RECORD OF DECISION

MONTANA POLE AND TREATING PLANT NATIONAL PRIORITIES LIST SITE

BUTTE, MONTANA

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INTRODUCTION

The Montana Department of Health & Environmental Sciences and the Environmental Protection Agency (EPA) present the Record of Decision for the Montana Pole and Treating Plant site (the Site). The Record of Decision is based on the Administrative Record, Remedial Investigation/Feasibility Study, the Proposed Plan, the public comments received, including those from the potentially responsible parties, EPA comments, and other new information. The Record of Decision presents a brief outline of the Remedial Investigation/Feasibility Study, actual and potential risks to human health and the environment, and the selected remedy. The state followed EPA guidance[1] in preparation of the Record of Decision. The Record of Decision has the following three purposes:

1. Certify that the remedy selection process was carried out in accordance with the requirements of the Comprehensive Environmental, Response, Compensation and Liability Act (CERCLA), 42 U.S.C. 9601 *et seq.*, as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Contingency Plan (NCP);

2. Outline the engineering components and remediation goals of the selected remedy; and

3. Provide the public with a consolidated source of information about the history, characteristics, and risks posed by the conditions at the Site, as well as a summary of the cleanup alternatives considered, their evaluation, and the rationale behind the selected remedy.

The Record of Decision is organized into three distinct sections:

- The **Declaration** functions as an abstract for the key information contained in the Record of Decision and is the section of the Record of Decision signed by the Director of the Montana Department of Health and Environmental Sciences and the EPA Regional Administrator;

- The **Decision Summary** provides an overview of the site characteristics, the alternatives evaluated, and the analysis of those options. The Decision Summary also identifies the selected remedy and explains how the remedy

[1]Guidance on Preparing Superfund Decision Documents: The Proposed Plan, the Record of Decision, Explanation of Differences, the Record of Decision Amendment, Interim Final, EPA/540/G, July 1989.

fulfills statutory requirements; and

- The **Responsiveness Summary** addresses public comments received on the Proposed Plan, the Remedial Investigation/Feasibility Study and other information in the administrative record.

DECLARATION

SITE NAME AND LOCATION

Montana Pole and Treating Plant Site
Butte, Montana

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedy for the Montana Pole and Treating Plant site (the Site), in Butte, Montana. The Montana Department of Health & Environmental Sciences (MDHES), in consultation with the United States Environmental Protection Agency (EPA), selected the remedy in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the NCP. The EPA concurs and adopts the selected remedy. The attached index identifies classes of documents or records that comprise the administrative record upon which the selection of the remedial action is based.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

This is the final action for the only operable unit for the Site. The operable unit includes all known sources and contaminated media at the Site. This action addresses the principal threats remaining and provides for treatment of contaminated soils and groundwater. Some treatment residuals and soils contaminated at lower levels will remain on-site, such that the Site will require long-term management.

The principle contaminants of concern at the Site are pentachlorophenol (PCP), polynuclear aromatic hydrocarbons (PAHs), polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans. This Record of Decision establishes cleanup levels for these and all other contaminants of concern at the Site. The major components of the selected remedy include:

1. Excavation of contaminated soils from accessible areas of the site, to the extent practicable. The volume of soils is estimated to be approximately 208,000 cubic yards;

2. Treatment of excavated soils (208,000 cubic yards approximately) and previously removed soils (10,000 cubic yards approximately) by above ground biological treatment;

3. In-place biological treatment of contaminated soils below the depth of excavation before backfilling;

4. Backfill of excavated and treated soils into excavated areas if possible, surface grading and revegetation;

5. Soil flushing of inaccessible soils areas (principally underlying Interstate 15/90) in order to recover hazardous substances;

6. Containment of contaminated groundwater and LNAPL using physical and/or hydraulic barriers (as determined during remedial design) in order to prevent the spread of contaminated groundwater and LNAPL and to limit releases of contamination into Silver Bow Creek;

7. Treatment of extracted groundwater using the present EPA water treatment plant (which consists of oil/water separation followed by granulated activated carbon treatment). The ultimate design of the groundwater treatment system (as determined during remedial design) may include the addition of biological means or ultraviolet oxidation (UV/oxidation) to maximize cost effectiveness of the treatment system. Treatment will meet standards for discharge or reinjection, as appropriate;

8. Discharge of extracted, treated groundwater into Silver Bow Creek and/or reinjection of extracted, treated groundwater into the aquifer (as determined during remedial design);

9. Enhanced *in-situ* biological treatment of contaminated groundwater, inaccessible contaminated soils areas and contaminated soils not recovered by excavation;

10. Treatment of contaminated site debris and equipment by decontamination followed by disposal of these materials in a licensed off-site landfill;

11. Treatment of contaminated oils and sludges in a licensed off-site incinerator;

12. Additional institutional controls preventing access to contaminated soils and groundwater; and

13. Groundwater monitoring to determine movement of contaminants and compliance with remedial action requirements.

Both soils and groundwater will be remediated at the Site. Soils will be excavated from four general areas: surface soil hot spot areas, surface and subsurface soils in the former plant process area, surface and subsurface soils along the historic drainage ditch running from the former plant process area to Silver Bow Creek and subsurface soils near the groundwater table which have been contaminated by floating wood treating product. The selected treatment technology for contaminated soils is above ground biological treatment. Some contaminated soils and associated wood treating fluid will remain in place due to inaccessibility and limits of excavation technology. These contaminated soils will be treated in place by in situ biological degradation.

Contaminated groundwater and any residual woodtreating fluids left after excavation, will be contained from further migration using hydraulic and/or physical barriers. To create hydraulic containment of contaminated groundwater, some contaminated water will be extracted, treated and discharged to Silver Bow Creek. Other extracted and treated water will be reinfiltrated on-site to assist in hydraulic containment, flushing of contaminated areas and in situ biological degradation. Extracted groundwater will be treated above ground in the water treatment plant constructed at the site by EPA. This facility presently consists of oil/water separation and granulated activated carbon treatment. The ultimate design of the groundwater treatment system may include the addition of biological means or ultraviolet oxidation (UV/oxidation) to maximize cost effectiveness of the treatment system.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy uses permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable and satisfies the preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Because this remedy may result in hazardous substances remaining on-site above health based levels, the five year review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection to human health and the environment.

Bob Robinson, Director
Montana Department of Health & Environmental Sciences

Date 9/21/93

Jack W. McGraw, Acting Regional Administrator
Environmental Protection Agency, Region VIII

Date 9/21/93

DECISION SUMMARY

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirements
ARCO	Atlantic Richfield Company
AWQC	Ambient Water Quality Criteria
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
DNAPL	Dense Non-Aqueous Phase Liquid
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
FS	Feasibility Study
GAC	Granulated Activated Carbon
HI	Hazard Index
LAO	Lower Area One
LNAPL	Light Non-Aqueous Phase Liquid
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDHES	Montana Department of Health and Environmental Sciences
MPTP	Montana Pole and Treating Plant
NCP	National Contingency Plan
OSWER	Office of Solid Waste and Emergency Response
PA/SI	Preliminary Assessment/Site Inspection
PAH	Polynuclear Aromatic Hydrocarbon
PCDD	Polychlorinated dibenzo-p-dioxins
PCDF	Polychlorinated dibenzofurans
PCP	Pentachlorophenol
PRAG	Preliminary Remedial Action Goal
PRP	Potentially Responsible Party
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RfD	Reference Dose
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
TCDD	Tetrachlorodibenzo(p)dioxin
TEF	Toxicity Equivalence Factor
TPH	Total Petroleum Hydrocarbons
UV	Ultraviolet (light)
VOC	Volatile Organic Carbon

I. SITE NAME, LOCATION AND DESCRIPTION

Montana Pole and Treating Plant
Butte, Montana

The Montana Pole and Treating Plant site is located at 202 West Greenwood Avenue, on the western edge of Butte, Montana, in the southeast quarter of Section 24, T3N, R8W (see Figures 1 and 2). Generally, the site is bordered on the north by Silver Bow Creek, on the south by Greenwood Avenue, on the west by a former smelter site and on the east by a railroad right-of-way. U.S. Interstate 15/90 runs across the site in an east-west direction and partitions the site into a northern and a southern section. Portions of the Site lie within the 100 year floodplain. The Lower Area One (LAO) Operable Unit of the Butte/Silver Bow Creek Superfund site overlaps the Site on the north.

The Site is located in a mixed land use area. Much of the land in the vicinity of the Site has been used industrially, usually associated with past and present mining activities, though commercial and residential areas are immediately adjacent to the Site. Two neighborhoods are within a quarter mile of the site. There is one residence, an auto body shop and an architect's office located on site. Groundwater use in the area is limited. In the residential area east of the site, there is one well which is currently being used for domestic purposes. The Mount Moriah cemetery south and upgradient of the site uses groundwater for lawn watering.

II. SITE HISTORY

The Montana Pole and Treating Plant operated as a wood treating facility from 1946 to 1984. During most of this period, a solution of about five 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, and related ancillary facilities. In April 1947, the first load of treated timbers was shipped off-site. 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 timber treatment production efficiency. A second retort, which was 66 feet long with a 7-foot diameter, was installed around 1956. The retorts were used both to dry green timber using the Boulton process, and to pressure treat timber with a petroleum/pentachlorophenol (PCP or penta) mixture. Drying timber by the Boulton process generated steam which was condensed. The condensate was discharged to two hot wells where the condensate partially separated into an oil and water phase. The water phase from the hot wells was reportedly discharged into an on-site unlined drainage ditch which flowed northward toward Silver Bow Creek. On-site sedimentation ponds were also apparently used for waste disposal purposes.

The retorts and butt treatment vats were in continuous operation until May 1969. 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 which 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. The west butt treatment vat was not destroyed by the fire and was thereafter used for some timber treatment and mixing the petroleum/PCP product used in the retorts. Petroleum/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, on-site tanks were not ruptured as a result of the fire.

A small on-site sawmill was constructed in the fall of 1978 and was fully operational by the fall of 1979. Additionally, in response to implementation of the Resource Conservation and Recovery Act (RCRA), a closed-loop process water system was constructed in 1980. The primary function of this system was to eliminate overland discharges of Boultonizing water (generated from the drying of green timber). The closed-loop water recovery system operated by collecting wastewater in storage tanks, recirculating this water through the condensing system, and evaporating excess water using aeration sprays.

On May 17, 1984, the Montana Pole and Treating Plant ceased operations.

Enforcement Actions

In March 1983, a citizen filed a complaint concerning oil seeping into Silver Bow Creek near the Montana Pole facility. MDHES investigated the complaint and discovered an oil seep on the south side of Silver Bow Creek directly downgradient from the Montana Pole facility. Further investigation of the site revealed oil-saturated soils adjacent to the creek and on Montana Pole property. Subsequent sampling confirmed the presence of PCP, polycyclic aromatic hydrocarbons (PAHs), and dioxins/furans in site soils and oil samples. MDHES and EPA completed a preliminary assessment and site inspection (PA/SI) followed by a Hazard Ranking Score in July 1985. The Montana Pole facility was included on the National Priority List for Superfund sites on July 22, 1987 (Fed. Reg. Vol. 52, 140 Pg. 17623).

In July 1985, the EPA Emergency Response Branch began conducting a removal action on the site to minimize impacts to Silver Bow Creek and to stabilize the site. EPA excavated approximately 10,000 cubic yards of highly contaminated soils, bagged them and placed them in storage buildings (pole barns) constructed on site. Tanks, retorts, pipes and other hardware were dismantled and stored on site in a former sawmill building. Two groundwater interception/oil recovery systems were installed to alleviate oil seepage into the creek. Contaminated areas of the site and features of the groundwater recovery system were fenced to restrict public access.

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

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

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

Public participation is required by CERCLA sections 113 and 117. These sections require that before adoption of any plan for remedial action to be undertaken by the President (EPA) or by a State (MDHES) or by anyone (PRPs), the lead agency shall:

1. Publish a notice and brief analysis of the Proposed Plan and make such plan available to the public; and

2. Provide a reasonable opportunity for submission of written and oral comments and an opportunity for a public meeting at or near the Site regarding the Proposed Plan and any proposed findings relating to cleanup standards. The lead agency shall keep a transcript of the meeting and make such transcript available to the public. The notice and analysis published under item #1 shall include sufficient information to provide a reasonable explanation of the Proposed Plan and alternative proposals considered.

Additionally, notice of the final remedial action plan (Record of Decision) adopted shall be published and the plan shall be made available to the public before commencing any remedial action. Such a final plan shall be accompanied by a discussion of any significant changes to the preferred remedy presented in the Proposed Plan along with the reasons for the changes and a response (Responsiveness Summary) to each of the significant comments, criticisms, and new data submitted in written or oral presentations during the public comment period.

MDHES has conducted required community participation activities through presentation of the Proposed Plan, a 60 day public comment period, a public hearing and presentation of the selected remedy in the Record of Decision. Specifically included with the Record of Decision is a Responsiveness Summary that summarizes public comments and MDHES responses. The Record of Decision documents changes to the preferred remedy as a result of public comments.

The Proposed Plan for the Site was released for public comment on May 5, 1993. The Proposed Plan was made available to the public in both the administrative record located at the Montana Tech Library in Butte and at MDHES offices in Helena, MT, and information repositories maintained at MDHES offices in Helena, the Montana Tech Library, the Butte Public Library, the Butte EPA Office and the State Library in Helena. The Proposed Plan was distributed to the MDHES Montana Pole Site mailing list. The notice of availability of the Proposed Plan was published in the Butte-Montana Standard newspaper on May 7, 1993. A public comment period was initially designated from May 7, 1993 through June 7,1993, but requests resulted in a 30 day extension to July 7, 1993.

A public hearing was held in Butte, Montana on May 27, 1993. At this hearing, representatives from EPA and the MDHES answered questions about problems at the Site and the remedial alternatives under consideration as well as the preferred remedy. A portion of the hearing was dedicated to accepting formal oral comments from the public. A court reporter transcribed the entire hearing and MDHES made the transcript available by placing it in the administrative record. A response to the comments received during the public comment period is included in the Responsiveness Summary, which is part of this Record of Decision. Also, community acceptance of the selected remedy is discussed in section VII, Summary of Comparative Analysis of Alternatives, of the Decision Summary.

IV. SCOPE AND ROLE OF RESPONSE ACTION

The primary focus of the MPTP RI/FS was to evaluate findings of previous investigations, to collect additional information to assist in characterizing current and future risks, and to develop and evaluate long term and permanent remedial action alternatives. The RI/FS was performed in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) 40 CFR Part 300, and CERCLA Section 104, 42 U.S.C. § 9604.

The overall objectives of the RI/FS were:

- To collect information on the types, concentrations, extent and movement of contaminants present in subsurface soils, surface soils, surface water, sediment, groundwater, oils, sludges, and dismantled equipment at the site;
- To provide information for estimating the volume of contaminated media and materials;
- To provide information on site physical characteristics and site contaminants for use in the Risk Assessment, the Feasibility Study, and the Remedial Design;
- To collect data for use in treatability studies during the FS and RD;
- To collect data on geotechnical properties for use in designing and locating remediation structures during the RD;
- To identify potentially applicable or relevant and appropriate regulations (ARARs) for response actions; and
- To identify and evaluate remedial alternatives to address human health and/or environmental risks.

Based on the evaluation of the wood treating operations, findings of previous investigations and the results of the RI field investigation, the sources and the areas of environmental contamination at the Montana Pole site have been adequately delineated.

The remedy outlined in this Record of Decision represents the final remedial action at the site and will address the principal threats to human health and the environment which are posed by the contaminated media and materials.

V. SUMMARY OF SITE CHARACTERISTICS

The following section discusses the principle contaminants of concern found at the site, summarizes the nature and extent of site contamination, provides a brief discussion of contaminant fate and transport at the site and provides estimated volumes of contaminated materials at the site.

Principle Contaminants of concern

Hazardous substances that have been released at or from the Site, but are not limited to, include the following:

Pentachlorophenol and other chlorinated phenols

A mild acid with an hydroxyl group, pentachlorophenol (PCP) is a hazardous substance as defined by CERCLA § 101(14). Pentachlorophenol ionizes in solution to form pentachlorophenate anion. The pH dependent ionization leads to higher solubility for pentachlorophenol than its normal aqueous solubility of 14.0 mg/L. Once pentachlorophenol dissolves in water, its adsorptive behavior begins to control its fate. As aqueous solubility decreases, the adsorption increases. Groundwater pH is generally in the neutral range at the Site, rendering pentachlorophenol more mobile in groundwater than the other contaminants of concern. Site aquifers are comprised of fairly transmissive sands and gravels, resulting in rapid migration of pentachlorophenol.

Pentachlorophenol is known to be biodegradable under both aerobic and anaerobic conditions. Anaerobic degradation rates are generally 10 to 100 times slower than aerobic degradation; therefore, if remediation time is critical, a method of oxygen enhancement is recommended (Woodward-Clyde, 1988). Other related chlorinated phenols have been identified at the Site. Chlorinated phenols are present in pentachlorophenol as manufacturing byproducts. They may also result from breakdown of pentachlorophenol. Pentachlorophenol is identified as a probable human carcinogen.

Polynuclear aromatic hydrocarbons

Several polynuclear aromatic hydrocarbons (PAHs), defined as hazardous substances by CERCLA § 101(14), have been identified at the Site. These include: anthracene, benzo(a)pyrene, benzo(a)anthracene, benzo(k)fluoranthene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno(c,d)pyrene, benzo(g,h,i)perylene, phenanthrene, chrysene, fluoranthene, fluorene, naphthalene and pyrene. The majority of the compounds do not contain active functional groups and have low aqueous solubilities.

The low molecular weight PAHs are comparatively more soluble in water than high molecular weight PAHs and have lower organic carbon partition coefficients. Low molecular weight compounds are typically more mobile in the environment than the high molecular weight PAHs.

PAH compounds are known to be biodegradable under both aerobic and anaerobic conditions. The rate of transformation of PAH compounds by soil microorganisms is related to the compound's molecular weight as well as the acclimation of the soil microbes to the PAH compounds. Thus, the low molecular weight PAHs biologically degrade at a faster rate than the high molecular weight PAHs. The four and five ringed PAHs found at the Site are suspected probable human (B2) carcinogens. The two and three ringed PAHs found at the Site are not probable human carcinogens; however, they can present noncarcinogenic health hazards.

Polychlorinated dibenzo-p-dioxins and Polychlorinated dibenzofurans

Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) are hazardous substances as defined by CERCLA § 101(14). PCDDs and PCDFs are a family of aromatic compounds that are often byproducts of chemical manufacturing or combustion processes involving chlorinated organic compounds and heat.

The biological degradation rate of these compounds is generally very slow when compared to other organic compounds. Because PCDDs and PCDFs have very low vapor pressures, they do not readily evaporate or volatilize to the atmosphere. The compounds adhere tightly to soil particles and do not migrate readily or leach into groundwater or surface water unless the contaminated soil particles themselves migrate via erosion processes (Freeman, 1989). This family of compounds includes suspected probable human carcinogens of varying toxicity. One isomer, 2,3,7,8-tetrachlorophenol dibenzo-p-dioxin (TCDD), has been determined to be the most toxic. Concentrations of the other less toxic isomers are multiplied by toxicity equivalence factors to determine their risk relative to 2,3,7,8-TCDD. The toxicity equivalence for each PCDD and PCDF analyzed for a sample is added together to result in one concentration value and the summation is expressed as TCDD toxicity equivalence (TE) which is used as the basis for determining overall health risks from these compounds.

Summary of Nature and Extent of Contamination

As reported in the Final RI Report (ARCO, 1993a), seven different media were sampled during the RI for the MPTP site. These media include: soils (surface, subsurface, and removed), groundwater, surface water, sediments, process equipment, miscellaneous oils, and miscellaneous sludges. The samples were typically analyzed for PCP, PAHs, total petroleum hydrocarbon (TPH), volatile organic compounds (VOCs), dioxins/furans, and metals. The removed soils and miscellaneous oils and sludges were also analyzed using the

TCLP method for metals and organics.

Elevated levels of PCP, PAHs, TPH, and dioxins were detected in the surface and subsurface soil samples collected from the plant process area and within and near the historical drainage ditch. Figure 3 presents PCP surface soil concentrations greater than 15,000 ug/kg. Figure 4 presents PCP subsurface soil concentrations above 10,000 ug/kg. Figures 5 through 8 present PCP subsurface soil boring concentrations in cross section. The maximum concentrations of PCP, TPH, and dioxins detected in the surface soil samples were 1,510,000 μg/kg, 71,500 mg/kg, and 8.18 μg/kg, respectively. The maximum concentrations of PCP, PAH, TPH, and dioxins detected in the subsurface soil samples were 1,160,000 μg/kg, 2,304,320 μg/kg, 55,600 mg/kg, and 11.36 μg/kg, respectively. Elevated levels of PCP and PAH were generally found to depths of 8 feet in the northern portion of the site and to depths greater than 15 feet in the southern portion of the site. PCP, PAH, and TPH were detected in surface soil samples collected from the former eastern and western wood storage yards at relatively low concentrations. PCP, PAH, and TPH were not detected in subsurface soil samples collected in the wood storage yards. The maximum concentrations of PCP, PAH, TPH, and dioxins detected in the removed soils were similar to the maximum concentrations detected in the surface and subsurface soils.

Figure 9 illustrates the approximate lateral extent of groundwater, LNAPL and surface water contamination associated with the MPTP site. PCP in the groundwater is fairly widespread throughout the site. Figures 10 and 11 show PCP concentrations detected in groundwater samples taken at and near the site. Figure 12 illustrates the estimated lateral extent of site PCP groundwater contamination at concentrations greater than 1 ug/l. LNAPL was detected in eight of the 39 wells sampled, although not all wells are screened at a depth that would allow LNAPL to be measured. The maximum LNAPL thickness measured during the RI was 2.2 feet in well W-8 which is located north of the pole barns. LNAPL thickness and the estimated extent of LNAPL contamination is shown in Figure 13. Only floating woodtreating product was found during the RI. No dense non-aqueous phase liquids (DNAPLs) were found.

PCP, PAH, and TPH were detected in the surface water and sediment samples collected near the oil seep locations on Silver Bow Creek. Figure 14 shows PCP, PAH and TPH surface water concentrations in Silver Bow Creek. Figure 15 shows PCP, PAH and TPH sediment concentrations in Silver Bow Creek. The maximum concentration of PCP detected in the surface water samples (591 μg/l) was from the sample collected near the farthest downstream seep. The maximum concentration of PCP detected in the sediment samples (1,820 μg/kg) was from the sample collected immediately downstream of the farthest downstream seep.

