective date for F032. Active management and disposal of soils containing F032 have and will occur after the effect date for land disposal restrictions of F032 wastes.

11. 40 CFR § 264.552(e)(1) states that the areal configuration of the CAMU will be specified.

The CAMU placement is expected to be over an area that is approximately 9 acres in size.

13. 40 CFR § 264.552(e)(2) states that CAMU-eligible waste management shall include the specification of applicable design, operation, treatment and closure requirements.

The design includes placement and compaction of the contaminated soil within the CAMU area (see Figure 1). Placement will be in maximum 8-inch loose lifts and compacted. The sides will not exceed a 1:4 slope. No treatment of contaminated soils will occur in the CAMU. The CAMU will be closed according to the closure requirements in 40 CFR § 264.552(e)(6) and an operation and maintenance (O&M) plan will define the requirements for corrective action during closure and post-closure of the CAMU. It is expected that CAMU cover requirements will be fully integrated into the final cover design, and maintained in accordance with the O&M plan.

14. 40 CFR § 264.552(e)(3)(ii)(B) states that alternative design requirements may be approved to include a design without a liner when the CAMU is to be established in an area with existing significant levels of contamination and if the design would still prevent contaminant migration from the unit that would exceed long-term remedial goals.

> The groundwater at Montana Pole is part of a larger Controlled Groundwater Area (CGWA) in place for the Butte Alluvial and Bedrock Site Groundwater Closure Area. The CGWA was placed to meet the requirements of the Records of Decision or Consent Decrees for the Butte Priority Soils Operable Unit (BPSOU), Butte Mine Flooding Operable Unit (BMFOU) and Montana Pole Site. The PCP plume is a remnant of the historic operation and remains because of soils that were too deep for practical excavation. The removal and treatment of contaminated soils, combined with pump and treat by the water treatment plant, have resulted in reduced PCP concentrations in the groundwater, as well as a shrinking plume. Therefore, the design does not include a liner because the CGWA and shrinking plume are protective. Also, the engineered cover proposed for the final cap is designed to prevent the infiltration of surface water therefore reducing the potential of leaching to groundwater of F032 waste from the contaminated soil.

15. 40 CFR §264.552(e)(4) requires minimum treatment standards for CAMU-eligible wastes.

Treatment standards analysis:

(e)(4)(i): determination of principal hazardous constituents (PHCs)

The Montana Pole and Treating Plant Record of Decision (ROD) lists:

- PCP,
- polynuclear aromatic hydrocarbons (PAHs): anthracene; benzo(a)pyrene; benzo(a)anthracene; benzo(k)fluoranthene; benzo(b)fluoranthene; dibenzo(a,h)anthracene; indeno(1,2,3-c,d)pyrene; phenanthrene; chrysene; fluorene; naphthalene; pyrene; and
- dioxins (polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans), which include: tetrachlorodibenzo-p-dioxins; tetrachlorodibenzofurans; pentachlorodibenzo-p-dioxins; pentachlorodibenzofurans; hexachlorodibenzo-p-dioxins; hexachlorodibenzofurans

These contaminants are found in the waste materials found at the site, and identified in the ROD as listed hazardous waste (F032 and F034). The ROD also identifies the CAMU rule as applicable with regard to placement of treated waste, if treatment levels specified in the ROD cannot be met after treatment.

(e)(4)(ii): PHCs must include all constituents in the waste that would be subject to LDRs (basis of listing)

The treated soils that would be subject to treatment requirements per 40 CFR Part 268 and the Montana Pole ROD contain all of the F032 and F034 PHCs except the following listed contaminants:

Phenolic compounds other than PCP:

- 2-4-dimethyl phenol
- phenol
- 2,3,4,6-tetrachlorophenol
- 2,4,6 trichlorophenol

The group of phenolic compounds were sampled during the RI, and were screened out during the risk assessment process. These compounds were omitted because the maximum detections were all below the risk-based concentrations for the site. Therefore, these compounds were not sampled during soil treatment. Treated soil concentrations for these compounds are a data gap that will be addressed before proceeding with construction of the CAMU.

Metals:

- Arsenic
- chromium

In the ROD arsenic and chromium are identified as potentially being "material derived during extraction and beneficiation processes." Therefore, these metals may be "excluded from Subtitle C under the mining waste (Bevill) exclusion."