Metals (i.e., arsenic, cadmium, chromium, copper, lead, and zinc) were detected in soil, groundwater, surface water and sediments at the site. Elevated metals concentrations were generally found in association with Silver Bow Creek and tailings deposits near the creek.

Elevated metals concentrations are considered to be related to historic mining activities in the vicinity of the site rather than any activities associated with the site.

Minimal wipe sampling was performed on the process equipment. The maximum concentrations of PCP, PAH, and 2,3,7,8-TCDD detected on the wipe samples (100 cm^2) were 317 μg/wipe, 10.76 μg/wipe, and 7.19 ng/wipe.

Approximately 26,000 gallons of oils and sludges are stored on site (at the time the RI was conducted) including oil recovered from the oil/water separator, oils treated by the KPEG process, reagent sludge from the KPEG processing operation, and miscellaneous oils and sludges presumably collected from various tanks used in the wood preserving operations. Elevated concentrations of PAHs, and VOCs were detected in all the oil and sludge samples. Elevated concentrations of PCP were detected in all but the KPEG treated oils and reagent sludge samples. Low levels of PCDDs and PCDFs were detected in all but the KPEG treated oils and reagent sludge samples.

Major Sources of Contamination from Historical MPTP Operations

Based on historical information about former MPTP operations and data gathered during the RI, the major sources of contamination from historic MPTP operations are discussed below and include:

- Plant process area;
- Wastewater discharge ditch including the former waste sedimentation pond; and
- LNAPL plume.

Plant Process Area. Two retorts and two butt treatment vats were located within the plant process area, and spillage of product from these facilities during MPTP operations has been reported (see Final RI Report, Section 1.2.2). Surface and subsurface soil samples from the plant process area indicate the presence of high concentrations of PCP and PAH compounds. Some of the soils in this area are saturated with woodtreating chemicals and petroleum carrier oils. In addition, PCP levels greater than 10,000 μg/l have been detected in groundwater beneath this area of the site, and an LNAPL layer is present on the water table.

Wastewater Discharge Ditch Area. Wastewater from the wood treating process was discharged into on-site sedimentation pond(s) and an on-site drainage ditch. PCP mixed with petroleum (PCP/oil) was used to treat timber during the time these discharges occurred.

The drainage ditch flows northward through the site toward Silver Bow Creek (see Figure 2).

Soil was excavated from portions of the ditch to a depth of up to 6 feet as part of EPA's removal actions. Sampling conducted during the RI indicates that soils and groundwater beneath the drainage ditch are heavily contaminated throughout its length. Depth to groundwater varies along the length of the drainage ditch. Groundwater is about 20 feet below grade near Greenwood Avenue; about 8 feet below grade beneath the interstate; and at about 2 to 4 feet below grade near Silver Bow Creek.

LNAPL Plume. As shown on Figure 13, an LNAPL plume consisting of PCP dissolved in petroleum carrier oils, extends from the former process area to Silver Bow Creek. The LNAPL is a result of former MPTP waste disposal practices and spillage of woodtreating chemicals. The RI indicated that LNAPL is discharging to Silver Bow Creek at several seep locations, and chemicals of concern are dissolving into groundwater from the LNAPL plume. No DNAPLs were found at the site.

Conceptual Model of Contaminant Fate and Transport

A conceptual model was developed and presented in the final RI report and provides an overview of site contaminant fate and transport as it existed during the RI (Figure 16). The conceptual model describes the relationship between source areas, migration pathways, and potential receptors. PCP, PAHs, dioxins, and furans at the MPTP site have entered the environment from several source areas by spillage, leaks, or infiltration and have migrated via various transport pathways (e.g., advective flow with the groundwater). A detailed discussion of the chemical and biological processes and an estimate of the rates of migration of different contaminants in the subsurface are presented in the Final RI Report (ARCO, 1993a).

Estimated Volumes of Contaminated Materials

In the Final FS Report (ARCO, 1993b), estimates were made of contaminated site soils, groundwater, LNAPL, oils, sludges, equipment and debris. The agencies believe that these estimates were adequate for the purposes of the FS and remedy selection. However, it is recognized that more accurate volume estimates may be required for remedial design.

Site Soils

The estimated volumes of contaminated site soils at the site are shown in Table 1. These volumes include previously removed soils that are stored in pole barns at the site, in place contaminated soils, and uncontaminated soils which would require removal to access underlying contamination. Figures 17 and 18 show the locations of the in place contaminated soils at the site.

Volumes estimates were developed:

- considering the remedial alternatives developed;
- using PCP as an indicator compound;
- using the PCP Preliminary Remedial Action Goal of 3 mg/kg;
- using physical parameters, as discussed below, for determining the location and accessibility of these contaminated soils.

PRAGs were developed based on information developed in the Baseline Risk Assessment and are presented in Table 2. DHES found little difference in soil volumes estimated for the 3 mg/kg PRAG and the 34 mg/kg PRAG. This may be because soil contamination at the MPTP site is generally associated with contact with wood treating chemical solutions and PCP concentrations in soils were generally found well above 3 mg/kg or well below 3 mg/kg.

The volume of previously excavated soils presently stored on site is approximately 10,000 yd^3. Volume estimates of soils removed near Silver Bow Creek and soils removed for installation of a groundwater treatment system were estimated for use under various remedial approaches. It is estimated that about 6,000 yd^3 of soils near the creek would require excavation and treatment. This volume calculation assumes all the soils north of the sheet piling installed by USEPA in September 1992 would be excavated to a depth of 4 feet below grade. The volume of soils estimated to be excavated during installation of the groundwater extraction and treatment system is approximately 7,000 yd^3.

Volume estimates of additional contaminated in-place site soils include surface soils and subsurface soils including soils impacted along the LNAPL plume. Areas where contamination was found above the 3 mg/kg PCP PRAG in surface soils <u>but not</u> in subsurface soils are shown in Figure 17 and consist of "hot spot" areas in the east and west treated wood storage yards and soils near the former process area. The volume of these soils is assumed to extend from the ground surface to 3 feet below ground surface and is estimated to be 10,000 yd^3. The actual depth of contamination in these areas will be determined during the remedial action.

Areas where contamination was found above the 3 mg/kg PCP PRAG in both the surface and subsurface soils, down to the groundwater table are shown in Figure 17. This includes the former process area, the former waste water drainage ditch running from the process area to Silver Bow Creek and areas adjacent to the drainage ditch on the north side of the interstate. The volume of soils in these areas is estimated to be 82,000 yd^3. This volume assumes that contaminated subsurface soil concentrations above PRAGs extend to approximately 4 feet below the groundwater surface. This depth is based on the RI data which showed that subsurface contamination above the 3 mg/kg PCP PRAG extends approximately 4 feet below groundwater in these areas and other areas affected by the LNAPL plume. The volume of these soils located beneath the highway is estimated at 4,000 yd^3.

In other areas of the site subsurface soils have been impacted by the floating LNAPL layer. This area of LNAPL influence extends from the former process area to Silver Bow Creek. LNAPL volume of 370,000 gallons has been estimated based upon the inferred LNAPL plume shown in Figure 13. The extent of the inferred LNAPL plume is based on the presence of LNAPLs in a number of wells and borings on the site. Within this area, a "smear zone" where LNAPL has contacted subsurface soils near the groundwater table has been estimated to extend vertically 2 feet above and 4 feet below the groundwater surface. Contaminated subsurface soils associated with the LNAPL plume in this area underlie uncontaminated soils. The volume of these uncontaminated soils have also been estimated and are presented on Table 1. In order to excavate contaminated soils associated with the LNAPL plume, the overlying soils would also require excavation. Separation of clean and contaminated soils during the remedial action would be important to minimize the volume of soils requiring treatment. Excavation of soils beneath the interstate highway is considered to be infeasible. Contaminated soils beneath the highway will be left in place and addressed by other methods.

The volume of accessible contaminated subsurface soils associated with the LNAPL plume is estimated at 93,000 yd^3. This volume is in addition to the 82,000 yd^3 surface/subsurface volume estimate. The volume of contaminated subsurface soils associated with the LNAPL plume which are considered inaccessible beneath the highway is estimated at 37,000 yd^3. This volume is in addition to the 4,000 yd^3 within the drainage ditch beneath the highway. The volumes of uncontaminated soils overlying the LNAPL plume are estimated to be 28,000 yd^3 in the area north of the highway and 66,000 yd^3 in the area south of the highway.

Groundwater

The areal extent of contaminated groundwater above the MCL for PCP of 1 μg/L is estimated to be 1.8 million square feet. Assuming an average aquifer thickness of 22 feet and a porosity of 30 percent, the total volume of alluvial groundwater contaminated above the MCL was estimated to be approximately 90 million gallons. This volume represents the volume of groundwater contaminated above the MCL in place. This value is substantially lower than the volume that would be treated by a pump-and-treat system.

Equipment and Debris

A rough estimate of the volume of equipment and debris on site was performed for the FS. It is estimated that there is about 9,100 cubic yards of debris on-site which consists of wood, soil cuttings, concrete, steel, and brick. A sampling program should be undertaken as part of remedial design to determine more accurately the volume of debris and extent of contamination prior to disposal.

Oils and Sludges

Approximately 6,300 gallons of untreated oily wastes from the oil/water separator process; 9,000 gallons of KPEG-treated oil; 2,200 gallons of KPEG-reagent sludge; and 3,000 gallons of miscellaneous oily wastes and sludge are estimated to be stored in drums and storage tanks at the MPTP site (ARCO, 1993a). Keystone (1991a) assumed that the total quantity of oily wastes and sludge requiring remediation was approximately 26,500 gallons. Additionally, it is estimated that between 3,000 and 6,000 gallons of oily wastes would be generated each year in the first few years of operation of a combined groundwater and LNAPL recovery system likely to be used for this site. The quantity of LNAPL recovered from the groundwater systems annually will decrease over time.

VI. SUMMARY OF SITE RISKS

The Baseline Risk Assessment (CDM, 1993) provides the basis for taking action and indicates the exposure pathways that need to be addressed by the remedial action. It serves as the baseline for indicating what risks could exist if no action were taken at the Site. This section of the Record of Decision reports the results of the Baseline Risk Assessment conducted for this Site.

As part of the remedial investigation and feasibility study, human health and ecological risk assessments, which together comprise the Baseline Risk Assessment, were developed to help MDHES and EPA determine actions necessary to reduce actual and potential risks from hazardous substances at the Site. Risk assessments were conducted at the Site with the following objectives:

- provide an analysis of baseline risk (potential risk if no remedy occurs) and help determine the need for action;
- provide a basis for determining cleanup levels (concentrations) that are protective of public health and the environment;
- provide a basis to compare potential public health and ecological impacts of various cleanup alternatives; and
- provide a consistent process to evaluate and document potential public health and ecological threats at the Site.

The Baseline Risk Assessment indicates that the principal threats stem from contaminated groundwater, releases of contaminated groundwater and oily wood treating fluids into surface water, and surface soils. The primary human health risk exposure pathways are ingestion of and direct contact with contaminated groundwater and ingestion of or direct contact with soils. Potentially affected receptors include residents, workers, trespassers, recreational users, and terrestrial and aquatic biota.

Human Health Risks

The Baseline Risk Assessment indicates that there are excessive human health cancer risks and excessive non-cancer health hazards associated with hazardous substances at the Site. Remedial action is required in order to reduce these potential risks.

Contaminants of Concern for Human Health

Chemicals detected on the Montana Pole site were screened as based upon their toxicity to humans or laboratory animals (when human data were unavailable), their maximum concentrations measured in each media, and their frequency of detection. The same screening criteria applied to soil and groundwater were also applied to surface water and sediment. This made the screen very conservative for these media, since it is unlikely that exposures to either surface water or sediment would occur over an extended time period on a daily basis.

Based on the above described process and some special considerations, the chemicals listed in Table 3 are considered contaminants of concern (COCs) for human health for the Montana Pole site.

Exposure Assessment

Potential pathways by which human receptors could be exposed to contaminants at, or originating from, the Montana Pole site are provided in Tables 4 and 5, and include incidental exposure to soil, surface water and sediment, use of groundwater for domestic purposes and consumption of vegetables grown in contaminated soils. In identifying potential pathways of exposure, both current and likely future land use of the site and surrounding study area were considered. Proximity to Silver Bow Creek and lack of access control for much of the site suggests that trespassers may frequent the site and be exposed to contamination. Past industrial use of the site suggests that future on site workers might be exposed to site-related contaminants while at work. Finally, past and present residential land use and zoning allowances suggest the potential for future residential development. DHES recognizes that efforts are being pursued by ARCO and Butte-Silver Bow government to further restrict land use at the site.

The assumptions used to estimate potential exposure for workers, trespassers and residents are shown in Tables 6 through 14. Exposure point concentrations for surface soils are shown in Table 15, for groundwater are shown in Table 16 and for surface water and sediments are shown in Table 17. The highest exposures were estimated for future on site residents, as expected, because such individuals are expected to contact contamination more frequently than either workers or site trespassers. For residents, exposure via the groundwater pathway is much greater than for any other pathway. Potential future use of the alluvial aquifer for domestic purposes represents the highest exposure potential for the site. Chemicals for which exposure is highest include pentachlorophenol (PCP), the major wood-treating chemical used on site, and PAHs which are constituents of creosote. Creosote was also used to treat wood at the Montana Pole site for a brief period.

Toxicity Assessment

The purpose of the toxicity assessment was to examine the potential for each chemical to cause adverse effects in exposed individuals and to provide an estimate of the dose-response relationship between the extent of exposure to a particular contaminant and adverse effects. Adverse effects include both noncarcinogenic and carcinogenic health effects in humans.

Carcinogenic Effects. Of the COCs for the site, several, including PCP, dioxins/furans, 2,4,6-trichlorophenol, some PAHs and arsenic, are known or suspected human carcinogens. The most potent of these chemicals are the dioxins/furans. Some of the PAHs are also relatively potent carcinogens, though less so than the dioxins/furans. PCP, for which site-related exposures may be greatest, is a less potent carcinogen than either dioxins/furans or the carcinogenic PAHs.

Noncarcinogenic Effects. The potential for COCs to produce noncancer effects varies widely. Dioxins/furans are extremely potent compounds, and only small exposures may be associated with increased risk of adverse effects. Other compounds, such as copper, are relatively non-toxic, and only produce adverse effects at much higher exposure levels. In general, exposures estimated in this assessment for noncarcinogenic effects are sufficiently low such that only the more potent toxicants could present a significant risk.

Risk Characterization

Cancer Risk Estimates. To evaluate potential cancer health risks related to the Montana Pole site, chemical exposures calculated are multiplied by cancer slope factors to develop upper range incremental lifetime cancer risks. Incremental cancer risks in the range of 10^{-6} or less may be characterized as acceptable by the EPA depending on the nature of the site and the COCs.

Cancer risks for exposure to COCs in groundwater are the greatest for any pathway. Only future residents are evaluated for this exposure (see Table 18). Risks exceed 1×10^{-2}, the upper limit for risk predictions using current models. Significant risk is attributable to PCP, even though this chemical is one of the least potent carcinogens among the COCs. This finding attests to the very high concentrations of PCP found in the groundwater beneath the Montana Pole site. Dioxins/furans also contribute significantly to risks. These compounds are expected contaminants of technical grade PCP which is used for wood treating.

The consumption of homegrown produce also contributes significant potential risk for future residents (Table 18). Risks for this pathway, however, may be only about 1 percent of the risks from drinking contaminated groundwater. This is due to a reduction in exposure concentration for most COCs (produce concentrations are estimated to be less than soil concentrations), and fewer days of exposure (the growing season in Butte is limited by climate). Risks from exposure to PCP and dioxins/furans are the greatest for this pathway (risks of 9×10^{-4} and 1×10^{-4}, respectively) for the southern area of the site. Exposures in the northern area, between the Interstate and Silver Bow Creek, had similar overall cancer risk estimates, although the risks for individual compounds varied somewhat.

Risks associated with direct contact with soil (incidental ingestion and dermal contact) are significantly less for all exposure scenarios than those estimated for groundwater and produce consumption. However, for workers and trespassers, these pathways are major contributors to overall risks, since groundwater and produce ingestion are not considered (Tables 19 and 20). Overall, cancer risk estimates for workers and trespassers are up to one thousand times less than those for future residents, and fall within the EPA risk range of 10^{-4} to 10^{-6}.

Noncarcinogenic Health Risks. To evaluate non-cancer health risks, chemical exposure is compared to one of several types of toxicity criteria to determine if the exposure is within a range of exposure which is unlikely to cause adverse health effects. The potential for noncarcinogenic health effects is evaluated by dividing a chemical-specific exposure level by a chemical-specific reference dose. The resulting hazard index (HI) assumes that there is a level of exposure (RfD) below which it is unlikely for even sensitive populations to experience adverse health effects. If the CDI exceeds the RfD (i.e., HI > 1), a potential for non-cancer health effects may exist.

The pattern for non-cancer risks is similar to that for carcinogenic risks. Risks are greatest for future residents and for groundwater and produce ingestion pathways. For groundwater, dioxins/furans, non-carcinogenic PAHs and PCP all have hazard indices (HIs) exceeding unity (533, 75, and 22 respectively, Table 18). Risks for adverse effects, which could include effects on the liver, kidneys, adrenal glands and other organs may be significant for these compounds.

For produce ingestion, His for dioxins/furans are smaller, but still exceed one. For example the HI for dioxins/furans is 6 (Table 18). However, because of a high estimate for PCP absorption through plant roots, the HI for PCP is higher (64) for this pathway. Only anthracene among the PAHs is a COC for soil, and it is present in quantities too small to present significant risk. The only other possible contributor to risk via this pathway is arsenic (HI=7).

For the direct soil contact pathways, risks (HIs) are substantially lower. For future or current residents, HIs for all chemicals are less than one, and no increased risk for adverse effects is anticipated. Noncancer risk estimates for workers and trespassers are shown in Tables 19 and 20.

Ecological Risks

The ecological risk assessment (ERA) for the Montana Pole site evaluated the potential for harm to terrestrial and aquatic populations following exposure to contaminants. Silver Bow Creek is presently degraded by metals contamination and does not support a viable fishery. The risk assessment concluded if Silver Bow Creek is remediated for metals contamination the presence of site contaminants could inhibit the recovery of aquatic populations (fish) in the stream.

Contaminants of Concern

From the list of chemicals expected to occur at the Montana Pole site, seven chemicals or chemical groups are selected for evaluation in the BRA. These chemicals were:

- Polycyclic Aromatic Hydrocarbons (PAHs)
- Pentachlorophenol (PCP)
- Dioxin/Furans
- Arsenic
- Cadmium
- Copper
- Zinc

Potential Receptors

Aquatic Communities. Silver Bow Creek adjacent to the Montana Pole site and downstream to the Warm Springs Ponds does not support a fishery population. Westslope cutthroat trout (*Oncorhynchus clarki lewisi*) and bull trout (*Salvelinus confluentus*) are reported to have once been caught in the vicinity of Butte prior to intensive mining activities. Prior to 1975, severe mining-related pollution in much of the upper Clark Fork River Basin drainage had rendered the system incapable of supporting a viable fishery. Excessive metals deposits still prevent the establishment of a fishery in Silver Bow Creek.

Benthic invertebrate communities and algae have re-established themselves within the study area since the cessation of direct mine waste water discharges to Silver Bow Creek. Mayflies, caddis flies, and stoneflies have been collected, although they demonstrate low density and limited diversity. No known surveys on benthic communities have been conducted within the study area since about 1984. The current density and diversity of this aquatic community is unknown.

Terrestrial Communities. No terrestrial communities within the Montana Pole site were identified as critical habitat or communities of special concern. No rare or endangered plants were identified within the study area boundaries of the Lower Area One (LAO) Operable Unit of the Silver Bow Creek NPL site, nor downstream of this study area. Vegetation growing adjacent to Silver Bow Creek within the Montana Pole site is limited to willows (*Salix exigua*) and grasses. Shrubs indicative of dry conditions are found throughout the area.

Ecological Toxicity Assessment

Toxicity assessment is typically comprised of two elements. The first, hazard identification, is intended to characterize the nature and extent of biota health hazards associated with chemical exposures. The second, a dose-response assessment, determines the relationship between the magnitude of exposure to a chemical and the occurrence of adverse health effects. For the Montana Pole site, each chemical of concern was evaluated for toxicity values for use in risk characterization.

Ecological Risk Characterization

The ecological risk evaluation is similar to human risk evaluation, in that exposure assumptions and toxicological data are combined with site data to estimate risk. However, nonhuman receptors vary greatly in physiology and behavior, and thus it is difficult to quantify risk. Thus, the ecological risk assessment was a qualitative discussion of potential risks and how these risks might affect biological receptors at the Montana Pole site.

Risks to Aquatic Life. Metals and arsenic found in sediments and surface water in Silver Bow Creek may be a primary reason for the lack of diversity and productivity of the reaches of Silver Bow Creek adjacent to the site. Elevated concentrations of these contaminants are considered a result of historical mining activity in the upper reaches of the Silver Bow Creek drainage. The Montana Pole wood treating plant is not considered to be a source of metals contamination in the area.

Dioxins/furans, PAHs and PCP have all been detected in surface water and/or sediments in stream reaches adjacent to the Montana Pole site. A seep where groundwater and LNAPL discharge into the creek was detected visually near the location of surface water sampling station SW-05. Thus chemicals are currently being released to surface water, and may pose a threat to aquatic life.

The stress on the Silver Bow Creek system from inorganic contamination limits the potential receptors for exposure to organic chemicals. In particular, the lack of fish greatly shortens the aquatic food chain by eliminating higher trophic levels. Further, lack of food sources (aquatic plants, insects and other invertebrates, small fish) make upper Silver Bow Creek unattractive for larger animals such as migratory water fowl or raptors. Under current conditions, it is unlikely that such animals would spend any significant time in stretches of the creek near the Montana Pole site. Any impact of organic contamination from the Montana Pole site should be considered potential, especially when such impacts are due to hypothetical biomagnification of chemicals near the top of the food web. However, once Silver Bow Creek has been remediated in association with the heavy metals contamination, and the aquatic food chain is re-established, there will be a potential threat associated with the organic chemicals. It is therefore necessary to address both inorganic and organic contamination of the Creek to once again establish aquatic life in the Creek.

Concentrations of PCP detected in surface water exceed both the acute (8.9 ug/l at pH of 7.0) and chronic (5.6 ug/l at pH of 7.0) ambient water quality criteria (AWQC). Water concentrations of PCP measured as high as 591 μg/l could limit the recovery of aquatic life in the impacted stretch of the creek.

PAHs, including lower molecular weight compounds such as anthracene, pyrene and naphthalene, are present only in low concentrations even at the area of the seep. The highest concentration reported was 12.7 μg/L for acenaphthene. Acute and chronic toxicity values for acenaphthene and many other PAHs are not available, however, the concentration of PAHs in surface water at the Montana Pole site and downstream of the site are below observed chronic toxicity values for aquatic organisms. Although individual PAHs are not specifically addressed in this assessment, the generally low concentrations found in surface water and sediments suggest that a more refined assessment would reach similar conclusions. For this reason, PAHs are discussed only as a group, even though individual members of the group vary considerably in their toxicity to aquatic life.

Risks to Terrestrial Life. Because organic COC concentrations appear to diminish rapidly with distance downstream from the Montana Pole site, potential future impacts from Montana Pole site-related chemicals are likely to be limited to a short reach of stream starting at the region of discharge of contaminated groundwater. Wildlife and/or domestic animals using the downstream portions of the creek as a drinking water source are not expected to be exposed to significant concentrations of organic COCs, unless discharge of contaminated groundwater significantly increases.

Significant exposure of major wildlife species to surface water, sediments, and soils in the impacted reach of the creek are also unlikely. The Montana Pole site is heavily disturbed by past human activity, and is surrounded by residential housing, industrial development, a cemetery and an Interstate freeway. The site is unlikely to be attractive to wildlife, and larger animals (predators, deer, elk) are not expected to use the site, or the adjacent reach of the creek.

VII. DESCRIPTION OF ALTERNATIVES

A brief description of the site cleanup alternatives the agencies considered in the Feasibility Study report follows. The estimated present worth cost of each alternative includes capital cost and annual operation and maintenance cost. Remedial action time frames are limited to 30 years for analysis, even for those alternatives requiring perpetual operation and maintenance.

The cleanup alternatives presented in the Feasibility Study report were developed before EPA constructed the groundwater treatment system which came on line in January 1993. Therefore the assumed design and costs of the alternatives do not incorporate the EPA system in their design. However, the presence of the EPA system was addressed in the FS and potential use of the system was considered. Utilization of the EPA groundwater treatment system will reduce the overall costs (presented below) for the alternatives which include groundwater treatment systems.

Alternative 1: No Action
Estimated present worth cost: $ 2,310,000 to $ 2,350,000
Implementation time: Not Applicable

Superfund law requires that agencies consider the no action alternative. This alternative is used as a baseline against which to compare the other alternatives. Under Alternative 1, no further action (other than the EPA's removal actions currently being conducted at the site) would be undertaken. Contaminated soils, oils, sludges, equipment and debris would remain on site. Contamination would continue to migrate and impact groundwater and Silver Bow Creek. Only the current fence (installed as part of EPA's removal actions) would limit trespasser access to the site. Existing institutional controls would allow most types of land uses. The costs for the no-action alternative are associated with maintaining operation of the existing groundwater containment and treatment system and continued administration of institutional controls for a period of 30 years. Actual costs and efforts associated with the no action alternative would be incurred indefinitely beyond the 30-year period.

Alternative 2: Additional Institutional Controls and Groundwater Monitoring
Estimated present worth cost: $ 3,270,000 to $ 4,400,000
Implementation time: 1 year institutional control
30+ years operations and maintenance

This alternative would involve implementing institutional controls in an attempt to limit human exposure to contaminants. Additional institutional controls, beyond those currently in existence, would be implemented to further restrict the development of site land. These controls could include deed restrictions that prevent residential development and construction activities in contaminated areas and modifications to the zoning laws and building codes. The zoning laws would have to be modified such that certain land uses including kennels, stables and stockyards would be prohibited. Building codes could be modified to restrict construction depths to less than the depth of the water table. Only the current fence (installed as part of EPA's removal actions) would limit trespasser access to the site.

The EPA's groundwater controls currently being conducted at the site would continue. Contaminated soils, oils, sludges, equipment and debris would remain on site. Contamination would continue to migrate and impact groundwater and Silver Bow Creek. This alternative would include monitoring of downgradient (the groundwater equivalent of downstream) and vertical migration of dissolved groundwater contamination and LNAPL.

The costs for Alternative 2 are associated with maintaining operation of the existing groundwater containment and treatment system, implementation of additional institutional controls, continued administration of institutional controls and site monitoring. Total estimated costs for Alternative 2 assume that the action would only occur for a period of 30 years. Because the site would continue to be contaminated and pose risks to human health and the environment indefinitely, actual costs and efforts associated with maintaining Alternative 2 would be incurred indefinitely beyond the 30-year period.

Alternative 3: Soil Capping and Groundwater Containment and Treatment

ALTERNATIVE 3A:

* Surface capping of contaminated soils;
* Treatment of previously removed soils and a limited amount of excavated soils using on-site incineration;
* Containment and treatment of groundwater and LNAPL;
* Treatment of oily wastes, sludges, equipment and debris; and
* Groundwater monitoring and institutional controls

Estimated present worth cost: $ 34,620,000 to $ 60,130,000
Implementation time: 2 years - soils
30+ years - groundwater, operations and maintenance

Under Alternative 3A, contaminated soils in the former wood-processing area and along the historic drainage ditch (see Figure 17) would be capped to prevent direct human contact and reduce infiltration of precipitation through the contaminated soils. Contaminated surface soil hot spots outside these areas would be excavated and consolidated with soils in the process area prior to capping. The cap would cover an area of approximately 170,000 square feet. (A football field is 57,600 square feet.) Approximately 213,000 cubic yards of contaminated soils would remain in place under this alternative.

Soils previously excavated during EPA's 1985 removal action (bagged soils), contaminated soils excavated during construction of groundwater remediation facilities (e.g., collection trenches), and contaminated soils located near Silver Bow Creek and downgradient of the groundwater collection system would be treated in an on-site incinerator. The estimated volume of soil treated under this alternative is 23,000 cubic yards, which includes approximately 10,000 cubic yards of previously removed soils plus approximately 13,000 cubic yards of excavated soils. Other soil actions which would be necessary under Alternative 3A include filling excavated areas using treated soils, surface grading and revegetation.

Under this alternative, oils and sludges currently in place at the site would be incinerated on-site along with soils. LNAPL recovered by the groundwater system while the incinerator was operating would also be incinerated. LNAPL recovered after on-site incineration has been discontinued would be incinerated off-site. Contaminated debris and equipment would be decontaminated and disposed of in an appropriately licensed off-site landfill.

A groundwater containment and treatment system would be constructed to contain the LNAPL and dissolved groundwater contaminant plumes and capture the contamination before it discharges to Silver Bow Creek. This system would include an extensive network of extraction and containment mechanisms (trenches, extraction wells, physical/hydraulic barriers). Groundwater treatment above ground is assumed to consist of oil/water separation, bioreactor treatment and carbon polishing. Other modes of treatment such as UV/oxidation or granulated activated carbon (GAC) may be utilized instead of a bioreactor depending on detailed design analysis and the ability to meet performance standards. Treatment of contaminated groundwater would occur to the degree necessary to meet applicable environmental standards and health-based criteria prior to discharge. Additionally, an *in-situ* (in-place) bioremediation process would be implemented to assist in long-term cleanup of groundwater and subsurface soils.

Once site remediation has effectively contained the contaminated groundwater and LNAPL, and releases to Silver Bow Creek have been effectively reduced or eliminated, it is expected that natural biodegradation and attenuation would effectively reduce the levels of organic contaminants in Silver Bow Creek, stream sediments and groundwater downstream of the site. These natural mechanisms would be relied upon to address the low level contamination found in this area.

The specific design of the groundwater system would take place during the remedial design and remedial action phase of site cleanup. The groundwater extraction and treatment system could utilize the groundwater treatment plant constructed at the site by EPA. Groundwater and LNAPL in and around the site would be monitored to evaluate the effectiveness of the recovery and treatment system. The same institutional controls would be implemented as those discussed under Alternative 2.

Total estimated costs for Alternative 3A assume the action would only occur for a period of 30 years. Since the site would continue to be contaminated indefinitely, actual costs and efforts associated with site monitoring, enforcement of institutional controls and operation and maintenance of the cap and the groundwater system would be incurred indefinitely beyond the 30 year period.

ALTERNATIVE 3B:

* Surface capping;
* Treatment of previously removed soils and a limited amount of excavated soils using biological land treatment;
* Containment and treatment of groundwater and LNAPL;
* Treatment of oily wastes, sludges, equipment and debris; and
* Groundwater monitoring and institutional controls

Estimated present worth cost: $ 21,060,000 to $ 36,640,000
Implementation time: 3 years - soils
30+ years - groundwater, operations and maintenance

Alternative 3B is the same as Alternative 3A except that soils would be treated using biological land treatment and all oils and sludges would be incinerated off-site. Biological land treatment is not expected to achieve the degree of treatment provided by incineration; however, final contaminant levels are anticipated to be within allowable levels. Design studies would be utilized to determine achievable treatment efficiencies and identify any additional remedial actions which may be necessary in conjunction with biological land treatment to ensure compliance with cleanup goals.

ALTERNATIVE 3C:

* Surface capping;
* Treatment of previously removed soils and a limited amount of excavated soils using soil washing;
* Containment and treatment of groundwater and LNAPL;
* Treatment of oily wastes, sludges, equipment and debris; and
* Groundwater monitoring and institutional controls

Estimated present worth cost: $ 27,720,000 to $ 43,780,000
Implementation time: 2 years - soils
30+ years - groundwater, operations and maintenance

Alternative 3C is the same as Alternative 3A except that soils would be treated using soil washing and all oils and sludges would be dechlorinated and incinerated off-site. Residual fine soils from the soil-washing process which do not meet cleanup criteria would be further treated in a bioslurry reactor. The volume of residual fine soils requiring further treatment is estimated at five percent of the total volume of treated soils. As with biological land treatment, soil washing is not expected to achieve the degree of treatment provided by incineration; however, it is anticipated that allowable final contaminant levels will be met. Design studies would be utilized to determine achievable treatment efficiencies and identify any additional remedial actions which may be necessary in conjunction with soil washing to achieve cleanup goals.

Alternative 4: Partial Excavation and Treatment of Soils and Groundwater Containment and Treatment

ALTERNATIVE 4A

* Excavation of contaminated surface and subsurface soils and treatment using on-site incineration;
* Treatment of previously removed soils using on-site incineration;
* Containment and treatment of groundwater and LNAPL;
* Treatment of oily wastes, sludges, equipment and debris; and
* Groundwater monitoring and institutional controls

Estimated present worth cost: $ 77,880,000 to $ 110,840,000
Implementation time: 5 years - soils
30+ years - groundwater, operations and maintenance

Under Alternative 4A, accessible contaminated soils in areas where surface soil concentrations are above cleanup levels and where contamination above cleanup levels extends from the surface to the groundwater table (see Figure 17) would be excavated and treated using an on-site incinerator. The areas of the site which would be excavated under Alternative 4A correspond to surface soil hot spots, the former process area, the waste water discharge ditch and contaminated soils located near Silver Bow Creek and downgradient of the groundwater collection system. Bagged soils previously excavated during EPA's 1985 removal action and contaminated soils excavated from construction of groundwater remediation facilities (e.g., collection trenches) would also be treated in an on-site incinerator. Excavation of surface soil hot spot areas would occur to a depth of approximately three feet. Subsurface excavation would occur to a maximum depth of four feet below the groundwater table. The estimated volume of soil excavated under this alternative is 105,000 cubic yards. The estimated volume of soil treated under this alternative is 115,000, cubic yards which includes the bagged soils. Other soil actions which would be necessary under Alternative 4A include filling excavated areas using treated soils, surface grading and revegetation.

Under Alternative 4A, approximately 124,000 cubic yards of contaminated soils would remain in place. This includes areas beneath the interstate highway which are considered inaccessible and subsurface soils located outside of the former process and drainage ditch areas which are contaminated by LNAPL near the groundwater table (see Figure 13). These soils would be addressed through LNAPL extraction, soil flushing and *in-situ* bioremediation.

Under this alternative, oils and sludges currently in place at the site would be incinerated on-site along with soils. LNAPL recovered by the groundwater system while the incinerator was operating would also be incinerated. LNAPL recovered after on-site incineration has been discontinued would be incinerated off-site. Contaminated debris and equipment would be decontaminated and disposed of in an appropriately licensed off-site landfill.

A groundwater containment and treatment system, similar to the Alternative 3 system, would be constructed to contain the LNAPL and dissolved groundwater contaminant plumes and capture the contamination before it discharges to Silver Bow Creek. This system would include an extensive network of extraction and containment mechanisms (trenches, extraction wells, physical/hydraulic barriers). Groundwater treatment above ground is assumed to consist of oil/water separation, bioreactor treatment and carbon polishing. Other methods of treatment such as UV/oxidation or granulated activated carbon (GAC) may be utilized instead of a bioreactor depending on detailed design analysis and the ability to meet performance standards. Treatment of contaminated groundwater would occur to the degree necessary to meet applicable environmental standards and health-based criteria prior to discharge. Additionally, an *in-situ* bioremediation process would be implemented to assist in long-term cleanup of groundwater and subsurface soils. Remediation of the contaminated aquifer to drinking water levels is a goal of this alternative.

Once site remediation has effectively contained the contaminated groundwater and LNAPL, and releases to Silver Bow Creek have been effectively reduced or eliminated, it is expected that natural biodegradation and attenuation would effectively reduce the levels of organic contaminants in Silver Bow Creek, stream sediments and groundwater downstream of the site. These natural mechanisms would be relied upon to address the low level contamination found in this area.

The specific design of the groundwater system would take place during the remedial design and remedial action phase of site cleanup. The groundwater extraction and treatment system could utilize the groundwater system installed at the site by EPA. Groundwater and LNAPL in and around the site would be monitored to evaluate the effectiveness of the recovery and treatment system. The same institutional controls would be implemented as those discussed under Alternative 2. Institutional controls may be adjusted or removed as the remedial action progresses toward completion and site conditions allow.

Total estimated costs for Alternative 4A assume that the groundwater action would only occur for a period of 30 years. Although groundwater aquifer remediation to cleanup levels is a goal under this alternative, some source areas would remain and be treated in place over the long term. Therefore, actual costs and efforts associated with site monitoring, enforcement of institutional controls and operation and maintenance of the groundwater system may be incurred beyond 30 years.

ALTERNATIVE 4B

* Excavation of contaminated surface and subsurface soils and treatment using biological land treatment;
* Treatment of previously removed soils using biological land treatment;
* Containment and treatment of groundwater and LNAPL;
* Treatment of oily wastes, sludges, equipment and debris; and
* Groundwater monitoring and institutional controls

Estimated present worth cost: $ 24,780,000 to $ 47,570,000
Implementation time: 6 years - soils

30+ years - groundwater, operations and maintenance

Alternative 4B is the same as Alternative 4A except that soils would be treated using biological land treatment and all oils and sludges would be incinerated off-site. Biological land treatment is not expected to achieve the degree of treatment provided by incineration; however, allowable final contaminant levels are anticipated to be met. Design studies would be utilized to determine achievable treatment efficiencies and identify any additional remedial actions which may be necessary in conjunction with biological land treatment.

ALTERNATIVE 4C

* Excavation of contaminated surface and subsurface soils and treatment using soil washing;
* Treatment of previously removed soils using soil washing;
* Containment and treatment of groundwater and LNAPL;
* Treatment of oily wastes, sludges, equipment and debris; and
* Groundwater monitoring and institutional controls

Estimated present worth cost: $ 35,450,000 to $ 52,660,000
Implementation time: 3 years - soils
30+ years - groundwater, operations and maintenance

Alternative 4C is the same as Alternative 4A except that soils would be treated using soil washing and all oils and sludges would be incinerated off-site. Residual fine soils from the soil washing process which do not meet cleanup criteria would be further treated in a bioslurry reactor. The volume of residual fine soils requiring further treatment is estimated at five percent of the total volume of treated soils. As with biological land treatment, soil washing is not expected to achieve the degree of treatment provided by incineration; however, it is anticipated that allowable final contaminant levels will be met. Design studies would be utilized to determine achievable treatment efficiencies and identify any additional remedial actions which may be necessary in conjunction with soil washing.

Alternative 5: Total Excavation and Treatment of Soils and Groundwater Containment and Treatment

ALTERNATIVE 5A

* Excavation of all accessible contaminated soils and treatment with on-site incineration;
* Treatment of previously removed soils using on-site incineration;
* Containment and treatment of groundwater and LNAPL;
* Treatment of oily wastes, sludges, equipment and debris; and
* Groundwater monitoring and institutional controls

Estimated present worth cost: $ 99,870,000 to $ 156,220,000

Implementation time: 8 years - soils
30+ years - groundwater, operations and maintenance

Under Alternative 5A, all accessible contaminated site soils would be excavated and treated in an on-site incinerator. This includes the areas identified under Alternative 4 in addition to subsurface soils impacted by LNAPL. These areas correspond to surface soil hot spots, the former process area, the waste water discharge ditch and soil areas near the groundwater table which have been impacted by LNAPL. Bagged soils previously excavated during EPA's removal action would also be treated in an on-site incinerator. Excavation in surface soil hot spot areas would occur to a depth of approximately three feet. Subsurface excavation would occur to a depth of approximately four feet below the groundwater table. Excavation of the soils impacted by the LNAPL is assumed to extend from two feet above to four feet below the groundwater table. The estimated volume of soil excavated under this alternative is 279,000 cubic yards which includes about 94,000 cubic yards of uncontaminated soil requiring excavation to access underlying LNAPL-impacted soils. The total estimated volume of soil treated under this alternative is 195,000 cubic yards and includes the bagged soils. Other necessary activities would include filling excavated areas using treated soils, surface grading and revegetation.

Under Alternative 5A, approximately 44,000 cubic yards of contaminated soils would remain in place. This includes areas beneath the interstate highway which are considered inaccessible. These soils would be addressed through LNAPL extraction, soil flushing and *in-situ* bioremediation.

Under this alternative, oils and sludges currently in place at the site would be incinerated on-site along with soils. LNAPL recovered by the groundwater system while the incinerator was operating would also be incinerated. LNAPL recovered after on-site incineration has been discontinued would be incinerated off-site. Contaminated debris and equipment would be decontaminated and disposed of in an appropriately licensed off-site landfill.

A groundwater containment and treatment system would be constructed to contain the dissolved groundwater contaminant plume and any residual LNAPL and capture the contamination before it discharges to Silver Bow Creek. However, the groundwater containment and extraction design for Alternative 5A would entail a less extensive network of extraction and containment mechanisms (trenches, extraction wells, physical/hydraulic barriers) than under Alternatives 3 or 4 because excavation of all accessible source areas containing LNAPL would occur as part of this alternative. Groundwater treatment above ground is assumed to consist of oil/water separation, bioreactor treatment and carbon polishing. Other methods of treatment such as UV/oxidation or granulated activated carbon (GAC) may be utilized instead of a bioreactor depending on detailed design analysis. Groundwater treatment above ground would occur to the degree necessary to meet applicable environmental standards and health-based criteria prior to discharge. Additionally, an *in-situ* bioremediation process would be implemented to assist in long-term cleanup of groundwater and residual subsurface soil contamination. Remediation of the contaminated aquifer to drinking water levels is a goal of this alternative.

Once site remediation has effectively contained the contaminated groundwater and LNAPL, and releases to Silver Bow Creek have been effectively reduced or eliminated, it is expected that natural biodegradation and attenuation would effectively reduce the levels of organic contaminants in Silver Bow Creek, stream sediments and groundwater downstream of the site. These natural mechanisms would be relied upon to address the low level contamination found in this area.

The specific design of the groundwater system would take place during the remedial design and remedial action phase of site cleanup. The groundwater extraction and treatment system could utilize the groundwater treatment plant installed at the site by EPA. Groundwater and LNAPL in and around the site would be monitored to evaluate the effectiveness of the recovery and treatment system. The same institutional controls would be implemented as those discussed under Alternative 2. Institutional controls may be reduced or lifted as the remedial action progresses toward completion.

Total estimated costs for Alternative 5A assume that the groundwater action would occur for a period of 30 years. Although groundwater remediation to cleanup levels is expected under this alternative, some inaccessible source areas (under the interstate highway) would remain and be treated in place. Therefore, actual costs and efforts associated with site monitoring, enforcement of institutional controls and operation and maintenance of the groundwater treatment system for the inaccessible source areas (under the interstate highway) may be incurred beyond 30 years.

ALTERNATIVE 5B

* Excavation of all accessible contaminated soils and treatment using biological land treatment;
* Treatment of previously removed soils using biological land treatment;
* Containment and treatment of groundwater and LNAPL;
* Treatment of oily wastes, sludges, equipment and debris; and
* Groundwater monitoring and institutional controls

Estimated present worth cost: $ 27,530,000 to $ 55,200,000
Implementation time: 11 years - soils
30+ years - groundwater, operations and maintenance

Alternative 5B is the same as Alternative 5A except that soils would be treated using biological land treatment and all oils and sludges would be incinerated off-site. Biological land treatment is not expected to achieve the degree of treatment provided by incineration; however, it is anticipated that allowable final contaminant levels will be achieved. Design studies would be utilized to determine achievable treatment efficiencies and identify any additional remedial actions which may be necessary in conjunction with biological land treatment.

ALTERNATIVE 5C

* Excavation of all accessible contaminated soils and treatment using soil washing;
* Treatment of previously removed soils using soil washing;
* Containment and treatment of groundwater and LNAPL;
* Treatment of oily wastes, sludges, equipment and debris; and
* Groundwater monitoring and institutional controls

Estimated present worth cost: $ 48,080,000 to $ 78,180,000
Implementation time: 4 year - soils
30+ years - groundwater, operations and maintenance

Alternative 5C is the same as Alternative 5A except that soils would be treated using soil washing and all oils and sludges would be incinerated off-site. Residual fine soils from the soil washing process which do not meet cleanup criteria would be further treated in a bioslurry reactor. The volume of residual fine soils requiring further treatment is estimated at five percent of the total volume of treated soils. As with biological land treatment, soil washing is not expected to achieve the degree of treatment provided by incineration; however, it is anticipated that allowable final contaminant levels will be achieved. Design studies would be utilized to determine achievable treatment efficiencies and identify any additional remedial actions which may be necessary in conjunction with soil washing.