(e)(4)(iii) and (iv): treatment analysis of PHCs

The dioxins/furans and PAH PHCs in the treated soils meet the treatment standards determined in accordance with paragraph (e)(4)(iv)(A) and (C). All but one sample for pentachlorophenol PHCs in the treated soils meet the treatment standards determined in accordance with paragraph (e)(4)(iv)(A) and (C). All of the dioxins/furans F032 congeners and all of the F032 PAHs are less than 10 times the Universal Treatment Standard (UTS); 40 CFR § 264.552(e)(4)(iv)(A) and (C). For pentachlorophenol, 95% (95/100 samples) of the treated soil samples are less than 10 times the Universal Treatment Standard, 40 CFR § 264.552(e)(4)(iv)(C). The other five samples exceed the Alternative Treatment Standard (ATS; less than 10 times the UTS), but four of those samples were below the 90 percent reduction in total PHC concentrations. Attachment 1 contains tables for the analysis of each PHC.

(e)(4)(v): adjusted standards for those constituents that don't meet the treatment analysis of (e)(4)(iii) and (iv)

The 90 percent reduction target for PCP at Montana Pole is 151 mg/kg, and is based on the highest pentachlorophenol concentration found in surface or subsurface soil during the RI. The one PCP exceedance of the 90 percent target concentration was 159 mg/kg. This one sample does not represent the effectiveness of the PCP treatment and exists as an outlier to the rest of the treated soils PCP concentrations. DEQ performed a ProUCL analysis of the 100 performance samples taken for the treated soils. The 95 percent Upper Confidence Level for the PCP treated soil is 30.99 mg/kg, which verifies that the majority of the performance concentrations represent an overall effectiveness well below the 90 percent reduction target of 151 mg/kg. Attachment 2 contains the outcome for the ProUCL analysis.

16. 40 CFR § 264.552(e)(5) requires that groundwater monitoring and corrective action requirements are sufficient to (1) detect and characterize existing releases of hazardous constituents in groundwater from sources located within the CAMU, (2) detect and characterize future releases from wastes that will remain in the CAMU after closure, and (3) require notification to EPA and corrective action as necessary to protect human health and the environment for releases to groundwater from the CAMU.

The O&M Plan being developed by DEQ will define the requirements for corrective action performance groundwater monitoring for the CAMU at the Site including appropriate notification and the necessary protective corrective actions based on detection and characterization of a release. Also, performance groundwater monitoring of the existing PCP plume has been conducted in the area of the CAMU for over 20 years. The existing ground water monitoring equipment therefore can be used to successfully monitor for releases from the CAMU as part of the O&M Plan.

17. 40 CFR § 264.552(e)(6) establishes the requirements for closure and post-closure of CAMUs.

(e)(6)(i): Closure of corrective action management units shall:

(A) Minimize the need for further maintenance; and

The design for the offload closure currently considers two options: earthen engineered cover, or a solar array built on an earthen engineered cover. Both will be designed to minimize maintenance to the maximum extent possible. A solar array will require access for maintenance, but may allow for cost savings that allow longer term operation of the groundwater treatment plant should that be necessary. DEQ and EPA will determine the cost-benefit of additional access and maintenance for a solar array.

(B) Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, for areas where wastes remain in place, post-closure escape of hazardous wastes, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground, to surface waters, or to the atmosphere.

Treated soils with contaminants of concern (COCs) at concentrations above site cleanup levels are considered wastes that will remain in place, but the CAMU design will meet the control, minimize or eliminate" requirement of (i)(B) because all of the treated wastes will be consolidated and placed in the CAMU area. Specifically, the design for the CAMU incorporates a non-permeable liner, which will cover all wastes, preventing direct contact, wind or surface water erosion, and leaching to surface water or groundwater from infiltration. The impermeable liner will be covered with an earthen engineered cover that will prevent photo-decay of the impermeable liner and establish vegetation to prevent erosion. Some untreated wastes remain in place at depths too deep to excavate at the time of the removal portion of the remedy. These wastes are already in contact with groundwater in the 'smear zone' beneath the CAMU footprint, but should be unaffected by direct infiltration in the CAMU footprint due to the cover. The groundwater that has contacted the wastes will be captured and treated through the current groundwater treatment system.