VIII. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

Section 300.430(e)(9) of the NCP requires that the agencies evaluate and compare the remedial cleanup alternatives based on the nine criteria listed below. The first two criteria overall protection of human health and the environment, and compliance with ARARs are threshold criteria and must be met. The selected remedy must represent the best balance of the selection criteria.

Evaluation and Comparison Criteria

Threshold Criteria

1. Overall protection of human health and environment addresses whether or not a remedy provides adequate protection and describes how potential risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls or institutional controls.

2. Compliance with applicable or relevant and appropriate requirements addresses whether or not a remedy will comply with federal and state environmental laws and/or provide grounds for invoking a waiver.

Primary Balancing Criteria

3. Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

4. Reduction of toxicity, mobility and volume through treatment refers to the degree that the remedy reduces toxicity, mobility and volume of the contamination.

5. Short-term effectiveness addresses the period of time needed to complete the remedy, and any adverse impact on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

6. Implementability refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed to carry out a particular option.

7. Cost evaluates the estimated capital costs, operation and maintenance costs and present worth costs of each alternative.

Modifying Criteria

8. State agency acceptance indicates whether, based on its review of the information, the state (MDHES) concurs with, opposes or has no comment on the preferred alternative. However, for this Site, MDHES is the lead management agency and EPA is the support agency. As such, the State has identified the selected remedy and EPA has concurred with and adopted that identification.

9. Community acceptance is based on whether community concerns are addressed by the selected remedy and whether or not the community has a preference for a remedy. Although public comment is an important part of the final decision, MDHES and EPA are compelled by law to balance community concerns with all of the other criteria.

Following is a summary of the agencies' evaluation and comparison of alternatives. Additional detail evaluating the alternatives is presented in the Feasibility Study report.

1) Overall protection of public health and the environment: Alternatives 1 and 2 are not expected to provide adequate protection of public health and the environment because releases of and exposure to site contaminants remain uncontrolled. Alternatives 3A through 5C, if properly implemented, could be protective of public health and the environment. However, the degree of protection provided by Alternatives 3A, 3B, and 3C is dependent upon effective long term maintenance of the cap and the groundwater system. Alternatives 5A, 5B and 5C would provide the greatest degree of protection of public health and the environment because all accessible contaminated source materials would be removed and treated which substantially reduces potential risks from future releases.

2) Compliance with applicable or relevant and appropriate requirements (ARARs): Alternatives 1 and 2 do not meet chemical-specific ARARs for groundwater or surface water. Alternatives 3, 4 and 5 are expected to meet chemical-specific ARARs for surface water, location-specific ARARs and action-specific ARARs. Achieving chemical-specific ARARs for groundwater is not likely under Alternative 3 because most source areas would remain in place. Achieving chemical-specific ARARs in groundwater under Alternative 4 is uncertain because, although a large volume of source material is removed, a substantial amount of source material would remain in place and require long-term remediation. Achieving chemical-specific ARARs for groundwater may be possible under Alternative 5 since all accessible source areas are removed.

3) Long-term effectiveness and permanence: Alternatives 1 and 2 provide no long-term effectiveness or permanence for reducing risks to human health and the environment beyond those currently in existence at the site. Cleanup goals for the site would not be achieved.

Alternatives 3, 4 and 5 permanently address the oils and sludges, contaminated equipment and debris through treatment and off-site disposal.

Excavated soils are most effectively and permanently treated by incineration under Alternatives 3A, 4A, and 5A. Biological land treatment and soil washing under Alternatives 3B, 3C, 4B, 4C, 5B, and 5C are not expected to be as effective as incineration but would permanently reduce the levels of contamination to within established risk ranges. *in-situ* bioremediation would be effective at treating residual source and dissolved phase groundwater contamination under Alternative 5. *in-situ* bioremediation would be less effective as applied to Alternatives 3 or 4 as substantial amounts of high strength source material, not effectively treated by *in-situ* bioremediation, would remain in place. Capping under Alternative 3 is subject to deterioration over time and requires long term maintenance. Containment and reliance upon engineering and institutional controls to protect human health and the environment do not provide the degree of permanence that removal and treatment of contamination does.

Groundwater containment and treatment systems under Alternatives 3, 4 and 5 could all be effective for containing contaminated groundwater, limiting contaminant migration, and reducing impacts to Silver Bow Creek to allowable levels. Under Alternative 3 the groundwater system is expected to require operation and maintenance indefinitely, since only minimal soil excavation and treatment is planned. Under Alternative 4 the overall effectiveness of groundwater remediation is expected to be greater than under Alternative 3, because a large volume of contaminated soils and associated LNAPL is excavated and treated. Operation and maintenance of the groundwater system under Alternative 4 is expected to be required for a shorter period of time than under Alternative 3. Groundwater treatment under Alternative 5 is anticipated to have the greatest effectiveness of the alternatives because all accessible contaminated soils and LNAPL are excavated and treated. Under Alternative 5, operation and maintenance of the groundwater system is expected to be required for a shorter period of time than under either Alternative 3 or Alternative 4. Because Alternative 5 captures and treats the greatest percentage of continuing sources of contamination, Alternative 5 provides the greatest assurance of long-term effectiveness and permanence. It is technically impracticable to remove more source material than is contemplated under Alternative 5.

4) Reduction of toxicity, mobility and volume: Alternatives 1 and 2 provide no reduction of toxicity, mobility or volume through treatment beyond that provided by the actions currently in place at the site. Alternatives 3, 4 and 5 reduce the toxicity and volume of oils and sludges through either on-site incineration or off-site incineration. The toxicity of contaminated equipment and debris is reduced by decontamination under Alternatives 3, 4 and 5.

The toxicity, mobility and volume of contaminants in excavated soils is effectively eliminated by incineration under Alternatives 3A, 4A and 5A. Biological land treatment and soil washing under Alternatives 3B, 3C, 4B, 4C, 5B and 5C reduce the toxicity and volume of contaminants in soils but not to the degree provided by incineration.

Alternative 3 provides minimal reduction of toxicity, mobility and volume of contaminated site soil because a cap is employed. Alternative 4 provides a greater reduction of toxicity, mobility and volume of contaminated site soil than Alternative 3 because a large amount of contaminated soils and associated LNAPL are excavated and treated. Alternative 5 provides the greatest reduction of toxicity, mobility and volume of contamination in soils of all the alternatives because all accessible contaminated soils and associated LNAPL are excavated and treated.

Groundwater treatment systems included in Alternatives 3, 4 and 5, provide reduction of toxicity, mobility, and volume of groundwater contamination. Alternative 4 provides greater reduction of toxicity, mobility and volume of groundwater contamination than Alternative 3 because large sources of groundwater contamination (contaminated soils and LNAPL) are excavated and treated. Alternative 5 provides the greatest reduction of toxicity, mobility and volume of groundwater contamination of all the alternatives because all accessible sources of groundwater contamination (contaminated soils and LNAPL) are excavated and treated.

5) Short-term effectiveness: Under Alternatives 1 and 2, there is potential for workers and site visitors to be exposed to hazardous chemicals during implementation of the current removal actions being performed by EPA at the site. Adhering to safe work practices and using health and safety equipment is designed to limit the exposure to workers and visitors to within allowable levels.

During implementation of Alternatives 3, 4 or 5 there is potential for workers, site visitors, and nearby residents to be exposed to hazardous chemicals. Adhering to safe work practices and using health and safety equipment should limit the exposure to workers and visitors to within allowable levels. Dust and vapor release control activities can be implemented to limit this exposure potential. The incinerator used under Alternatives 3A, 4A, and 5A can be designed to ensure emissions meet allowable standards. Given this and the short duration that the incinerator would be on-site, health risks to nearby residents would be low.

6) Implementability: Alternatives 1 through 5 are all technically implementable. Capping source areas (Alternative 3) is likely easier to implement than removal and treatment of source areas (Alternative 4 and 5). Excavation of saturated soils is more difficult than excavation of soils above the water table. For Alternatives 3, 4 and 5 the technologies for soil and groundwater treatment are readily implementable and have all been used in full scale application at other sites. Prior to full-scale implementation of any of these treatment technologies at the site, design optimization studies are appropriate. On-site incineration may not be acceptable to the local community and off-site incineration can be difficult to implement because off-site incinerator operators are reluctant to accept wastes containing dioxin. Under Alternative 3, cap maintenance and operation and maintenance of the groundwater system will have to continue indefinitely. Operation and maintenance of the groundwater systems under Alternatives 4 and 5 may be required beyond 30 years.

7) Cost: Alternative 1 is the least costly to implement. Alternative 5A is the most costly to implement. The 30-year present worth of Alternative 3 ranges from $16.5 million to $36.4 million; Alternative 4 ranges from $18.8 million to $88.6 million; and Alternative 5 ranges from $22.5 million to $132.2 million.

Cost estimates provided for the FS showed above-ground biological treatment of soils to be more cost effective than soil washing and incineration. Incineration is significantly more expensive than either biological land treatment or soil washing. Design studies could further define the relative costs of these treatment options.

Total estimated costs for all the alternatives assume that the action will only occur for a period of 30 years. Under Alternatives 1, 2, and 3, since the site will continue to be contaminated indefinitely, actual costs and efforts associated with remedial actions would be incurred indefinitely beyond the 30 year period. Although the goal under Alternatives 4 and 5 is to remediate the site in a finite period of time, the actual costs and efforts associated with remedial actions, particularly groundwater remediation, may be incurred beyond the 30 year period. Additionally, because the estimated groundwater remediation costs under Alternatives 3, 4 and 5 include entire system costs, utilization of the EPA groundwater treatment system would reduce the estimated costs of groundwater remediation as presented here and in the feasibility study report.

8) State agency acceptance: The State of Montana has been the lead agency for the development of this Record of Decision and has selected a modified Alternative 5B as the remedy contained herein. EPA has participated in the remedial process as the support agency and has concurred with and adopted the remedy selection.

9) Community acceptance: Public comment on the Remedial Investigation, Feasibility Study and Proposed Plan was solicited during formal public comment periods extending from May 7, 1993 until July 7, 1993. Comments received from the community indicate overwhelming support for the preferred remedy. Response to the community comments are found in the Responsiveness Summary.

During the public comment period, MDHES and EPA received extensive comments from Potentially Responsible Parties (PRPs) that have been identified for the Site. Comments received from the PRPs indicated their opposition to the preferred alternative, specifically to the goal of groundwater cleanup to drinking water standards. In initial comments, the PRPs preferred the approach of Alternative 3 which consists primarily of soil capping and stressed implement because off-site incinerator operators are reluctant to accept wastes containing dioxin. Under Alternative 3, cap maintenance and operation and maintenance of the groundwater system will have to continue indefinitely. Operation and maintenance of the groundwater systems under Alternatives 4 and 5 may be required beyond 30 years.

7) Cost: Alternative 1 is the least costly to implement. Alternative 5A is the most costly to implement. The 30-year present worth of Alternative 3 ranges from $16.5 million to $36.4 million; Alternative 4 ranges from $18.8 million to $88 6 million; and Alternative 5 ranges from $22.5 million to $132.2 million.

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During the public comment period, MDHES and EPA received extensive comments from Potentially Responsible Parties (PRPs) that have been identified for the Site. Comments received from the PRPs indicated their opposition to the preferred alternative, specifically to the goal of groundwater cleanup to drinking water standards. In initial comments, the PRPs preferred the approach of Alternative 3 which consists primarily of soil capping and stressed that the most appropriate land uses at the site are industrial or recreational. In comments received from some of the PRPs after the close of the comment period, the PRPs suggested an approach based on a modification of Alternative 4B. PRP comments with MDHES and EPA responses are also found in the Responsiveness Summary.

MDHES and EPA have carefully considered all comments, and have made some modifications to the preferred remedy (Alternative 5B) which the agencies deem appropriate. Modifications to preferred remedy are described in Section XI of this document.

IX. SELECTED REMEDY

Based upon consideration of CERCLA requirements, the detailed analysis of alternatives, and public comments, MDHES and EPA have determined that Alternative 5B, with some modifications, represents the best balance of considerations using the selection criteria and is the appropriate remedy for the site. This alternative will provide maximum source reduction, remediate groundwater to the extent practicable and limit releases to Silver Bow Creek to allowable levels. All accessible contaminated soils and LNAPL will be excavated to the extent practicable and treated, preventing this material from continuing to contaminate groundwater. The long-term effectiveness and degree of permanence of the selected remedy is high. MDHES does not expect any unmanageable short-term risks associated with this alternative. This remedy will comply with all applicable or relevant and appropriate requirements. This remedy uses treatment technologies and permanent solutions to the maximum extent practicable and will be cost effective. The selected remedy will also satisfy the preference for treatment as a principal element of the remedy and for on-site remedies established in CERCLA. While certain other alternatives may better satisfy certain individual selection criteria, the selected remedy best meets the entire range of the selection criteria and achieves, in the determination of both EPA and MDHES, the appropriate balance, considering site specific conditions and the criteria identified in CERCLA and the NCP. The criteria described above are discussed in more detail in Section X, Statutory Determinations, below.

Components of Selected Remedy

The major components of the selected remedy include:

1. Excavation of contaminated soils from accessible areas of the site, to the extent practicable. The volume of soils is estimated to be approximately 208,000 cubic yards;

2. Treatment of excavated soils (208,000 cubic yards approximately) and previously removed soils (10,000 cubic yards approximately) by above ground biological treatment;

3. In-place biological treatment of contaminated soils below the depth of excavation before backfilling;

4. Backfill of excavated and treated soils into excavated areas if possible, surface grading and revegetation;

5. Soil flushing of inaccessible soils areas (principally underlying Interstate 15/90) in order to recover hazardous substances;

6. Containment of contaminated groundwater and LNAPL using physical and/or hydraulic barriers (as determined during remedial design) in order to prevent the spread of contaminated groundwater and LNAPL and to limit releases of contamination into Silver Bow Creek;

7. Treatment of extracted groundwater using the present EPA water treatment plant (which consists of oil/water separation followed by granulated activated carbon treatment). The ultimate design of the groundwater treatment system (as determined during remedial design) may include the addition of biological means or ultraviolet oxidation (UV/oxidation) to maximize cost effectiveness of the treatment system. Treatment will meet standards for discharge or reinjection, as appropriate;

8. Discharge of extracted, treated groundwater into Silver Bow Creek and/or reinjection of extracted, treated groundwater into the aquifer (as determined during remedial design);

9. Enhanced *in-situ* biological treatment of contaminated groundwater, inaccessible contaminated soils areas and contaminated soils not recovered by excavation;

10. Treatment of contaminated site debris and equipment by decontamination followed by disposal of these materials in a licensed off-site landfill;

11. Treatment of contaminated oils and sludges in a licensed off-site incinerator;

12. Additional institutional controls preventing access to contaminated soils and groundwater; and

13. Groundwater monitoring to determine movement of contaminants and compliance with remedial action requirements.

Once site remediation has effectively contained the contaminated groundwater and LNAPL, and releases to Silver Bow Creek have been effectively reduced or eliminated, it is expected that natural biodegradation and attenuation will effectively reduce the levels of organic contaminants in Silver Bow Creek, stream sediments and groundwater downstream of the site. These natural mechanisms will be relied upon to address the low level contamination found in this area.

<u>**Estimated Costs of the Remedy**</u>

The total present worth cost of Alternative 5B was estimated by ARCO in the feasibility study in the range of \$27.5 million to \$55.2 million. These costs are detailed in Table 21. The estimated cost of the selected remedy is expected to vary somewhat from that of Alternative 5B as explained below.

Cost Uncertainties

The actual cost of implementing the remedy will be lower than the Alternative 5B estimate because the groundwater treatment plant constructed by EPA will be utilized. Additionally, ARCO did not fully account for soil flushing costs in the FS. ARCO has provided those costs to DHES as shown in Table 22. The estimated 30 year present worth cost for soil flushing under the interstate highway ranges from \$328,000 to \$612,000. Subtracting the cost of the treatment facility, estimated between \$981,000 and \$1,090,000, from the original cost estimate and adding the cost of soil flushing changes the total present worth cost of the alternative to between \$26.9 million to \$54.7 million.

Furthermore, the agencies believe that the estimate of costs for this alternative as presented by ARCO in the feasibility study report significantly overstate certain cost elements. For example, the cost figure of \$17.00 per yd^3 for excavation of soils can be expected to apply only to a portion of the most difficult to excavate materials. The costs for most of the excavation should be under \$9.00/yd^3. For purposes of comparison of alternatives, however, even the higher figure for this alternative is used. For purposes of budgeting and planning, the agencies' best estimate of the cost of this alternative is \$26.9 million.

It is also recognized that operation and maintenance costs beyond the thirty year time frame used in the FS, and the discount rate used to evaluate the present worth of operation and maintenance costs are important considerations. DHES recognizes that the use of a 7 percent discount rate used in the FS and calculation of present worth costs without inclusion of inflation, tends to underestimate future costs. This also makes the costs of remedies that rely more heavily on future actions such as operations and maintenance for the bulk of site remediation appear less costly than capital intensive remedies.

DHES firmly believes that, because Alternative 5 removes and treats a large volume of source material while Alternative 3 does not, total remediation time under Alternative 5 is substantially less than under Alternative 3. Therefore, DHES believes the costs of Alternative 5 beyond 30 years would be less than the costs of Alternative 3 beyond 30 years.

Some elements of the remedy will be further refined during remedial design. Specific design and start-up testing will be necessary prior to implementation of the selected remedy.

<u>Cleanup Levels</u>

Currently the Montana Pole site is zoned for industrial land use with residential use allowed for owners and caretakers of businesses on the premises. However, it is possible that the site will be restricted from any residential use in the future. The PRPs indicated in comments submitted during the Proposed Plan comment period that they are pursuing rezoning of this area, as well as creation of conservation easements and possibly other institutional controls to preclude residential land use and groundwater use at the site. Representatives of the Planning Office of Butte-Silver Bow County have expressed a willingness to accommodate the PRPs' requests and institute such land use restrictions.

Accordingly, cleanup levels and the selection of the remedy are based upon an assumption of adequate institutional controls to prevent any residential use at the site. Soil cleanup levels have been developed to protect recreational and industrial land users at the site from excessive health risks. If, for any reason, appropriate land restrictions are not actually implemented, cleanup goals will be adjusted accordingly.

Cleanup levels for site soils are listed in Table 23. These levels are based on a 1 in 1,000,000 cancer risk level for recreational land use at the site for each contaminant of concern for the most susceptible exposure pathway. For example, the cleanup level for PCP corresponds to a 10^{-6} risk level via dermal exposure, while the cleanup level for dioxins is based on a 10^{-6} risk level via ingestion. These cleanup levels correspond to total cancer risk of approximately 3.86×10^{-6} when risks for all contaminants of concern and all pathways are summed (see Table 24). These cleanup levels have been set using the 10^{-6} target to be protective. These cleanup levels correspond to a total cancer risk of approximately 2.0×10^{-5} for industrial land use as shown on Table 24.

The cleanup goals for site groundwater are shown on Table 25 and include maximum contaminant levels (MCLs) and non-zero maximum contaminant level goals (MCLGs). For those contaminants of concern for which MCLs or MCLGs do not exist, cleanup levels will be based on a 1 in 1,000,000 cancer risk level or a 0.9 hazard index for ingestion of groundwater. Cleanup goals for groundwater must be met at the Point of Compliance, which will be the management unit boundary, as defined below. These cleanup goals are necessary even with planned institutional controls to ensure the contamination does not spread, Silver Bow Creek is protected, and the NCP expectations for groundwater are met.

The cleanup levels for Silver Bow Creek are shown in Table 26 and are based on MCLs, non-zero MCLGs and the Montana Water Quality Act I-Classification standard. One goal of the groundwater remedial action is to contain and then remediate contaminated groundwater in order to limit release of contaminants to Silver Bow Creek and reduce contaminant levels in the creek to within applicable standards. Using the I-Class methodology, instream contaminant concentrations at the Point of Compliance must be reduced to the larger of either Gold Book levels or one-half of the mean instream concentrations immediately upstream of the site. This takes into account that there may be other sources of contaminants upstream of the site. However, as all sources of contaminants are reduced or eliminated, instream contaminant levels from Montana Pole sources will approach the Gold Book levels. Therefore the ultimate cleanup levels which are to be achieved in the stream are Gold Book levels, MCLs and non-zero MCLGs as shown on Table 26.

The cleanup levels for treated water discharges to Silver Bow Creek are also based on MCLs, non-zero MCLGs and the I-Classification standard. The ultimate cleanup levels which are to be achieved are shown on Table 27.

The cleanup levels for any water to be reinjected into the aquifer are based on non-degradation criteria and must be no greater than the average concentration of groundwater contamination in the area of recharge.

Points of Compliance

Compliance with cleanup levels described in Table 23 must be met for all excavated soils. Other performance standards must be achieved for contaminated soils below the depth of excavation or for soils not accessible to excavation (under the EPA water treatment plant and under Interstate I-15/90).

For groundwater, compliance with remediation levels must be achieved at the waste management area boundary. Since the contaminated materials will be excavated, treated to levels protective for soil standards, and returned to their place, some contaminated material will effectively remain in place. In such a situation, EPA has determined that "the remediation levels should generally be attained at and beyond the edge of the waste management area." Preamble to the final NCP, 55 Fed. Reg. 8753 (March 8, 1990). This boundary can effectively be defined as the edge of the excavated area, including any additional area where contaminated material is not excavated for any reason. This boundary is to be specifically delineated during remedial design/remedial action to ensure that groundwater contamination does not migrate into uncontaminated areas. Along Silver Bow Creek, this boundary is to be the south bank of the creek. Using this boundary as the point of compliance for attainment of the groundwater remediation levels is protective of any off-site groundwater uses and protective of the water quality goals for the stream.

This point of compliance reflects the change from the Proposed Plan that results from elimination of the possibility of future residential use at the site. Because impending zoning changes and other institutional controls will prevent use of groundwater on the site for drinking water purposes, it will not be necessary to attain the remediation levels throughout the contaminated plume itself, as anticipated in the Proposed Plan. If, however, appropriate changes and controls are not implemented, the point of compliance should be viewed as throughout the plume, except the area under the interstate, since any other location on the site would be a potential area for access to groundwater for drinking water purposes.

Surface water cleanup levels must be achieved at all points within Silver Bow Creek. Upstream surface water measurements, needed for determination of the I-Class standard, must be made upstream of all sources of contamination at the site. Additionally, any runoff from the site to Silver Bow Creek, for example, from precipitation or snow melt, must meet the same surface water standards identified for treated water discharge. Runoff not meeting those standards must be captured and treated along with extracted groundwater prior to discharge.