(e)(6)(ii) Requirements for closure of CAMUs shall include the following, as appropriate and as deemed necessary by the DEQ Director for a given CAMU:

(A) Requirements for excavation, removal, treatment or containment of wastes; and

Treated site soils and remaining untreated site soils containing PCP will be contained on-site in the CAMU. Dust control will be strictly enforced during relocation of the soils from the LTU to the CAMU. The Record of Decision (ROD) and Explanation of Significant Difference (ESD) already describe the excavation, removal, treatment or containment of wastes as approved by the EPA Regional 8 Administrator. Non-soil waste that has been in contact with F032 contaminated soils will be handled and disposed of in accordance with applicable RCRA regulations. The proposed ESD describes the rationale for containing the wastes and the design basis describes the rationale and plan for containment.

(B) Requirements for removal and decontamination of equipment, devices, and structures used in CAMU-eligible waste management activities within the CAMU.

Standard earth-moving equipment will be used to relocate the soils from the LTU to the CAMU and to remove the LTU liner and any waste-impacted soils beneath the liner that contain COC concentrations above site cleanup levels. The liner and other wastes that require cleaning prior to disposal in a RCRA Subtitle D landfill will be washed clean of soil with pressure washers prior to disposal. Wastes that cannot be decontaminated will be transported to a permitted RCRA Subtitle C facility for incineration or disposal. All construction and washing equipment that comes in contact with soils containing F032 waste will be required to be decontaminated with the pressure washers. Decontamination of equipment will be evaluated through collection and analysis of equipment blanks.

(e)(6)(iii) In establishing specific closure requirements for CAMUs under paragraph (e) of this section, the DEQ Director shall consider the following factors:

(A) CAMU characteristics;

The wastes in the CAMU will consist of treated and untreated site soils containing COCs as described above. The cap will be designed and engineered in such a way that the soils will be placed in the CAMU footprint and compacted in lifts to the design proctor and contoured to the designed lines and grades. The design will include a review of applicable design stability requirements, which the design will exceed with a given factor of safety. The compacted soils will be covered with an impermeable 40 mil HDPE liner, a geocomposite drainage net, and an earthen, vegetated engineered cover. Monitoring wells currently placed to evaluate plume boundaries will be extended up through the compacted lifts of waste and through the liner. The well perforations will be sealed at the liner to prevent infiltration at the well locations.

(B) Volume of wastes which remain in place after closure;

No surface wastes exceeding site cleanup goals for industrial use and/or protection to groundwater will be left in place after LTU closure. All surface wastes will be contained within the footprint of the LTU. Contaminated soil at depths too deep to excavate, at the time of the removal portion of the remedy, and located in the ‘smear zone will remain in place. Their locations are documented in the LTU Offload Design Investigation Report by Tetra Tech in 2017.

(C) Potential for releases from the CAMU;

Potential release scenarios would likely be caused by damage to the engineered cover, a flood that damages the CAMU, or a seismic event that causes sluffing of the engineered cover and underlying wastes. Institutional controls and regular maintenance will be used to prevent damage to the engineered cover. The impermeable liner and earthen engineered cover will prevent air or surface water erosion of the wastes. They will also prevent infiltration of surface water and subsequent leaching of wastes to groundwater. The final site design locates the CAMU outside of the 100-year floodplain that bisects the site. The CAMU is designed with maximum slopes of 4:1, which should be protective for all seismic events in the area. As long as the earthen engineered cover is maintained, the potential for release is minimal.

(D) Physical and chemical characteristics of the waste;

The wastes consist of unconsolidated site soils, including clayey sands, gravels, and crushed asphalt that have residual concentrations of the site COCs (PAHs, PCP, and dioxins). The wastes may also contain concentrations of metals above Regional Screening Levels (RSLs) due to previous ore processing near the site.

(E) Hydrogeological and other relevant environmental conditions at the facility which may influence the migration of any potential or actual releases; and

None of the designed actions associated with the creation of the CAMU and consolidation of the wastes will change the existing hydrogeologic or other migration regimes.

(F) Potential for exposure of humans and environmental receptors if releases were to occur from the CAMU.

The potential for exposure in the unlikely incident of a waste release from the CAMU is minimal. No residential areas exist in the surface flow path between the CAMU and the nearest surface water body, Silver Bow Creek. The groundwater treatment system captures and treats groundwater from downgradient of the CAMU. There is also a controlled groundwater area that restricts all groundwater use around the site. The engineered cover will prevent direct contact by site visitors and wildlife.