Performance Standards for Soils

For soils and sediments, the remedial goal is treatment so that the contaminant concentration levels pose no unacceptable risk to human health or the environment. Since no federal or state chemical specific ARARs exist for these media, cleanup levels were determined for contaminants of concern through a site specific risk assessment.

The specific performance standards which will be used to ensure attainment of the remediation levels for these contaminated media are:

- Excavation of accessible soils and associated LNAPLs with contamination levels in excess of the cleanup levels specified in Table 23. Depth of excavation, particularly at and below the groundwater table, will be based on field judgment and technical practicability, as determined by the lead agency in consultation with the support agency. LNAPLs at the groundwater table will be recovered to the maximum extent practicable as determined by the agencies;

- Soils below the depth of excavation with contaminant levels above cleanup levels specified in Table 23 will be bioremediated in place. Biotreatment may include nutrient addition via irrigation, and tilling on routine intervals. After it has been determined by the lead agency, in consultation with the support agency, that in-place bioremediation of these soils is no longer effective or practicable and contaminant levels have plateaued, or it is determined by the agencies that these areas would be effectively addressed by the *in-situ* bioremediation implemented under the groundwater actions, these areas will be backfilled. Residual contamination will be further treated by *in-situ* bioremediation as outlined under Performance Standards for Groundwater;

- Treatment of excavated and previously excavated soils to achieve cleanup levels specified in Table 23. Soils excavated from near Silver Bow Creek which contain tailings materials with elevated metals concentrations will be biologically treated and disposed in an appropriate Butte mine waste repository. All contaminated soils north of the active railroad bed are considered tailings material;

- Backfill of treated soils into excavated areas if possible, filling of remaining excavations with clean fill, replacement of all clean soils, surface grading and revegetation or covering with suitable material compatible with existing or future land uses;

- Remediation of inaccessible contaminated soils (consisting primarily of those soils underlying Interstate I-15/90 and any soils under the EPA water treatment plant) by a two phased approach. First, enhanced LNAPL recovery via extraction wells and recovery trenches using hydraulic gradients and soil flushing to remove hazardous substances from these inaccessible soils. Adjustment of pH, use of surfactants and other methods should be considered to maximize recovery of hazardous substances. After it has been determined by the lead agency, in consultation with the support agency, that recovery of hazardous substances from these areas by these methods is no longer effective or practical and contaminant levels have plateaued, these areas will be addressed by *in-situ* bioremediation as outlined under Performance Standards for Groundwater;

- Implementation of engineering and institutional controls during the remedial action to prevent access to contamination and to limit the spread of contamination; and

- Attainment of all ARARs identified in Appendix A for the remediation of soils.

Sampling will be performed during the response action to verify that all soils contaminated above the cleanup levels are treated. The sampling program shall be developed during remedial design.

Performance Standards for Groundwater

For site groundwater, remediation goals provide maximum source reduction and protect Silver Bow Creek and uncontaminated groundwater by minimizing migration of contaminants with the groundwater. Cleanup levels for groundwater are MCLs and non-zero MCLGs established by the Safe Drinking Water Act or risk based levels developed in the absence of MCLs or MCLGs. Attainment of these cleanup levels at groundwater points of compliance will be protective of human health and the environment and will ensure that uncontaminated aquifers and adjacent surface waters are protected for potential beneficial uses.

The specific performance standards which will be used to ensure attainment of the remediation goals for groundwater are:

- Containment of contaminated groundwater and LNAPL using hydraulic and/or physical barriers (as determined during remedial design) to effectively prevent the spread of contaminated groundwater and LNAPL and limit releases of contamination into Silver Bow Creek. Releases into Silver Bow Creek must be reduced in order to achieve cleanup levels identified in Table 26 for Silver Bow Creek. Migration of contaminated groundwater must be limited in order to maintain groundwater cleanup levels (Table 25) at groundwater points of compliance;

- Treatment of extracted groundwater to cleanup levels in Table 27 prior to discharge to Silver Bow Creek. Control and treatment, if necessary, of any contaminated runoff prior to discharge to Silver Bow Creek to meet the same cleanup levels;

- Treatment of the contaminated groundwater aquifer and contaminated soils not recovered by excavation by enhanced *in-situ* biormediation. *in-situ* treatment may include the reinjection of treated groundwater and the addition of oxygen and nutrients to promote the biodegradation of contaminants. *in-situ* treatment of the site groundwater will continue until contaminant levels have plateaued and it is no longer effective or practical to continue treatment, as determined by the lead agency in conjunction with the support agency;

- Attainment of all ARARs identified in Appendix A for groundwater remediation;

- Monitoring of groundwater wells within or proximate to the contaminated groundwater plume for contaminants of concern for groundwater; and

- Implementation of institutional controls to prevent access to or impacts upon contaminated groundwater at the site.

Groundwater sampling will be performed during the response action to verify that contaminated groundwater above the cleanup levels is contained and treated. It is anticipated that the treatment prescribed for sources of contamination at the site will effectively reduce the levels of contamination and shrink the contaminant plume sufficient to stabilize the site within a reasonable period of time.

Compliance Sampling Program

A sampling program for monitoring the remedial action and determining compliance with the performance standards shall be implemented during the remedial action. In addition, to ensure that groundwater performance standards are maintained, it is expected that groundwater will be monitored at least twice annually during the groundwater seasonal high and low for a period of at least three years following discontinuation of groundwater remediation. These monitoring programs will be developed during remedial design and shall include, at a minimum, the following: analytical parameters (focusing on the contaminants of concern, but analyzing other contaminants, if any, that are not contaminants of concern and are determined to be occurring at levels exceeding MCLs or non-zero MCLGs), sampling points, sampling frequency and duration, and statistical methods for evaluating data. Specific performance monitoring points shall be specified and approved by EPA and MDHES during remedial design, considering appropriate points of compliance.

Because the soils cleanup levels established in this Record of Decision are health based standards for recreational use of the Site that do not provide for unlimited use with unrestricted exposure, and because residual hazardous substances may be left on-site and the cleanup is expected to take several years, the selected remedy will require five year reviews under Section 121(c) of CERCLA, Section 300.430(f)(4)(ii) of the NCP, and applicable guidance to assure the long-term effectiveness of the remedy.

As there are residents and businesses utilizing groundwater for domestic and lawn watering purposes in the immediate vicinity of the site, all wells within one-quarter mile of contaminated site groundwater will be sampled on a routine basis for contaminants. If site related contaminants are detected in any well above regulatory or risk based levels, appropriate measures such as individual treatment at the tap shall be implemented as deemed appropriate by the regulatory agencies.

Engineering and Institutional Controls

These controls are required to maintain the protectiveness of the remedy. Since cleanup for all media are not likely to be met in less than 10 years, measures must be instituted to control risks during implementation of the remedy. Fencing and posting of areas where active remediation is occurring will be required to prevent unauthorized access to contaminated media or to remedial action areas. The remedy itself includes certain actions to contain and prevent migration of the contaminant plume during implementation of the remedy. The design of this engineered containment will have to consider and accommodate removal actions to be conducted at the Lower Area One Operable Unit of the Silver Bow Creek/Butte Area NPL Site, particularly compensating for any dewatering in connection with the removal of mine tailings at that site.

The institutional controls which must be implemented for the selected remedy include adequate zoning restrictions, conservation easements, and other controls to prevent any future residential use of the site and appropriate controls to prevent any water well drilling in the contaminated groundwater plume and adjacent areas to prevent additional receptors of contaminated groundwater or an expansion of the plume. As noted above, the PRP's for the site have indicated that they are currently pursuing implementation of these controls, in coordination with the city/county government. If controls deemed adequate by the agencies are not ultimately implemented, the assumptions used in determining the points of compliance and other aspects of the selected remedy will be invalid, and the contingency measures specified below will be implemented.

Contingency Measures

Soil Remediation

Soil cleanup levels have been determined based on the anticipated implementation of zoning restrictions, conservation easements and groundwater restrictions by the PRPs and Butte-Silver Bow County which will permanently prohibit residential and groundwater use at the site. If these permanent site-wide changes are not implemented, revised soil cleanup levels based on residential land use will be substituted for the recreational land-use cleanup levels presented in this Record of Decision.

If the residence which currently exists on-site remains after implementation of the institutional controls, contaminated soils subject to residential use will be removed and replaced with clean soils. Soil removal levels will correspond to a 1 in 1,000,000 cancer risk level for residential land use for each contaminant of concern for the most susceptible exposure pathway.

Groundwater Remediation

Groundwater remediation points of compliance are based on the expected implementation of zoning restrictions, conservation easements, and groundwater restrictions by the PRPs and Butte-Silver Bow County. If these permanent changes are not implemented, the groundwater points of compliance will be revised to require compliance with remediation levels throughout the contaminated groundwater plume.

Oils and Sludges Remediation

The selected remedy for oils and sludges is off-site incineration. Investigation during the feasibility study determined that some licensed incinerators are reluctant to accept wastes containing dioxin. If, subsequent to the implementation of the selected remedy, no facility is available or willing to accept the site oils and sludges for incineration, the lead agency will require the implementation of a contingency plan. Such a contingency plan would consist of:

- o A determination by the agencies that no facility is available or willing to accept these wastes for treatment and that no facility is likely to become available in the future;

- All practical methods for off-site treatment, disposal, reuse and recycling will be investigated, and, if an appropriate option of this type is available, this option will be substituted for the selected remedy; otherwise,

- Oils and sludges will be treated using on-site incineration which will comply with all ARARs.

The decisions to invoke any or all of these contingency measures may be made by the agencies at any time during implementation of the remedial action, as appropriate.

X. STATUTORY DETERMINATIONS

While the majority of the comments received from the community supported selection of Alternative 5B, many of the comments submitted, particularly those submitted by the PRPs, suggested use of a containment remedy rather than removal of the source of contamination. However, after considering those comments fully, as evidenced in the Responsiveness Summary, the agencies have determined that maximum removal of the source, as outlined in the remedy description, is the appropriate remedy for the site and most fully satisfies the selection criteria established in CERCLA and the NCP.

A number of site specific conditions have been considered by the agencies in the determination of the remedy. Much of the contamination at the site exists in the form of a light non-aqueous phase liquid (LNAPL) which floating on the groundwater surface at a depth that ranges from approximately 5 to 20 feet below ground surface. No dense non-aqueous phase liquid (DNAPL) was found at the site. Since the LNAPL material is lighter than water, the groundwater essentially forms a floor which stops the downward migration of the LNAPL. This material floating on top of the groundwater then constitutes a major source of contamination to the groundwater and Silver Bow Creek by dissolving into the groundwater. This dissolved phase of contamination then migrates with the natural groundwater movement and spreads to surrounding areas and enters the stream.

With a substantial amount of high-strength source material in contact with site groundwater, a containment remedy may have to operate essentially forever in order to prevent releases of contaminants to the stream and surrounding areas. Certain elements of the selected remedy are intended to eliminate this continuing source of contamination. After elimination of this source material, residual contamination levels will be further reduced using long-term *in-situ* biological degradation. This may ultimately allow a stabilization of site conditions such that containment at the site may no longer be necessary.

Both DHES and EPA have determined that, considering all appropriate factors, including site specific conditions and the remedy selection criteria specified in CERCLA and the NCP, the remedy presented in this record of decision, including excavation and/or treatment of the contaminated source material, both soils and LNAPL, is the appropriate remedy for the site.

Under CERCLA section 121, MDHES and EPA must select a remedy that is protective of human health and the environment, complies with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), is cost-effective, and utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that include treatment which permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element. The following sections discuss how the selected remedy meets these statutory requirements.

Protection of Human Health and the Environment

The selected remedy protects human health and the environment first through containment and then treatment of contaminants at the site, including a combination of soil and groundwater remedial actions and use of institutional controls. Soil actions include excavation and biological treatment of the LNAPL plume and contaminated soils. Treated soils will be backfilled into excavated areas and revegetated.

Soil flushing and *in situ* biological treatment will be used in those areas where excavation is not practicable or cost effective, as defined in the remedy description section. Implementation of the soil flushing alternative under I-15/90 will eliminate the need for relocation/excavation of the Interstate Highway and will reduce the levels of contamination in those areas to the extent practicable. The other soils treatment alternatives evaluated were not implementable for the contaminated soils under I-15/90 without removing the roadbed. Prior to backfilling of excavated areas, in place biological treatment of contaminated soils below the depth of excavation will reduce the volume and toxicity of these materials and aid in groundwater control.

Biological treatment of the contaminated soil will reduce the threat of exposure through direct contact with or ingestion of contaminated soil. By excavating the contaminated soils and treating them, the cancer risks from exposure will be reduced to approximately 3.9×10^{-6} for recreational use which is within the EPA's acceptable risk range of 1×10^{-4} to 1×10^{-6} as specified by the NCP. In addition, the cleanup levels established will be protective for industrial use at the site at an excess cancer risk of approximately 2×10^{-5}. It is anticipated that residential use at the site will be prohibited through the use of institutional controls. There are no short term threats associated with the selected remedy that cannot be readily controlled. In addition, no adverse cross-media impacts are expected from the remedy.

Initially, containment of contaminated groundwater will reduce the potential for exposure to contaminants in adjacent aquifers and in Silver Bow Creek. Permanent protectiveness will be attained through removal and treatment of contaminant source areas and then treatment of the groundwater, with treatment and discharge or reinjection of extracted groundwater and *in situ* biological treatment of groundwater.

By first containing releases to surface water and then removing sources and remediating the groundwater migrating to Silver Bow Creek, protection of affected surface waters will be achieved. Also by treating extracted groundwater to drinking water standards before discharging to surface water, the loading of contaminants of concern from this site will be brought to within acceptable levels for Silver Bow Creek. Once all these sources of contamination from the site are addressed, natural attenuation and biodegradation will restore the stream to acceptable and protective levels for contaminants of concern from this site.

There are no short term threats associated with the selected remedy that cannot be readily controlled. In addition, no adverse cross media impacts are expected from the remedy.

A variety of engineering and institutional controls will be implemented with the remedy to ensure protectiveness while the remedy is being implemented and in the future. As there are residents and businesses utilizing groundwater for domestic and lawn watering purposes in the immediate vicinity of the site, all wells within one-quarter mile of contaminated site groundwater will be sampled on a routine basis for contaminants. If site related contaminants are detected in any well above regulatory or risk based levels, appropriate measures such as individual treatment at the tap shall be implemented as deemed appropriate by the regulatory agencies. Institutional controls will be implemented to prohibit groundwater use in the affected area and to prevent an expansion of the plume. Fencing and posting to prevent unauthorized access to contaminated media during remediation will be used.

Compliance with Applicable or Relevant and Appropriate Requirements

The final determination of ARARs by MDHES and EPA is set forth in Appendix A attached to this Record of Decision. The selected remedy will comply with all applicable or relevant and appropriate requirements (ARARs). No waiver of ARARs is expected to be necessary. Some significant ARARs are listed below.

Contaminant-specific ARARs

Contaminant-specific ARARs typically set levels or concentrations of chemicals that may be allowed in or discharged to the environment. The primary contaminant-specific ARARs for this remedy are the maximum contaminant levels (MCLs) and non-zero maximum contaminant level goals (MCLGs) established under the Safe Drinking Water Act. The selected remedy will remediate existing groundwater contamination to achieve these relevant and appropriate MCLs and MCLGs at appropriate points of compliance.

In addition the remedy will attain the surface water quality standards for site contaminants in Silver Bow Creek, as designated under Montana law. ARM 16.20.623 specifies the standards for the "I" classification, applicable to Silver Bow Creek, and requires eventual attainment of Ambient Water Quality Criteria (Gold Book levels).

Since no treatment standards have been set for the RCRA listed wastes on site (F032 and F034 wastes) as of the date of this Record of Decision, RCRA Land Disposal Restrictions will not apply to the remedy.

Location-specific ARARs

Location-specific ARARs establish requirements or limitations based on the physical or geographic setting of the Site or the existence of protected resources on the Site.

Portions of the site are within a 100-year floodplain. Design of the remedy will have to ensure that no prohibited structures or other artificial obstructions are constructed in the floodplain. Although treated soils will be backfilled into excavated areas within the floodplain, the floodplain may not be used for storage or disposal of wastes.

Regulations concerning the protection of wetlands, including those relating to the Fish and Wildlife Coordination Act and Executive Orders 11,988 and 11,990, will apply to the implementation of this remedy. The protected resource which has the potential to be adversely affected by the selected remedy is wetland areas directly associated with Silver Bow Creek. These wetland areas are also within the Lower Area One Operable Unit of the Butte-Silver Bow Creek NPL site and are being addressed under removal actions taking place within LAO. Consultation with the U.S. Fish and Wildlife Service during the design and implementation phase will be required to establish if any additional mitigative measures, beyond those planned for LAO, will be necessary.

Similarly, the one protected historical resource near the site is a slag wall that is actually located on the Lower Area One Operable Unit. Any necessary mitigation measures or other protection for that slag wall are being determined in connection with activities at LAO.

Action-specific ARARs

Action-specific ARARs generally provide guidelines for the manner in which specific activities must be implemented. Thus, compliance with many action-specific requirements must be ensured through appropriate design of the remedy.

The remedy will meet all action-specific ARARs, including the following RCRA requirements: monitoring for releases from waste management units, requirements for management of waste piles and land treatment units, and transportation requirements, as well as all requirements for reclamation of excavated areas.

In addition, the remedy, as designed, will meet other action-specific standards, including Clean Air Act regulations for particulate matter, dust control practices that achieve ambient air quality standards, Clean Water Act regulations requiring run-on and run-off controls that prevent any discharge of contaminants from remedial actions that would violate surface water standards, sufficient treatment before reinjection of groundwater to ensure compliance with groundwater nondegradation standards, the requirements of the Underground Injection Control program under the Safe Drinking Water Act and RCRA regulations associated with the treatment, storage and transportation of hazardous waste.

Cost-Effectiveness

MDHES and EPA have determined that the selected remedy is cost-effective in mitigating the principal risks posed by the soils, sediments and contaminated groundwater. Section 300.430(f)(ii)(D) of the NCP requires evaluation of cost-effectiveness. The remedy must provide overall effectiveness proportional to its costs. Overall effectiveness is determined by the following three balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; and short-term effectiveness. The selected remedy rates very high in satisfying the first two criteria and presents no substantial problems for short-term effectiveness. To the extent that the estimated cost of the selected remedy exceeds the costs of other alternatives, the difference in cost is reasonably related to greater overall effectiveness of the selected remedy.

The cost for the selected remedy was estimated by ARCO to be between $27,530,000 to $55,200,000. MDHES and EPA have determined that this cost will be reduced to at least between $26.9 million to $54.7 million and believe that the actual cost will be near the bottom end of the range.

By comparison, the cost of the containment alternative supported by some of the PRPs in their comments was estimated in the feasibility study at between $21.1 million and $36.6 million, and the agencies believe that, fairly assessing the present value of the costs of perpetual operation of that system, the actual costs should be viewed as at the high end of that range.

Based on data provided by ARCO in the feasibility study report, the selected remedy for the soils (biological land treatment) provides the best overall effectiveness of all alternatives considered proportional to its cost. The selected remedy will reduce the toxicity, mobility, and volume of contaminated soils to the maximum extent practicable. Also the implementation of this remedy will result in long-term effectiveness by reducing residual carcinogenic risks to within the acceptable risk range through permanent treatment.

Soil flushing and *in situ* bioremediation of areas beneath Interstate I-15/90 was thought to be a more cost effective remediation of this limited area of contamination than demolition and excavation of the Interstate.

The selected remedy for groundwater provides the best overall effectiveness of all alternatives considered proportional to its cost. The combination of plume containment via hydraulic (pump and treat) and physical barriers and *In Situ* biological treatment, will reduce the toxicity, mobility or volume of affected groundwater and will be a permanent solution. This groundwater remediation approach, in combination with the source removal accomplished by the soil remediation, is believed necessary in order to adequately protect Silver Bow Creek and the alluvial aquifers, in addition to providing a realistic opportunity to fully stabilize and achieve cleanup goals at the site in the future.

The selected remedy assures a high degree of certainty that the remedy will be effective in the long-term because of the significant reduction of the toxicity and mobility of the wastes achieved through biological treatment of the soil. The groundwater component of the remedy ensures a high degree of certainty of effectiveness because the technology employed is known to be effective for organic contaminated wastewaters and will enhance the degradation of contaminants remaining *in situ*.

Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

MDHES and EPA have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner at the Site. Of those alternatives that are protective of human health and the environment and comply with ARARs, MDHES and EPA have determined that this selected remedy provides the best balance of trade-offs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, or volume achieved through treatment, short-term effectiveness, implementability and cost, while also considering the statutory preference for treatment as a principal element and considering state and community acceptance. The detailed evaluation of the balance of these criteria among the alternatives considered is set forth in the FS Report and is summarized in section VII, Description of Alternatives, of this record of decision.

The selected remedy includes treatment of contaminated media which will permanently and significantly reduce the principal threats posed by the soils and groundwater. The other alternative considered which could achieve similar or more substantial reductions, incineration, was significantly more expensive. Other alternatives considered, including containment, capping and partial excavation, did not offer similar prospects for effectiveness or permanence.

Preference for Treatment as a Principal Element

By biologically treating the contaminated groundwater and the contaminated soils, the selected remedy addresses the principal threats posed by the Site through the use of treatment technologies. By utilizing treatment as a significant portion of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied.

XI. DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the Site was released for public comment May 5, 1993. The plan identified Alternative 5B as the preferred remedy for the site. MDHES and EPA have reviewed all written and oral comments submitted during the public comment period. After consideration of the public comments, MDHES and EPA have determined that changes to the Proposed Plan are warranted.

Comments received from ARCO and Butte-Silver Bow government indicate that further restrictions on land and groundwater use at the site are likely. Based on these anticipated changes, the agencies have modified the preferred remedy as follows:

- Soil cleanup levels have been modified anticipating that residential land use at the site will be effectively prohibited. As such, revised soil cleanup levels have been determined which will be protective for the anticipated industrial and recreational uses. Revised soil cleanup levels are based on a 1 in 1,000,000 cancer risk level for recreational land use at the site for each contaminant of concern for the most susceptible exposure pathway. Soil cleanup levels are fully explained in Section IX - Cleanup Levels.

- Groundwater points of compliance have been modified anticipating that access and use of site contaminated groundwater will be effectively prohibited. Points of compliance have been set at the waste management area boundary as explained in Section IX - Points of Compliance. These requirements will be protective of surrounding groundwater and Silver Bow Creek, and are fully consistent with the NCP and CERCLA requirements.