(e)(6)(iv) Engineered cover requirements:

(A) At final closure of the CAMU, for areas in which wastes will remain after closure of the CAMU, with constituent concentrations at or above remedial levels or goals applicable to the site, the owner or operator must cover the CAMU with a final cover designed and constructed to meet the following performance criteria, except as provided in paragraph (e)(6)(iv)(B) of this section:

(1) Provide long-term minimization of migration of liquids through the closed unit;

The engineered cover will include an upper 40 mil HDPE liner, geocomposite drainage net, and vegetated soil engineered cover that will prevent migration of liquids through the surface of the closed unit.

(2) Function with minimum maintenance;

The engineered cover will be designed to function with minimal maintenance. CAMU slopes are not steep and should not require regular significant maintenance.

(3) Promote drainage and minimize erosion or abrasion of the cover;

The engineered cover design meets EPA guidance with a minimum 3% slope on surface areas to promote drainage of surface water. A geocomposite drainage net installed over the liner will allow drainage of infiltrated water over the liner without failure of the overlying soil engineered cover. The CAMU will be bordered on all sides by stormwater control ditches to prevent flow onto the CAMU and contain any flow off the CAMU. Drainage water will be directed to an on-site stormwater containment area and will not be discharged from the site.

(4) Accommodate settling and subsidence so that the cover's integrity is maintained; and

The base of the CAMU and wastes within the CAMU will be compacted to 90-95% proctor to prevent settlement of wastes within the CAMU that could disrupt the cover.

(5) Have a permeability less than or equal to the permeability of any bottom-liner system or natural subsoils present.

The engineered cover design includes an impermeable HDPE liner that is less permeable than the sandy subsoils at the site.

(e)(6)(v) Post-closure requirements as necessary to protect human health and the environment, to include, for areas where wastes will remain in place, monitoring and maintenance activities, and the frequency with which such activities shall be performed to ensure the integrity of any cap, final cover, or other containment system.

Post closure requirements and monitoring activities to protect human health and the environmental to ensure the integrity of the cap for areas where waste remains in place will comply with 40 CFR Part 264, Subpart M as recommended in Appendix A of the ROD for Federal Action-Specific ARARs.

Conclusion

Consistent with Superfund law, DEQ as lead agency for the Montana Pole site is designating approximately 9 acres as a CAMU for use as a final repository for treated remediation wastes off-loaded as a remedial action under the *Montana Pole and Treating Plant Record of Decision, September 1993*. The information provided in this document and supporting documents fulfills the regulatory requirements for DEQ to consider in designating this CAMU. Based upon consideration of all information available at this time, DEQ has concluded that it is appropriate to designate this area as a CAMU.

Documents Relevant to this Decision

Montana DEQ, 1993. Montana Pole and Treating Plant Record of Decision, September 1993.

Montana DEQ, 2017. Fourth Five-Year Review Report for the Montana Pole and Treating Plant Site, Butte, Montana, May 2017.

Attachments

Attachment 1: PHC Tables

Attachment 2: PCP ProUCL Analysis Outcome

Figure

Figure 1: CAMU footprint in relationship to existing plume

Declaration

The CAMU designation is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant, appropriate to the remedial action to the extent practicable, and is cost effective. The CAMU designation will facilitate a remedy that utilizes permanent solutions and alternative treatment, or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

5/8/19
Date

[signature]
Shaun McGrath
Director
Department of Environmental Quality

Attachment 1
PHC Tables

Dioxins/Furans	**Maximum Concentration (ug/kg)**	*90% Reduction	ATS ug/kg	UTS ug/kg	Exceeds UTS	Range of Exceedances
2,3,7,8-TCDD	598	59.8	10	1	0/30	None
1,2,3,4,7,8-HxCDD	17.1	1.71	10	1	0/30	None
1,2,3,4,7,8-HxCDF	12.9	1.29	10	1	1/30	1.1
1,2,3,6,7,8-HxCDD	25	2.5	10	1	15/30	1.1 - 3.7
1,2,3,6,7,8-HxCDF	2.3	0.23	10	1	0/30	None
1,2,3,7,8,9-HxCDD	2	0.2	10	1	0/30	None
1,2,3,7,8,9-HxCDF	0.38	0.038	10	1	0/30	None
1,2,3,7,8-PeCDD	2	0.2	10	1	0/30	None
1,2,3,7,8-PeCDF	2	0.2	10	1	0/30	None
2,3,4,6,7,8-HxCDF	2.2	0.22	10	1	0/30	None
2,3,4,7,8-PeCDF	1.3	0.13	10	1	0/30	None
2,3,7,8-TCDF	0.421	0.0421	10	1	0/30	None
* 90 percent reduction is based on the highest concentration						
>UTS, but <ATS					16/360	

	Maximum Concentration (mg/kg)	*90% Reduction	ATS ug/kg	UTS ug/kg	Exceeds UTS	Exceeds ATS	Exceeds 90% Reduction	Maximum Exceedance
Pentachlorophenol	1,510	151	74	7.4	80/100	4/100	1/100	159
* 90 percent reduction is based on the highest concentration								
>UTS, but <ATS								

PAHs	Max Concentraiton (mg/kg)	*90% Reduction	ATS mg/kg	UTS mg/kg	Exceeds UTS	Range of Exceedances
Acenaphthene	457	45.70	34	3.4	3/60	4.1 - 4.9
Anthracene	13.4	1.34	34	3.4	0/60	None
Benzo (a) anthracene	64.9	6.49	34	3.4	0/60	None
Benzo (a) pyrene	9.13	0.91	34	3.4	2/60	3.46 - 6.28
Benzo (b) flouranthene	13.4	1.34	68	6.8	2/60	7.72 - 13.4
Benzo (k) flouranthene	9.13	0.91	68	6.8	0/60	None
Chrysene	4.53	0.45	34	3.4	0/60	None
Dibenzo (a,h) anthracene	116	11.60	82	8.2	0/60	None
Flourene	88.3	8.83	34	3.4	2/60	5.2 - 7.1
Indeno (1,2,3-cd) pyrene	83.4	8.34	34	3.4	0/60	None
Napthalene	284	28.40	56	5.6	0/60	None
Phenanthrene	181	18.10	56	5.6	3/60	6.7 - 22
Pyrene	40.4	4.04	82	8.2	0/60	None
* 90 percent reduction is based on the highest concentration						
>UTS, but <ATS					12/780	

Attachment 2
PCP ProUCL Analysis Outcome

Lognormal UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	ProUCL 5.12/26/2019 11:02:45 AM
From File	penta_mptp.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

[PCP]

General Statistics

Total Number of Observations	100	Number of Distinct Observations	85
		Number of Missing Observations	0
Minimum	1.31	Mean	24.83
Maximum	159	Median	18.3
SD	23.9	Std. Error of Mean	2.39
Coefficient of Variation	0.962	Skewness	2.926

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.974	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.263	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0801	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.0889	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Logged Statistics

Minimum of Logged Data	0.27	Mean of logged Data	2.862
Maximum of Logged Data	5.069	SD of logged Data	0.876

Lognormal Maximum likelihood Estimates (MLEs)

MLE Mean	25.68	MLE Standard Deviation	27.57
MLE Median	17.5	MLE Skewness	4.459
MLE Coefficient of Variation	1.074	80% MLE Quantile	36.57
90% MLE Quantile	53.75	95% MLE Quantile	73.89
99% MLE Quantile	134.2		

Lognormal Minimum Variance Unbiased Estimates (MVUEs)