- Recognizing the concerns expressed in the PRP comments about the implementability of excavation below the groundwater table, excavation will be to the extent practicable, as determined by the agencies. Contaminated soils which remain will be addressed by in-site bioremediation.

- Soil washing was retained in the Proposed Plan as an optional soil treatment technology. However, upon review of additional treatability studies conducted by EPA at the site on soil washing, the agencies have determined that soil washing does not provide significant advantages over biological treatment, either in cost or effectiveness, to warrant retaining the technology further.

XII. REFERENCES

Atlantic Richfield Company (ARCO). 1993a. Final Remedial Investigation Report, Montana Pole and Treating Plant NPL Site. Prepared by James M. Montgomery, Consulting Engineers, Inc., February 1993.

______. 1993b. Final Feasibility Study, Montana Pole and Treating Plant NPL Site. Prepared by James M. Montgomery, Consulting Engineers, Inc., March 1993.

Calgon Carbon Corporation, 1991. Accelerated Column Testing for Removal of Pentachlorophenol (PCP) and Naphthalene from a Groundwater Stream. Prepared for Keystone, September 1991.

CDM, 1993. Final Baseline Risk Assessment for the Montana Pole NPL Site. Denver, Colorado.

EPA (U.S. Environmental Protection Agency). 1991. Risk Assessment Guidance for Superfund. Volume I; Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors." March.

______. 1989a. Risk Assessment Guidance for Superfund, Human Health Evaluation Manual, Volume I. Interim Final. OSWER Directive 9285.701A, Office of Solid Waste and Emergency Response. Washington, D.C.

______. 1989b. Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-dioxins and -Dibenzofurans (CDDs and CDFs) and 1989 Update. EPA/625/3-89/016. March.

______. 1989c. Exposure Factors Handbook. Exposure Assessment Group, Office of Health and Environmental Assessment. Washington, D.C. EPA-600-8-89-043. May.

______. 1989d. Interim Final Guidance for Soil Ingestion Rates. Office of Solid Waste and Hazardous Waste. OSWER Directive 985.04.

______. 1989e. Guidance on Preparing Superfund Decision Documents, Office of Emergency and Remedial Response, Interim Final, EPA/540/G, July 1989.

Freeman, Harry M., 1989. Standard Handbook of Hazardous Waste Treatment and Disposal, McGraw Hill, New York, N.Y.

Keystone, 1991a. Supplemental Work Plan for Additional Work Following the Fall Sampling. Prepared for ARCO, April 1991.

Keystone, 1991b. Alternative Screening Document Montana Pole and Treating Plant Site, Butte Montana. Prepared for ARCO, July 1991.

Woodward-Clyde, November 1988. Feasibility Study for Site Remediation, Libby, MT.

TABLES

TABLE 1

CONTAMINATED SOIL VOLUME ESTIMATES

Soils	Volume yd^3
1. Bagged Soils[a]	10,000
2. Contaminated Near Creek Soils[b]	6,000
3. Soils Excavated for Groundwater Extraction System	7,000
4. Contaminated Surface soils[c]	10,000
5. Contaminated Surface and Subsurface soils[d]	82,000
6. Accessible LNAPL "smear zone" soils[e]	93,000
7. Soils overlying accessible LNAPL "smear zone" soils[f]	
Northern portion of site	28,000
Southern portion of site	66,000
8. Inaccessible soils[g]	41,000

[a] Soils previously excavated and stored on-site.

[b] Near-creek soils are those soils north of the Gundlwall constructed during USEPA's 1992 removal action at the site and covers an area of about 750 feet long by 50 feet wide.

[c] Areas marked Contaminated Surface Soils on Figure 17; volume from ground surface to 3 feet below ground surface.

[d] Areas marked Contaminated Surface and Subsurface Soils on Figure 17, volume from ground surface to 4 feet below groundwater surface.

[e] Areas marked on Figure 13 associated with the LNAPL plume. Volume includes soils from 2 feet above groundwater surface to 4 feet below groundwater surface. Volume excludes the area accounted by surface/subsurface soils in #5 above and soils beneath the highway.

[f] Areas of uncontaminated soils which overlie accessible LNAPL "smear zone" soils shown on Figure 13.

[g] Inaccessible soils beneath interstate highway include approximately 37,000 yd^3 associated with the LNAPL "smear zone" as shown on Figure 13 and approximately 4,000 yd^3 of surface/subsurface soils shown in Figure 17.

TABLE 2

PRELIMINARY REMEDIAL ACTION GOALS FOR SOILS
(concentrations in mg/Kg)

Chemical	Residential Land Use	Industrial Land Use	Trespasser or Recreational Land Use
Pentachlorophenol[a]	3	9	34
Dioxins/Furans[b]	0.00001	0.00003	0.0002
PAH (Carcinogenic)[bc]	0.2	0.7	4.0

a Levels correspond to an excess cancer risk of 1×10^{-6} and are based on data for the dermal exposure pathway as presented in the Baseline Risk Assessment Report (CDM, 1993).

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

c Levels are based on benzo(a)pyrene (BAP) equivalents using the toxicity equivalence factors (TEFs) as described in the Baseline Risk Assessment Report (CDM, 1993).

TABLE 3

CONTAMINANTS OF CONCERN FOR HUMAN HEALTH

GROUNDWATER

Arsenic
Chromium (VI)
Copper
Lead
Manganese
2-chlorophenol
4-chloro-3-methylphenol
2,4-dichlorophenol
2,4-dinitrophenol
2,4-dinitrotoluene
Dioxins/Furans
2-methyl-4,6-dinitrophenol
Acenaphthene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
Chrysene
Dibenzo(a,h)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
2-methyl naphthalene
Naphthalene
Phenanthrene
Pyrene
Pentachlorophenol
2,3,5,6-tetrachlorophenol
2,4,6-trichlorophenol

SOIL

Arsenic
4-chloro-3-methylphenol
Dioxins/Furans
2-methyl-4,6-dinitophenol
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Indeno(1,2,3-cd)pyrene
Pentachlorophenol
2,4,6-trichlorophenol

SURFACE WATER

Arsenic
Copper
Lead
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Chrysene
Dibenzo(a,h)anthracene
Pyrene
Pentachlorophenol
Zinc

SEDIMENTS

Arsenic
Dioxins/Furans
Lead

TABLE 4

POTENTIAL EXPOSURE PATHWAYS UNDER
CURRENT LAND USE CONDITIONS

Exposure Medium	Potential Routes of Exposure	Potential Receptors	Pathway Complete	Potential for Chemical Exposure
Soil	Dermal absorption, incidential ingestion	Trespassers	Yes	High. Potential for trespassers to contact surface soil high.
Surface Water and Sediments in Silver Bow Creek	Dermal absorption, incidential ingestion	Trespassers	Yes	High for trespassers. Children are reported to swim in Silver Bow Creek, contaminants are present in surface water and sediment.
Air	Inhalation of volatile organics and fugitive dust	Residents located down wind of the site	Yes	Moderate. Potential for fugitive dust generation and volatilization of organics from soil is moderate.
Groundwater	Ingestion, dermal absorption, and inhalation while showering	Trespassers	No	Low. Groundwater is not used for drinking purposes.

TABLE 5

POTENTIAL EXPOSURE PATHWAYS UNDER
FUTURE LAND USE CONDITIONS

Exposure Medium	Potential Routes of Exposure	Potential Receptors	Potential for Chemical Exposure
Soil	Dermal absorption, incidental ingestion	Future on-site residents, workers	High. Children are especially likely to play on soils.
Surface Water and Sediments in Silver Bow Creek	Dermal absorption, incidental ingestion	Future on-site residents, workers	High. Children are especially likely to swim and wade in creek.
Air	Inhalation of volatile organics and fugitive dust	Future on-site residents, workers	High. Potential for fugitive dust generation and volatilization of organics from soil is high.
Groundwater	Ingestion	Future on-site residents, workers	High. Contaminants are present in groundwater.[a]
Produce	Ingestion	Future on-site residents, workers	Moderate. Uptake of contaminants in groundwater and soils by plants is likely to occur.[b]

[a] Assumes that drinking water wells may be installed in the future. Actual potential for on site residential development appears to be low.

[b] Assumes that gardening in the Butte area will be limited by climate.

TABLE 6

EXPOSURE ASSUMPTIONS FOR DERMAL CONTACT WITH SURFACE SOIL FOR WORKERS (FUTURE) AND TRESPASSERS (CURRENT)

Parameter	Exposure Assumption
Frequency of Exposure	
Workers (future)	150 d/yr[a]
Trespassers (current)	60 d/yr[b]
Period of Exposure	
Workers (future)	25 yr[c]
Trespassers (current)	12 yr[d,e]
Skin Surface Area	
Workers (future)	3,120 cm^2 [f]
Trespassers (current)	5,165 cm^2 [f]
Average Body Weight	
Workers (future)	70 kg[d]
Trespassers (current)	43 kg[g]
Averaging Time	
Noncarcinogens	365 d/yr x 25 yr[d] (worker)
	365 d/yr x 12 yr (trespasser)
Carcinogens	365 d/yr x 70 yr[d]
Skin Adherence Factor	1.45 mg/cm^2 [d]
Fraction Contaminated	
Workers (future)	1.0
Trespassers (current)	0.5
Absorption Factor	
Organics	0.1
Inorganics & Dioxins/Furans	0.01

[a] Based on exposure occurring 5 days a week for 7 months of the year (5/7 x 210 = 150).
[b] Based on exposure occurring 2 times a week (2/7 x 210 = 60).
[c] EPA (1991b). Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual. Supplemental Guidance. "Standard Default Exposure Factors." Interim Final. OSWER Directive: 9285.6-03.
[d] EPA (1989a). Risk Assessment Guidance for Superfund, Human Health Evaluation Manual, Volume I. Interim Final.
[e] Current exposure is for trespassers ages 6 through 18.
[f] EPA (1989a). 50th percentile body surface area for adult forearms and hands were used for workers; children; and forearms, hands, and legs were used for trespassers ages 6 through 18.
[g] EPA (1989c). Exposure Factors Handbook. Office of Health and Environmental Assessment. EPA/600-8-89/043.

TABLE 7

EXPOSURE ASSUMPTIONS FOR INCIDENTAL INGESTION OF SURFACE SOIL FOR WORKERS (FUTURE) AND TRESPASSERS (CURRENT)

Parameter	Exposure Assumption
Frequency of Exposure	
Workers (future)	150 d/yr[a]
Trespassers (current)	60 d/yr[b]
Exposure Duration	
Workers (future)	25 yr[c]
Trespassers (current)	12 yr[d]
Ingestion Rate	
Workers (future)	100 mg/day[c,e]
Trespassers (current)	100 mg/day[c,e]
Average Body Weight	
Workers (future)	70 kg[c]
Trespassers (current)	43 kg[f]
Fraction Ingested	
Workers (future)	1.0
Trespassers (current)	0.5

[a] Based on exposure occurring 5 days a week for 7 months of the year (5/7 x 210 = 150).
[b] Based on exposure occurring 2 times a week (2/7 x 210 = 60).
[c] EPA (1989a, 1991).
[d] Current exposure is for trespassers ages 6 through 18.
[e] EPA (1989d). Interim Final Guidance for Soil Ingestion Rates. Office of Solid Waste and Emergency Response. (OSWER Directive 9850.4)
[f] EPA (1989c). Exposure Factors Handbook. Office of Health and Environmental Assessment. EPA/600-8-89/043.

TABLE 8

EXPOSURE ASSUMPTIONS FOR DIRECT CONTACT AND INCIDENTAL INGESTION OF SURFACE WATER

Parameter	Exposure Assumption
Frequency of Exposure Trespassers (current)	43 d/yr[a]
Exposure Duration Trespassers (current)	12 yr[b]
Skin Surface Area Trespassers (current)	13,050 cm^2 [c]
Exposure Time Trespassers (current)	2 hr/day[c]
Average Body Weight	43 kg[d]
Ingestion Rate	50 ml/hr[c]
Fraction Contaminated	0.5
Permeability Constant	8.4 E-04 cm/hr[c]

[a] Based on exposure occurring twice a week for 150 days (2/7 x 150 = 43)
[b] Exposure is for a trespasser ages 6 through 18
[c] EPA (1989a)
[d] EPA (1989c). Exposure Factors Handbook. Office of Health and Environmental Assessment. EPA\600\8-89\043.

TABLE 9

EXPOSURE ASSUMPTIONS FOR
DIRECT CONTACT WITH SEDIMENTS

Parameter	Exposure Assumption
Frequency of Exposure Trespassers (current)	43 d/yr[a]
Period of Exposure Trespassers (current)	12 yr[b]
Skin Surface Area Trespassers (current)	13,050 cm^2 [c]
Average Body Weight Trespassers (current)	43 kg[d]
Skin Adherence Factor	2.0 mg/cm^2 [c]
Absorption Factor	0.1[e] 0.01[f]
Ingestion Rate Trespassers (current)	50 mg/day[b]
Fraction Contaminated	0.5

[a] Based on exposure occurring twice a week for 150 days (2/7 x 150 = 43)
[b] EPA (1989a)
[c] Current exposure is for a trespasser ages 6 through 18
[d] EPA (1989c). Exposure Factors Handbook. Office of Health and Environmental Assessment. EPA\600\8-89\043.
[e] For organic compounds other than dioxins/furans.
[f] For inorganic compounds and dioxins/furans.

TABLE 10

EXPOSURE ASSUMPTIONS FOR DERMAL CONTACT WITH SURFACE SOIL FOR RESIDENTS (FUTURE)[a]

Parameter	Exposure Assumption
Frequency of Exposure Children (future) Residents (future)	 350 d/yr[b] 350 d/yr
Period of Exposure Residents (future) Children (future)	 30 yr[b] 10 yr[b]
Skin Surface Area Residents (future) Children (future)	 3,476 cm^2 [c] 4,187 cm^2 [c]
Average Body Weight Residents (future) Children (future)	 59 kg[d] 19 kg[g]
Averaging Time Noncarcinogens Carcinogens	 365 d/yr x 30 yr[b] (resident) 365 d/yr x 12 yr (child) 365 d/yr x 70 yr[b]
Skin Adherence Factor	1.45 mg/cm^2 [c]
Fraction Contaminated	0.7
Absorption Factor Organics Inorganics & Dioxins/Furans	 0.1 0.01

[a] Chronic daily intakes (CDIs) for estiminating cancer risks to future residents are conservatively based on exposure during the first 30 years of life. CDIs for estimating non-cancer risks are conservatively based on exposure for children ages 0 to 10 years old.

[b] EPA (1989a).

[c] EPA (1989a,c). 50th percentile body surface area for adult forearms and hands were used for adult residents; forearms, hands, and legs were used for children ages 0 through 10.

TABLE 11

EXPOSURE ASSUMPTIONS FOR INCIDENTAL INGESTION OF SURFACE SOIL FOR RESIDENTS (FUTURE)[a]

Parameter	Exposure Assumption
Frequency of Exposure	
Children (future)	350 d/yr[b]
Residents (future)	350 d/yr[b]
Exposure Duration	
Residents (future)	30 yr[b]
Children (future)	10 yr[b]
Ingestion Rate	
Residents (future)	120 mg/day[c,d]
Children (future)	160 mg/day[c,e]
Average Body Weight	
Residents (future)	59 kg[b]
Children (future)	19 kg[b]
Fraction Ingested	
Residents (future)	0.7
Children (future)	0.7

[a] CDIs for estimating cancer risks to future residents are conservatively based on exposure during the first 30 years of life. CDIs for estimating non-cancer risks are conservatively based on exposure for children ages 0 to 10 years old.

[b] EPA (1989a).

[c] EPA (1989d). Interim Final Guidance for Soil Ingestion Rates. Office of Solid Waste and Emergency Response. (OSWER Directive 9850.4)

[d] Soil ingestion prorated for incidental ingestion of 200 mg/day for ages 0 to 6 and 100 mg/day for ages 6 to 30.

[e] Soil ingestion prorated for incidental ingestion of 200 mg/day for ages 0 to 6 and 100 mg/day for ages 6 to 10.

TABLE 12

EXPOSURE ASSUMPTIONS FOR
INGESTION OF HOME GROWN VEGETABLES[b]

Parameter	Exposure Assumption
Frequency of Exposure	
Residents (future)	52 d/yr
Children (future)	52 d/yr
Exposure Duration	
Residents (future)	30 yr[b]
Children (future)	10 yr
Ingestion Rate	
Vine Crops	151 g/day
Leafy Crops	144 g/day
Root Crops	114 g/day
Body Weight	
Residents (future)	59 kg
Children (future)	19 kg
Averaging Time	
Noncarcinogen	365 d/yr x 10 yrs
Carcinogen	365 d/yr x 70 yrs
Fraction Absorbed	1[d]

[a] For compounds other than pentachlorophenol.
[b] CDIs for estimating cancer risk to future residents are conservatively based on exposure during the first 30 years of life. CDIs for estimating non-cancer risks are conservatively based on exposure for children ages 0 to 10 years old.
[c] EPA (1989a).
[d] For arsenic, absorption is assumed to be 80 percent.

TABLE 13

EXPOSURE ASSUMPTIONS FOR
INGESTION OF HOME GROWN VEGETABLES
GROWN IN SOIL CONTAINING PENTACHLOROPHENOL[a]

Parameter	Exposure Assumption
Frequency of Exposure	
Residents (future)	52 d/yr
Children (future)	52 d/yr
Exposure Duration	
Residents (future)	6 yr[b]
Children (future)	6 yr
Ingestion Rate	
Root Crops	114 g/day
Body Weight	
Residents (future)	59 kg
Children (future)	19 kg
Averaging Time	
Noncarcinogen	365 d/yr x 6 yrs[a]
Carcinogen	365 d/yr x 70 yrs[a]
Fraction Absorbed	1[b]

[a] EPA (1989a).
[b] For arsenic, absorption is assumed to be 80 percent.

TABLE 14

EXPOSURE ASSUMPTIONS FOR
INGESTION OF GROUNDWATER[a]

Parameter	Exposure Assumption
Frequency of Exposure	
Residents (future)	350 d/yr[b]
Children (future)	350 d/yr[b]
Exposure Duration	
Residents (future)	30 yr[b]
Children (future)	10 yr
Ingestion Rate	
Residents (future)	2L/d[b]
Children (future)	2L/d[b]
Body Weight	
Residents (future)	59 kg[b]
Children (future)	19 kg[b]
Averaging Time	
Noncarcinogen	365 d/yr x 10 yrs[b]
Carcinogen	365 d/yr x 70 yrs[b]

[a] CDIs for estimating cancer risk to future residents are conservatively based on exposure during the first 30 years of life. CDIs for estimating non-cancer risks are conservatively based on exposure for children ages 0 to 10 years old.

[b] EPA (1989a)

TABLE 15

EXPOSURE POINT CONCENTRATIONS FOR SURFICIAL SOILS (μg/kg)

	Southern Area	Northern Area
Anthracene	51.07	224.95
Benzo(a)anthracene	20.25	6825.61
Benzo(b)fluoranthene	18.30	476.06
Benzo(k)fluoranthene	8.74	457.42
Benzo(a)pyrene	12.04	270.23
Indeno(1,2,3-cd)pyrene	15.99	338.89
4-chloro-3-methylphenol	765.09	6605.55
2-methyl-4,6,-dinitrophenol	11445.54	14759.28
Pentachlorophenol	319070.4	61943.0
2,4,6-trichlorophenol	1492.55	7212.23
OCDD	46.79	5020
1234678-HpCDD	4.23	469
1234789-HpCDF	.013	12.9
123789HxCDD	.019	1.7
123678HxCDD	.126	14.9
123478HxCDD	.015	1.4
12378PeCDD	.004	0.0067
2378-TCDF	.002	0.421
2378-TCDD	.008	0.0106
1234678-HpCDF	.298	81.8
123678HxCDF	.0371	2.6
234678HxCDF	.0142	2
123789HxCDF	0	0.00056
123478HxCDF	.037	17.1
OCDF	.787	433
23478PeCDF	.0049	2.2
12378PeCDF	.0064	2
Arsenic	40985.21	147177.10

TABLE 15 (Cont.)

EXPOSURE POINT CONCENTRATIONS
SURFICIAL SOILS (μg/kg)

	Southern Area	Northern Area
Cadmium	789.25	1862.56
Chromium	11047.69	9829.16

TABLE 16

EXPOSURE POINT CONCENTRATIONS FOR GROUNDWATER

	µg/L
Acenaphthene	474.08
Acenaphthylene	238,069.08
Anthracene	259.85
Benzo(a)pyrene	69.63
Benzo(a)anthracene	7,199.97
Benzo(b)fluoranthene	0.18
Benzo(g,h,i)perylene	9.62
Benzo(k)fluoranthene	35.89
Chrysene	19,805.83
Dibenzo(a,h)anthracene	18.75
Fluoranthene	421.12
Fluorene	42,850.20
Indeno(1,2,3-cd)pyrene	1.29
2-methylnaphthalene	4,039.26
Naphthalene	4,259.54
Phenanthrene	3,817.27
Pyrene	848.02
4-chloro-3-methylphenol	331.13
2,4-dichlorophenol	985.15
2-methyl-4,6-dinitrophenol	381.94
2,3,5,6-tetrachlorophenol	3,090.53
2,4,6-trichlorophenol	231.89
Pentachlorophenol	6,506.98
2-chlorophenol	40.47
2,4-dinitrotoluene	220.51
1234678-HpCDD	1.66
1234678-HpCDF	0.182
1234789-HpCDF	0.0156

TABLE 16 (Cont.)

EXPOSURE POINT CONCENTRATIONS
FOR GROUNDWATER

	µg/L
123678HxCDD	0.0653
123789HxCDD	0.0097
123478HxCDF	0.0468
123678HxCDF	0.0085
234678HxCDF	0.0179
OCDD	14.96
OCDF	0.543
12378PeCDF	0.0072
23478PeCDF	0.007
Arsenic	23.14
Chromium	28.39
Copper	139.51
Lead	29.68
Manganese	2,493.35

[a] 95 percent upper confidence limit on geometric mean unless otherwise noted.

[b] 95 percent upper confidence limit on arithmetic mean.

[c] Maximum detected concentration due to limited sample numbers.

TABLE 17

EXPOSURE POINT CONCENTRATIONS FOR
SURFACE WATER AND SEDIMENTS

	Surface Water µg/L	Sediments µg/kg
Pentachlorophenol	591	—
Benzo(a)anthracene	1.5	—
Benzo(a)pyrene	0.2	—
Benzo(b)fluoranthene	0.4	—
Chrysene	9.0	—
Dibenzo(a,h)anthracene	0.6	—
Pyrene	1.36	—
Dioxins/Furans	—	1.4
Arsenic	24.9	—
Copper	220	—
Lead	30	—

— = not considered a COC for this medium

TABLE 18

SUMMARY OF ESTIMATED RISKS FOR FUTURE ON-SITE RESIDENTS

Chemical	Soil Ingestion	Dermal Contact with Soil	Ingestion of Home-Grown Vegetables	Groundwater Ingestion
Carcinogenic Exposure				
Pentachlorophenol	2.23E-05	9.41E-05	8.92E-04	1.09E-02
Dioxins/Furans	1.15E-05	4.83E-06	1.08E-04	1.10E-01
2,4,6-Trichlorophenol	9.57E-09	4.03E-08	2.10E-05	3.55E-05
Benzo(a)pyrene (TEFs)	1.29E-07	NA	4.63E-06	3.09E-02
Arsenic	3.35E-05	1.76E-05	4.64E-04	5.64E-04
Total Cancer Risk	6.74E-05	1.17E-04	1.49E-03	1.53E-01
Noncarcinogenic Exposure				
Pentachlorophenol	6.01E-02	2.28E-01	5.39E+01	2.19E+01
Dioxins/Furans (TEFs)	7.40E-01	2.81E-01	5.20E+00	5.33E+03
2,4,6-Trichlorophenol	NA	NA	NA	NA
PAH (Total noncarcinogen)	NA	NA	NA	7.54E+02
2-chlorophenol	NA	NA	NA	8.17E-01
Arsenic	6.18E-01	2.93E-01	6.40E+00	7.86E+00
Copper	NA	NA	NA	3.52E-01
Manganese	NA	NA	NA	2.52E+00
Lead	NA	NA	NA	NA
Chromium	NA	NA	NA	2.73E-01
2,4-Dichlorophenol	NA	NA	NA	3.31E+01
2,4-Dinitrotoluene	NA	NA	NA	3.27E-02
4-Chloro-3-methylphenol	NA	NA	NA	NA
Anthracene	9.62E-07	NA	2.66E-05	NA
Cadmium	8.92E-03	3.39E-05	1.41E+00	NA
2-methyl-4,6-dinitrophenol	NA	NA	NA	NA
2,3,5,6-Tetrachlorophenol	NA	NA	NA	1.04E+01
Total Hazard Index	1.43E+00	8.05E-01	6.69E+01	6.16E+03

NA = Not Applicable

TABLE 19

SUMMARY OF ESTIMATED RISKS FOR
FUTURE ON-SITE WORKERS

Chemical	Soil Ingestion	Dermal Contact with Soil	Sediment Ingestion	Surface Water Ingestion	Dermal Contact with Surface Water
Carcinogenic Exposure		**Incremental Lifetime Cancer Risk**			
Pentachlorophenol	8.03E-06	3.63E-05	NA	NA	NA
Dioxins/Furans (TEFs)	4.12E-06	1.86E-06	NA	NA	NA
2,4,6-Trichlorophenol	3.44E-09	1.56E-08	NA	NA	NA
Benzo(a)pyrene (TEFs)	4.65E-08	NA	NA	NA	NA
Arsenic	1.20E-05	6.80E-06	NA	NA	NA
Total Cancer Risk	2.42E-05	4.50E-05	0.00E+00	0.00E+00	0.00E+00
		Total Cancer Risk for all Media			6.92E-05
Noncarcinogenic Exposure		**Hazard Index**			
Pentachlorophenol	6.24E-03	2.82E-02	NA	NA	NA
Dioxins/Furans (TEFs)	7.69E-02	3.48E-02	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA
2-methyl-4,6-dinitrophenol	NA	NA	NA	NA	NA
Anthracene	9.99E-08	NA	NA	NA	NA
Arsenic	6.42E-02	3.63E-02	NA	NA	NA
Cadmium	9.72E-04	4.19E-04	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA
Total Hazard Index	1.48E-01	9.97E-02	0.00E+00	0.00E+00	0.00E+00
		Total Hazard Index for all Media			2.48E-01

NA = Not Applicable

TABLE 20

SUMMARY OF ESTIMATED RISKS FOR
CURRENT ON-SITE TRESPASSERS

Chemical	Soil Ingestion	Dermal Contact with Soil	Sediment Ingestion	Surface Water Ingestion	Dermal Contact with Surface Water
Carcinogenic Exposure		**Incremental Lifetime Cancer Risk**			
Pentachlorophenol	1.25E-06	9.40E-06	NA	3.33E-06	3.65E-07
Dioxins/Furans (TEFs)	6.44E-07	4.82E-07	2.47E-09	NA	NA
2,4,6-Trichlorophenol	5.38E-10	4.03E-09	NA	NA	NA
Benzo(a)Pyrene (TEFs)	7.27E-09	NA	NA	4.35E-07	NA
Arsenic	1.88E-06	1.76E-06	NA	NA	NA
Total Cancer Risk	3.78E-06	1.16E-05	2.47E-09	3.77E-06	3.65E-07
		Total Cancer Risk for all Media			1.96E-05
Noncarcinogenic Exposure			**Hazard Index**		
Pentachlorophenol	2.03E-03	1.52E-02	NA	5.40E-03	5.90E-04
Dioxins/Furans (TEFs)	2.50E-02	1.88E-02	9.59E-05	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA
2-methyl-4,6-dinitrophenol	NA	NA	NA	NA	NA
Anthracene	3.25E-08	NA	NA	NA	NA
Arsenic	2.09E-02	1.96E-02	NA	NA	NA
Cadmium	3.02E-04	2.26E-04	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	1.24E-05	NA
Total Hazard Index	4.82E-02	5.38E-02	9.59E-05	5.41E-03	5.90E-04
		Total Hazard Index for all Media			1.08E-01

NA = Not Applicable

TABLE 21

ESTIMATED COST FOR REMEDIAL ALTERNATIVE 5B

Soil: Bioremediation (10 years)
Groundwater: Oil/Water Separation Followed by Biotreatment and Carbon Polishing
Oily Wastes and Sludge: Off-Site Incineration

Item/Description	Duration	Quantity	Unit	Unit Cost Min.	Unit Cost Max.	Total Cost Min.	Total Cost Max.
CAPITAL COSTS							
Institutional Controls							
Implementation	1st year	1	lump sum	$75,000	$75,000	$75,000	$75,000
Groundwater Monitoring							
Well Installation	1st year	4	each	$1,200	$2,000	$4,800	$8,000
Site Preparation							
Excavate and Reconstruct Railroad	1st year	1,000	feet	$100	$150	$100,000	$150,000
Containment							
Soil Cover	11th year	51,100	cu. yd.	$10	$20	$511,000	$1,020,000
Common Borrow	1st year	16,000	cu. yd.	$8	$15	$128,000	$240,000
Treatment and Disposal							
Soil							
Fixed Costs	1st year	1	lump sum	$2,660,000	$6,040,000	$2,660,000	$6,040,000
Transportation	1st year	6,000	cu. yd.	$4	$8	$24,000	$48,000
Groundwater							
Treatment Facility	1st year	1	lump sum	$981,000	$1,090,000	$981,000	$1,090,000
Extraction Facility	1st year	1	lump sum	$371,000	$557,000	$371,000	$557,000
Infiltration Facility	1st year	1	lump sum	$133,000	$168,000	$133,000	$168,000
Oily Wastes and Sludge							
Off-Site Incineration	1st year	30,000	gallon	$17	$26	$504,000	$792,000
Equipment and Debris							
Mob/Decon/Disposal	1st year	1	lump sum	$1,600,000	$1,720,000	$1,600,000	$1,720,000
SUBTOTAL						$7,090,000	$11,910,000
Contractors Overhead and Profit @ 20%						$1,420,000	$2,380,000
Contractors Mobilization and Demobilization @ 15%						$1,060,000	$1,790,000
Engineering Design @ 20%						$1,420,000	$2,380,000
Administrative Costs @ 15%						$1,063,500	$1,786,500
TOTAL CAPITAL REQUIREMENT						$12,050,000	$20,250,000

TABLE 21 (Cont.)

ESTIMATED COST FOR REMEDIAL ALTERNATIVE 5B

Soil: Bioremediation (10 years)

Groundwater: Oil/Water Separation Followed by Biotreatment and Carbon Polishing

Oily Wastes and Sludge: Off-Site Incineration

Item/Description	Duration	Quantity	Unit	Unit Cost Min.	Unit Cost Max.	Total Cost Min.	Total Cost Max.
OPERATION AND MAINTENANCE COSTS							
Institutional Controls							
Institutional Controls	Year 1 - 30	1	lump sum	$10,000	$10,000	$10,000	$10,000
Five Year Site Review	Every 5 years	1	lump sum	$40,000	$60,000	$40,000	$60,000
Groundwater Monitoring							
Analytical/Reporting	Year 1 - 30	1	year	$70,000	$151,000	$70,000	$151,000
Containment							
Cover Maintenance	Year 12 - 30	1	lump sum	$30,000	$50,000	$30,000	$50,000
Treatment and Disposal							
Soil							
Excavation/Backfill	Year 1 - 10	29,200	cu. yd.	$17	$75	$500,000	$2,190,000
Dewatering removed soils	Year 1 - 10	11,400	cu. yd.	$3	$20	$34,000	$228,000
Bioremediation	Year 1 - 10	20,700	cu. yd.	$26	$34	$534,000	$708,000
Groundwater							
Bioreactor	Year 1 - 30	72,580	1,000 gallons	$7	$14	$510,000	$1,033,000
Oily Wastes and Sludge							
Off-Site Incineration	Year 2 - 30	3,500	gallon	$17	$26	$58,800	$92,400
Annual cost for year 1						$1,670,000	$4,330,000
Annual cost for years 2 - 10						$1,720,000	$4,420,000
Annual cost for year 11						$657,000	$1,298,000
Annual cost for years 12 - 30						$687,000	$1,348,000
PRESENT WORTH							
Duration	30 years						
Discount rate	7 percent					$27,530,000	$55,200,000

being filmed.

TABLE 22

ESTIMATED COST FOR SOIL FLUSHING SYSTEM
Present Worth Basis
(for 25 gpm system)

			Unit Cost		Total Cost	
Item/Description	**Quantity**	**Unit**	**Min.**	**Max.**	**Min.**	**Max.**
CAPITAL COSTS						
Hydraulic Study	1	lump sum	$15,000	$50,000	$15,000	$50,000
Pilot Test	1	lump sum	$30,000	$50,000	$30,000	$50,000
Well Installation	12	each	$1,200	$2,000	$14,400	$24,000
Piping Installation	1,000	linear ft.	$30	$50	$30,000	$50,000
			Total Capital Costs		$89,400	$174,000
OPERATION AND MAINTENANCE COSTS						
Annual Costs						
Carbon Usage(a)	1	lump sum	$8,000	$13,000	$8,000	$13,000
Labor	0.5	FTE	$20,000	$40,000	$10,000	$20,000
			Total Annual Costs		$18,000	$33,000
PRESENT WORTH						
Duration = 30 Years						
Discount Rate = 7 Percent						
TOTAL					$328,000	$612,000

(a) Costs are based on estimated carbon usage rate of 0.5 lbs. carbon per 1,000 gallons of groundwater treated. This estimate was provided by Calgon for removing PCP and naphthalene from groundwater (Calgon, 1991).

TABLE 23
SOIL CLEANUP LEVELS AND CORRESPONDING RISKS

Media	Contaminant	Cleanup level (μg/kg)	Basis	Cancer Risk (recreational use for soil)	Noncancer health hazard quotient
Soils	Pentachlorophenol[a]	34,000	risk	1.0 X 10^{-6}	<1
	B2 PAHs (TEF)[bc]	4,200	risk	1.0 X 10^{-6}	<1
	Dioxin TCDD (TEF)[bd]	0.20	risk	1.0 X 10^{-6}	<1

NA - Not applicable

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

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

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

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

TABLE 24
PATHWAY RISK ESTIMATES
CORRESPONDING TO SOIL CLEANUP LEVELS

Recreational Soil Pathway Cancer Risks

Chemical	Cleanup Level (ug/kg)	Risk Ingestion	Risk Dermal	Total COC
Pentachlorophenol	34000	1.33E−07	1.00E−06	1.14E−06
Dioxins/Furans (TEFs)	0.2	9.83E−07	7.36E−07	1.72E−06
B2 PAH (TEFs)	4200	1.00E−06		1.00E−06
	Total Pathway	2.12E−06	1.74E−06	
			Total	3.86E−06

Industrial Soil Pathway Cancer Risks

Chemical	Cleanup Level (ug/kg)	Risk Ingestion	Risk Dermal	Total COC
Pentachlorophenol	34000	8.56E−07	3.58E−06	4.44E−06
Dioxins/Furans (TEFs)	0.2	6.29E−06	2.84E−06	9.13E−06
B2 PAH (TEFs)	4200	6.42E−06		6.42E−06
	Total Pathway	1.36E−05	6.42E−06	
			Total	2.00E−05

TABLE 24
PATHWAY RISK ESTIMATES
CORRESPONDING TO SOIL CLEANUP LEVELS

Recreational Soil Pathway Cancer Risks

		Risk		
Chemical	Cleanup Level (ug/kg)	Ingestion	Dermal	Total COC
Pentachlorophenol	34000	1.33E−07	1.00E−06	1.14E−06
Dioxins/Furans (TEFs)	0.2	9.83E−07	7.36E−07	1.72E−06
B2 PAH (TEFs)	4200	1.00E−06		1.00E−06
	Total Pathway	2.12E−06	1.74E−06	
			Total	3.86E−06

Industrial Soil Pathway Cancer Risks

		Risk		
Chemical	Cleanup Level (ug/kg)	Ingestion	Dermal	Total COC
Pentachlorophenol	34000	8.56E−07	3.58E−06	4.44E−06
Dioxins/Furans (TEFs)	0.2	6.29E−06	2.84E−06	9.13E−06
B2 PAH (TEFs)	4200	6.42E−06		6.42E−06
	Total Pathway	1.36E−05	6.42E−06	
			Total	2.00E−05

TABLE 25
GROUNDWATER CLEANUP LEVELS AND CORRESPONDING RISKS

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

NA - Not applicable

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

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

TABLE 26
SURFACE WATER CLEANUP LEVELS AND CORRESPONDING RISKS

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

NA - Not applicable

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

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

TABLE 27
DISCHARGE TO SURFACE WATER CLEANUP LEVELS AND CORRESPONDING RISKS

Media	Contaminant	Cleanup level (μg/l)	Basis	Cancer Risk (drinking use for surface water)	Noncancer health hazard quotient
Discharge to Surface Water	Pentachlorophenol	1.0	MCL	1.7×10^{-6}	< 1
	Benzo(a)pyrene	0.2	MCL	2.1×10^{-5}	NA
	Benzo(a)anthracene	1.0	risk	1.0×10^{-7}	NA
	Benzo(b)fluoranthene	0.2	risk	2.1×10^{-5}	NA
	Benzo(k)fluoranthene	1.0	risk	1.0×10^{-6}	NA
	Chrysene	1.0	risk	1.0×10^{-6}	NA
	Dibenzo(a,h)anthracene	0.2	risk	2.1×10^{-5}	NA
	Indeno(1,2,3-CD)pyrene	1.0	risk	1.0×10^{-6}	NA
	Benzo(g,h,i)perylene	1.0	risk	1.0×10^{-6}	NA
	Total D PAHs[a]	360	hazard quotient	NA	0.9
	Dioxin TCDD (TEF)[b]	1.0×10^{-5}	aquatic criteria	2.0×10^{-5}	< 1
	2,4,6-trichlorophenol	6.5	risk	1.0×10^{-6}	NA
	2-chlorophenol	45	hazard quotient	NA	0.9
	2,4-dichlorophenol	27	hazard quotient	NA	0.9
	2,3,5,6-tetrachlorophenol	267	hazard quotient	NA	0.9
	Arsenic	48	aquatic criteria	NA	NA
	Cadmium	1.1	aquatic criteria	NA	NA
	Chromium	11	aquatic criteria	NA	NA
	Copper	12	aquatic criteria	NA	NA
	Lead	3.2	aquatic criteria	NA	NA
	Zinc	110	aquatic criteria	NA	NA

NA - Not applicable

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

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

TABLE 28

ESTIMATED TOXICITY EQUIVALENCE FACTORS AND POTENCY ESTIMATES FOR PAHs

Chemical	Relative Potency[a] (Chu/Chen 1984)	EPA Classification	TEF (OSWER)	Resulting OSWER Potency (oral slope factor) $(mg/kg/day)^{-1}$
Benzo(a)anthracene	0.0134	B2[b]	0.01	7.3×10^{-2}
Benzo(b)fluoranthene	0.0800	B2	1.0	7.3
Benzo(k)fluoranthene	0.0044	B2	0.01	7.3×10^{-2}
Benzo(a)pyrene	1	B2	1.0	7.3
Benzo(g,h,i)perylene	ND	D	0.01	7.3×10^{-2}
Chrysene	0.0012	B2	0.01	7.3×10^{-2}
Dibenz(a,h)anthracene	0.6900	B2	1	7.3
Indeno(1,2,3-cd)pyrene	0.0171	B2	0.01	7.3×10^{-2}

[a] Relative to BaP
[b] Probable human carcinogen

TABLE 29

TOXICITY EQUIVALENCY FACTORS FOR
CHLORINATED DIBENZO-P-DIOXINS AND -DIBENZOFURANS[a]

Compound	TEF
Mono, Di, and TriCDDs	0
2,3,7,8-TCDD Other TCDDs	1 0
2,3,7,8 - PeCDD Other PeCDDs	0.5 0
2,3,7,8 - HxCDD Other HxCDDs	0.1 0
2,3,7,8 - HpCDD Other HpCDDs	0.01 0
OCDD	0.001
Mono, Di-, and TriCDFS	0
2,3,7,8 - TCDF Other TCDFs	0.1 0
1,2,3,7,8 - PeCDF 2,3,4,7,8 - PeCDF Other PeCDFs	0.05 0.5 0
2,3,7,8 - HxCDF Other HxCDFs	0.1 0
2,3,7,8 - HpCDF Other HpCDFs	0.01 0
OCDF	0.001

a EPA 1989b. Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-Dioxins and Dibenzofurans (CDDs and CDFs) and 1989 Update. EPA/625/3-89/016.

MONTANA POLE ROD - DECISION SUMMARY

FIGURES

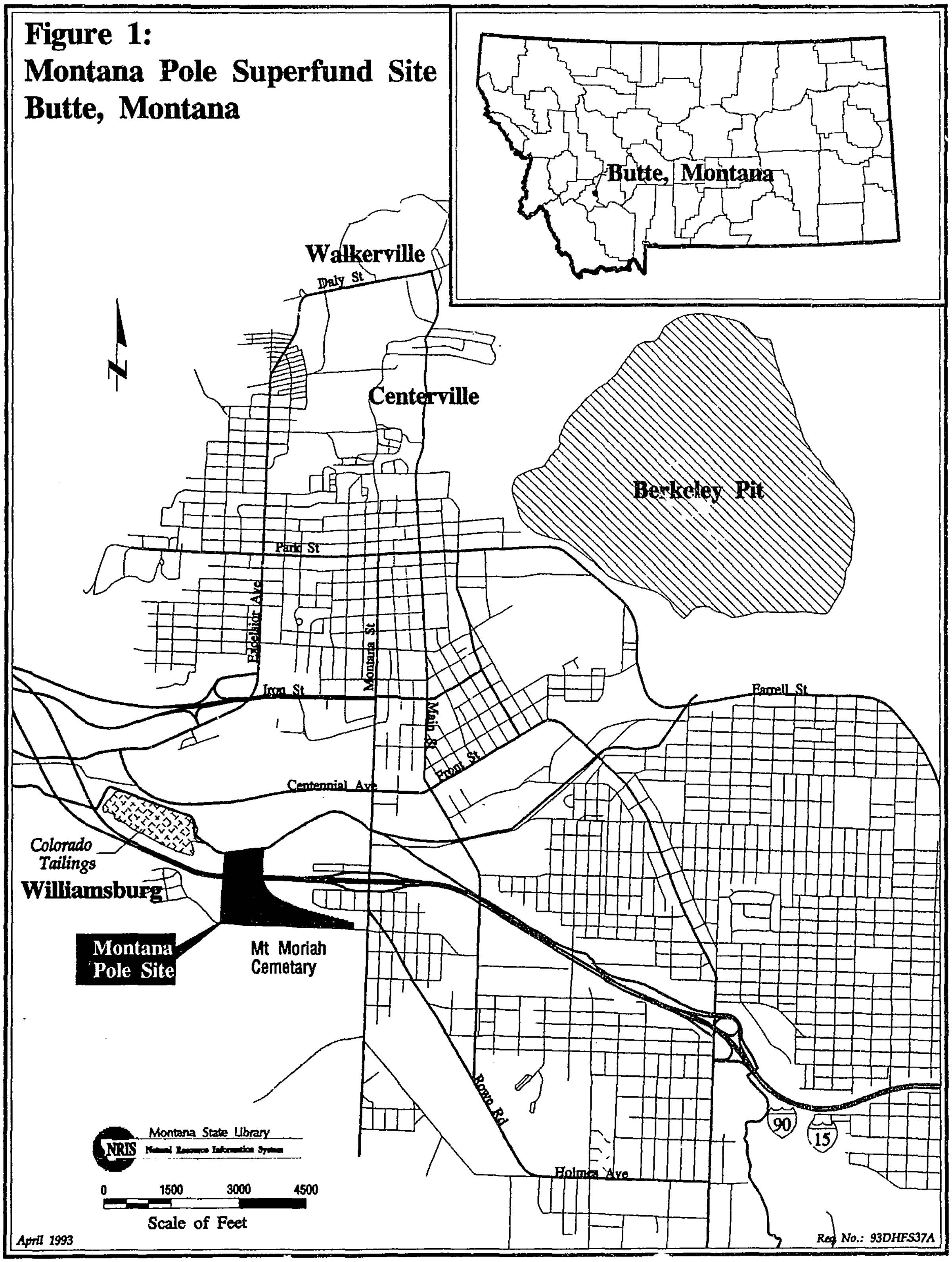


Figure 1:
Montana Pole Superfund Site
Butte, Montana
Butte, Montana
Walkerville
Daly St
Centerville
Berkeley Pit
Park St
Excelsior Ave
Montana St
Iron St
Farrell St
Main St
Front St
Centennial Ave
Colorado Tailings
Williamsburg
Montana Pole Site
Mt Moriah Cemetary
Rowe Rd
Holmes Ave
90
15
Montana State Library
NRIS
0
1500
3000
4500
Scale of Feet
April 1993
Req No.: 93DHFS37A