MVUE Mean	25.54	MVUE SD	26.86
MVUE Median	17.43	MVUE SEM	2.589

Assuming Lognormal Distribution

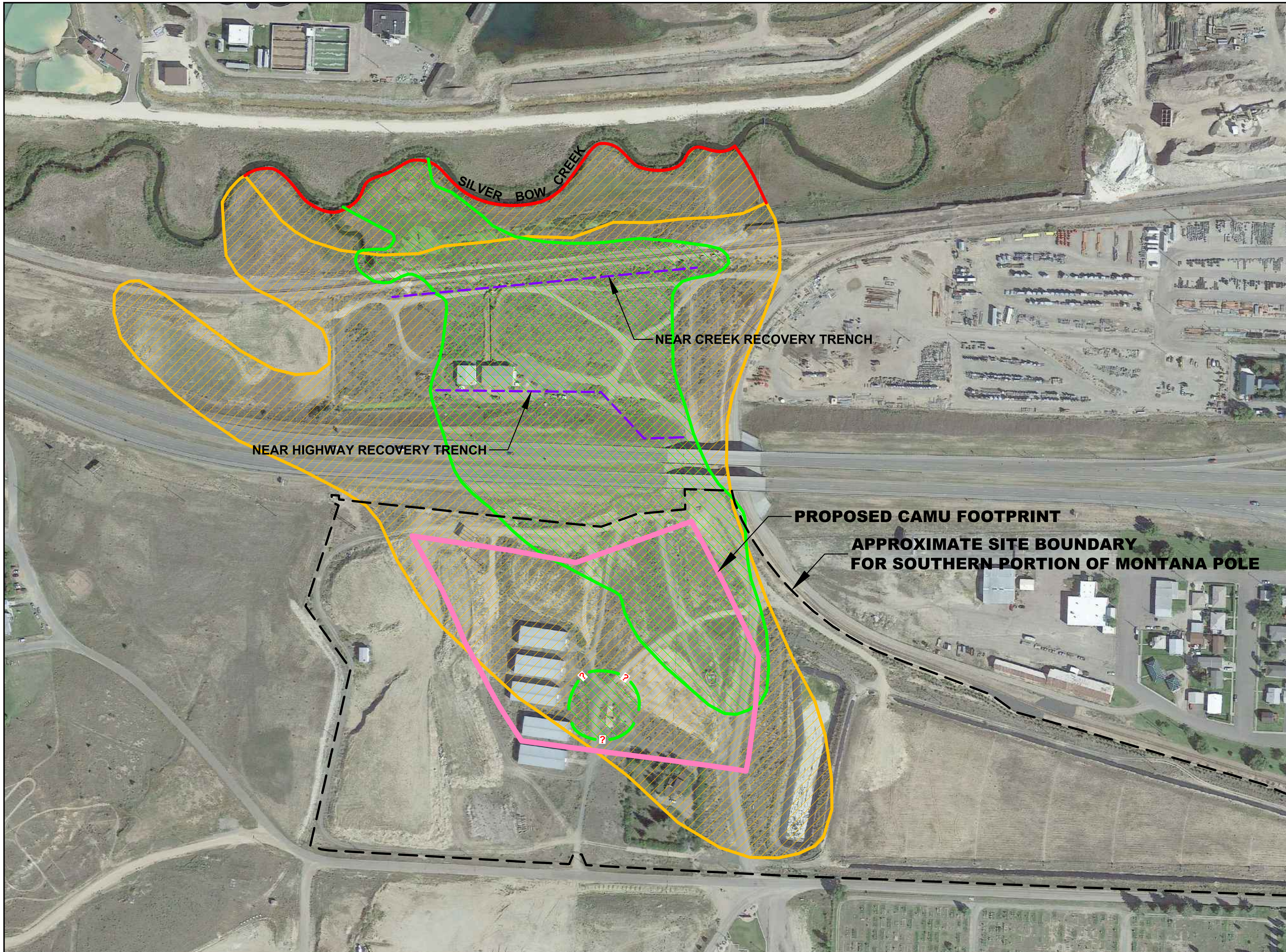
95% H-UCL	30.99	90% Chebyshev (MVUE) UCL	33.31
95% Chebyshev (MVUE) UCL	36.83	97.5% Chebyshev (MVUE) UCL	41.71
99% Chebyshev (MVUE) UCL	51.3		

Nonparametric Distribution Free UCLs

95% CLT UCL	28.77	95% Jackknife UCL	28.8
95% Standard Bootstrap UCL	28.74	95% Bootstrap-t UCL	30
95% Hall's Bootstrap UCL	30.42	95% Percentile Bootstrap UCL	29.21
95% BCA Bootstrap UCL	29.77		

	A	B	C	D	E	F	G	H	I	J	K	L
53	90% Chebyshev(Mean, Sd) UCL					32	95% Chebyshev(Mean, Sd) UCL					35.25
54	97.5% Chebyshev(Mean, Sd) UCL					39.76	99% Chebyshev(Mean, Sd) UCL					48.62
55												
56	**Suggested UCL to Use**											
57	95% H-UCL					30.99						
58												
59	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
60	Recommendations are based upon data size, data distribution, and skewness.											
61	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
62	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
63												
64	**ProUCL computes and outputs H-statistic based UCLs for historical reasons only.**											
65	**H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.**											
66	**It is therefore recommended to avoid the use of H-statistic based 95% UCLs.**											
67	**Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.**											
68												

Figure



LEGEND

- AUGUST 2017 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 2017 PCP PLUME AREA (16.7 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 (2017))

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 SOUTH OF THE 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

COMPARISON OF PLUME AREAS
1993 VERSUS AUGUST 10, 2017
WITH PROPOSED CAMU FOOTPRINT

TETRA TECH

Figure_PCP Comparison_1993 vs 2017-with CAMU Footprint.dwg - DWH - 10/17/2018