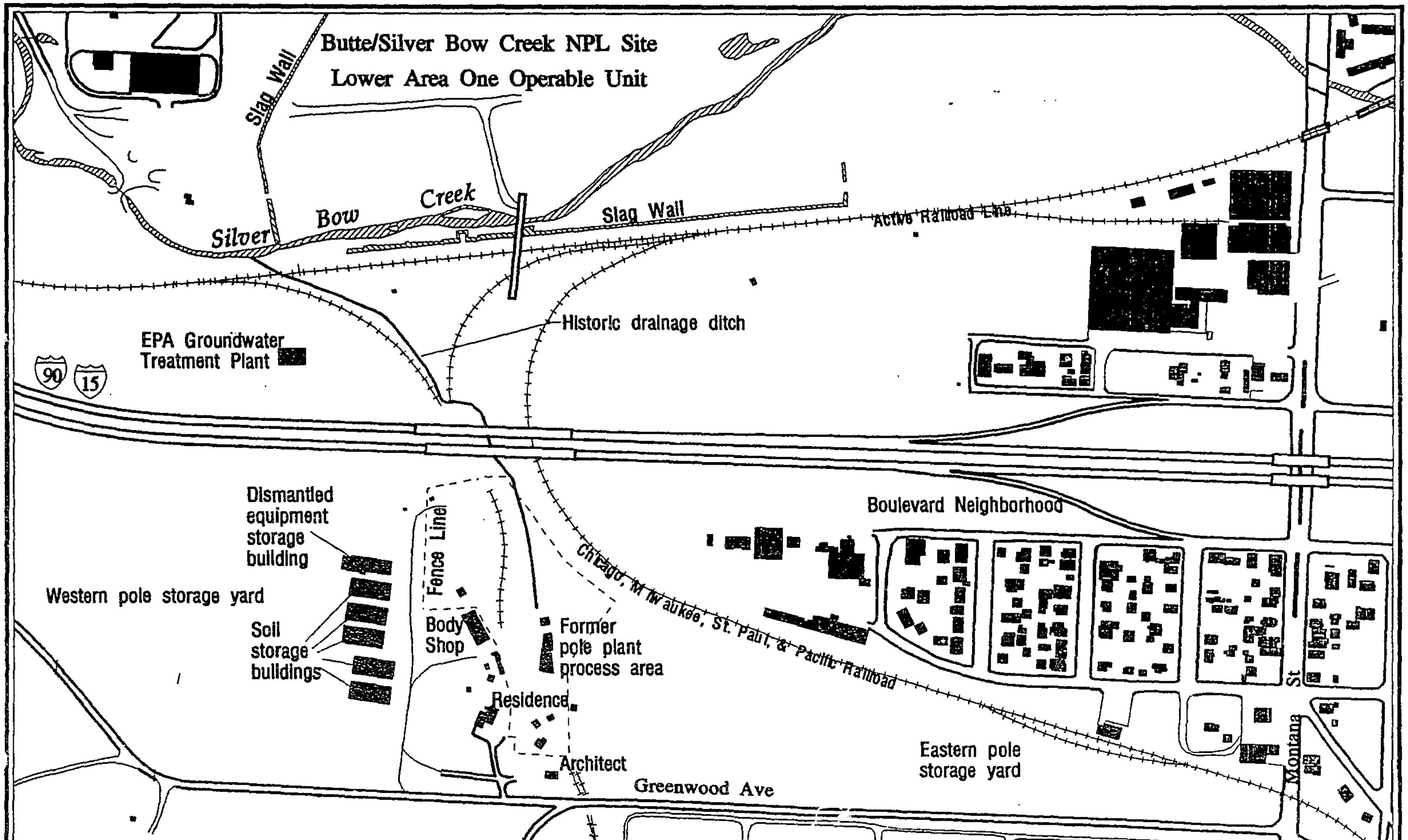


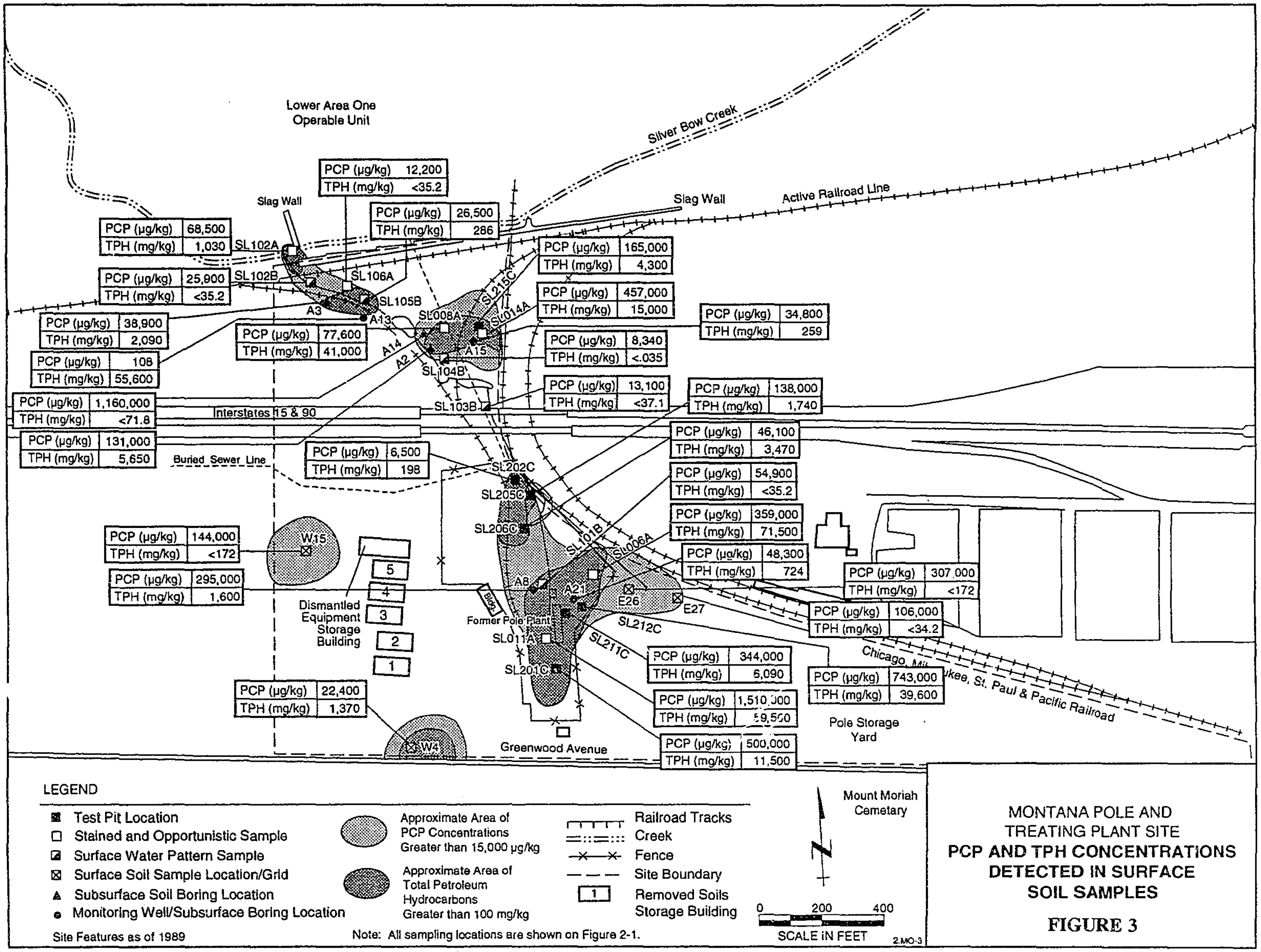
Figure 2: Montana Pole and Treating Plant. Site Layout and Features

Montana State Library
NRIS Natural Resource Information System

0 200 400 600 800 1000
Scale in Feet

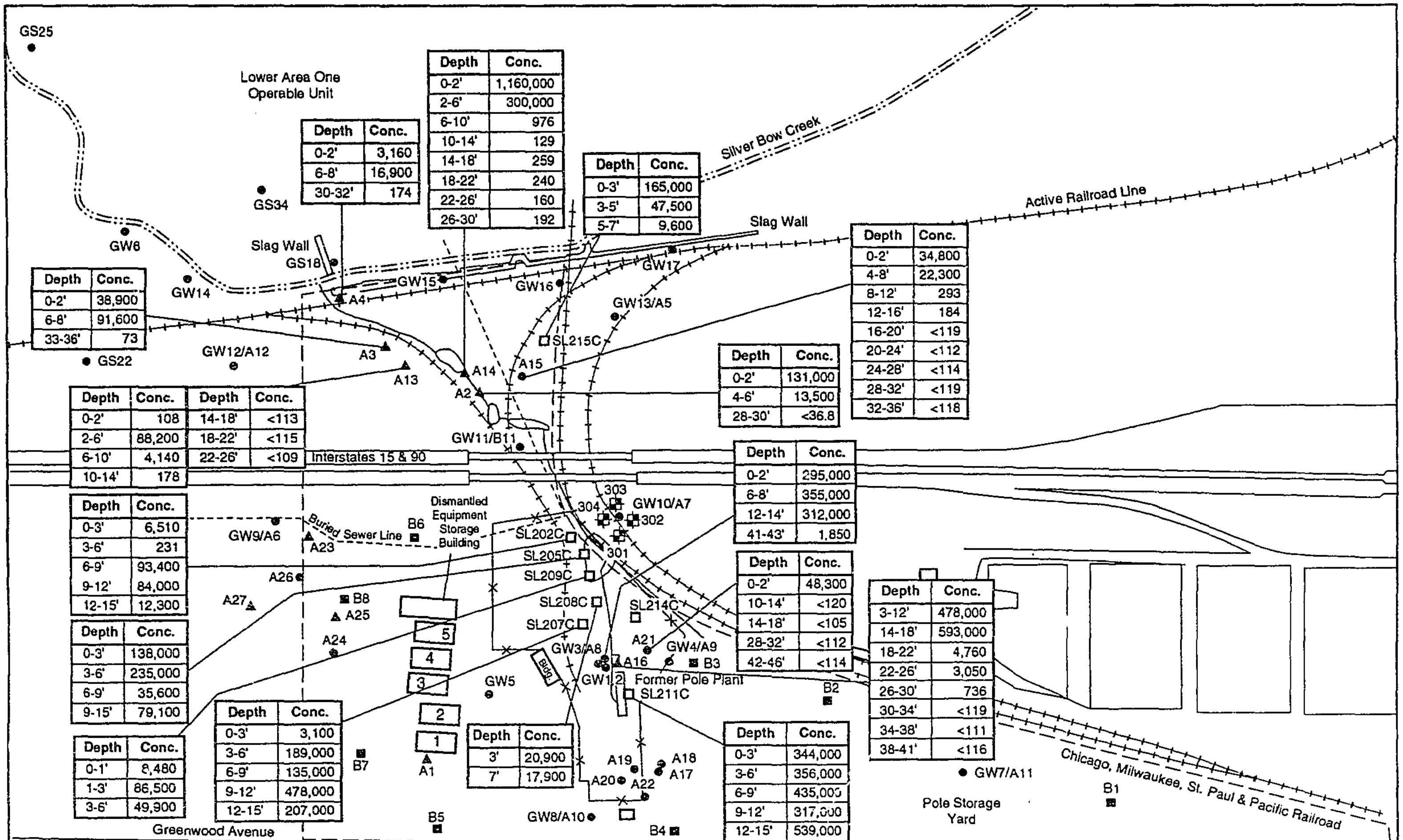
Building
Water
Slag Wall
Paved Road
Railroad
Fence Line

April 1993
Req No: 93DHES32B



MONTANA POLE AND
TREATING PLANT SITE
**PCP AND TPH CONCENTRATIONS
DETECTED IN SURFACE
SOIL SAMPLES**

FIGURE 3



Depth	Conc.
0-2'	3,160
6-8'	16,900
30-32'	174

Depth	Conc.
0-2'	1,160,000
2-6'	300,000
6-10'	976
10-14'	129
14-18'	259
18-22'	240
22-26'	160
26-30'	192

Depth	Conc.
0-3'	165,000
3-5'	47,500
5-7'	9,600

Depth	Conc.
0-2'	38,900
6-8'	91,600
33-36'	73

Depth	Conc.
0-2'	34,800
4-8'	22,300
8-12'	293
12-16'	184
16-20'	<119
20-24'	<112
24-28'	<114
28-32'	<119
32-36'	<118

Depth	Conc.
0-2'	131,000
4-6'	13,500
28-30'	<36.8

Depth	Conc.	Depth	Conc.
0-2'	108	14-18'	<113
2-6'	88,200	18-22'	<115
6-10'	4,140	22-26'	<109
10-14'	178		

Depth	Conc.
0-2'	295,000
6-8'	355,000
12-14'	312,000
41-43'	1,850

Depth	Conc.
0-3'	6,510
3-6'	231
6-9'	93,400
9-12'	84,000
12-15'	12,300

Depth	Conc.
0-2'	48,300
10-14'	<120
14-18'	<105
28-32'	<112
42-46'	<114

Depth	Conc.
3-12'	478,000
14-18'	593,000
18-22'	4,760
22-26'	3,050
26-30'	736
30-34'	<119
34-38'	<111
38-41'	<116

Depth	Conc.
0-3'	138,000
3-6'	235,000
6-9'	35,600
9-15'	79,100

Depth	Conc.
0-1'	8,480
1-3'	86,500
3-6'	49,900

Depth	Conc.
0-3'	3,100
3-6'	189,000
6-9'	135,000
9-12'	478,000
12-15'	207,000

Depth	Conc.
3'	20,900
7'	17,900

Depth	Conc.
0-3'	344,000
3-6'	356,000
6-9'	435,000
9-12'	317,000
12-15'	539,000

LEGEND

- ▲ Subsurface Soil Boring Location
- ■ Subsurface Boring Based on 20% Surface Borings
- ● Monitoring Well/Subsurface Boring Location
- □ Test Pit Samples
- Supplemental Surface Soil Location
- Railroad Tracks
- Creek
- Fence
- Site Boundary

Conc. = Concentration in µg/kg

Site Features as of 1989

Note: 0-2' measurements are also included in Figure 2-3.
All sampling locations are shown on Figure 2-1.

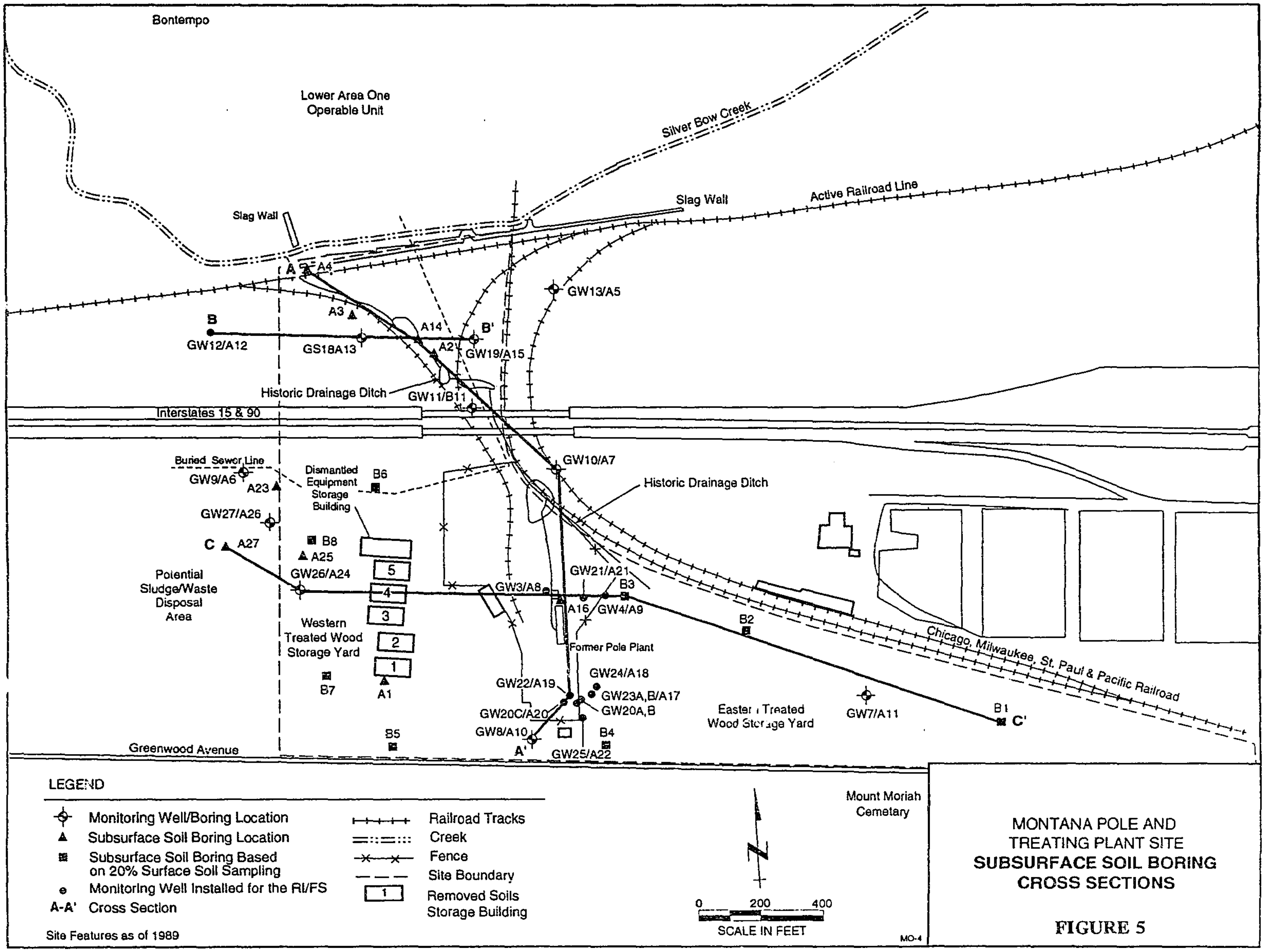
Mount Moriah Cemetary

0 200 400
SCALE IN FEET

MO-3

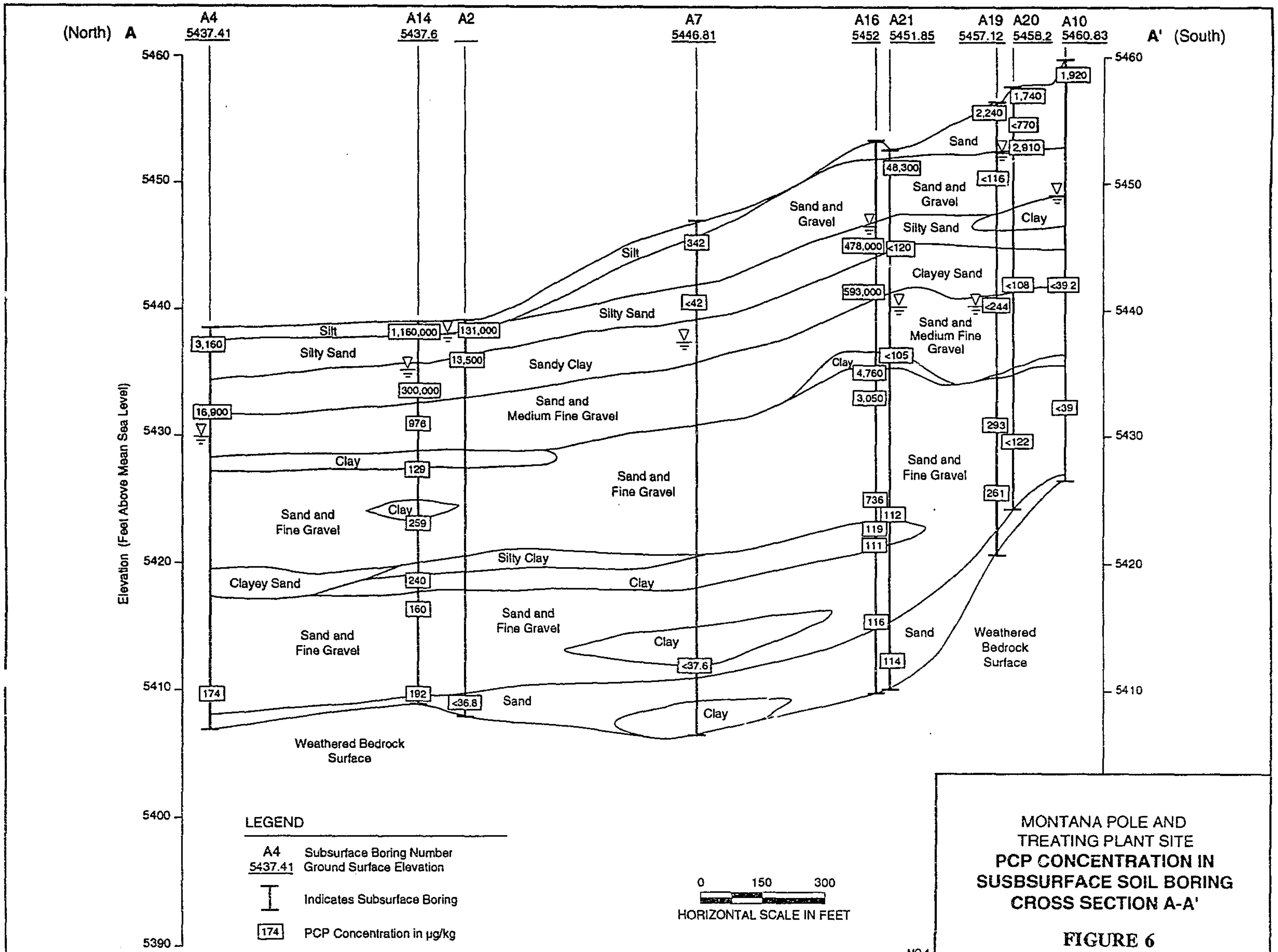
MONTANA POLE AND
TREATING PLANT SITE
PCP CONCENTRATIONS DETECTED IN SUBSURFACE SOIL SAMPLES

FIGURE 4



MONTANA POLE AND TREATING PLANT SITE
SUBSURFACE SOIL BORING CROSS SECTIONS

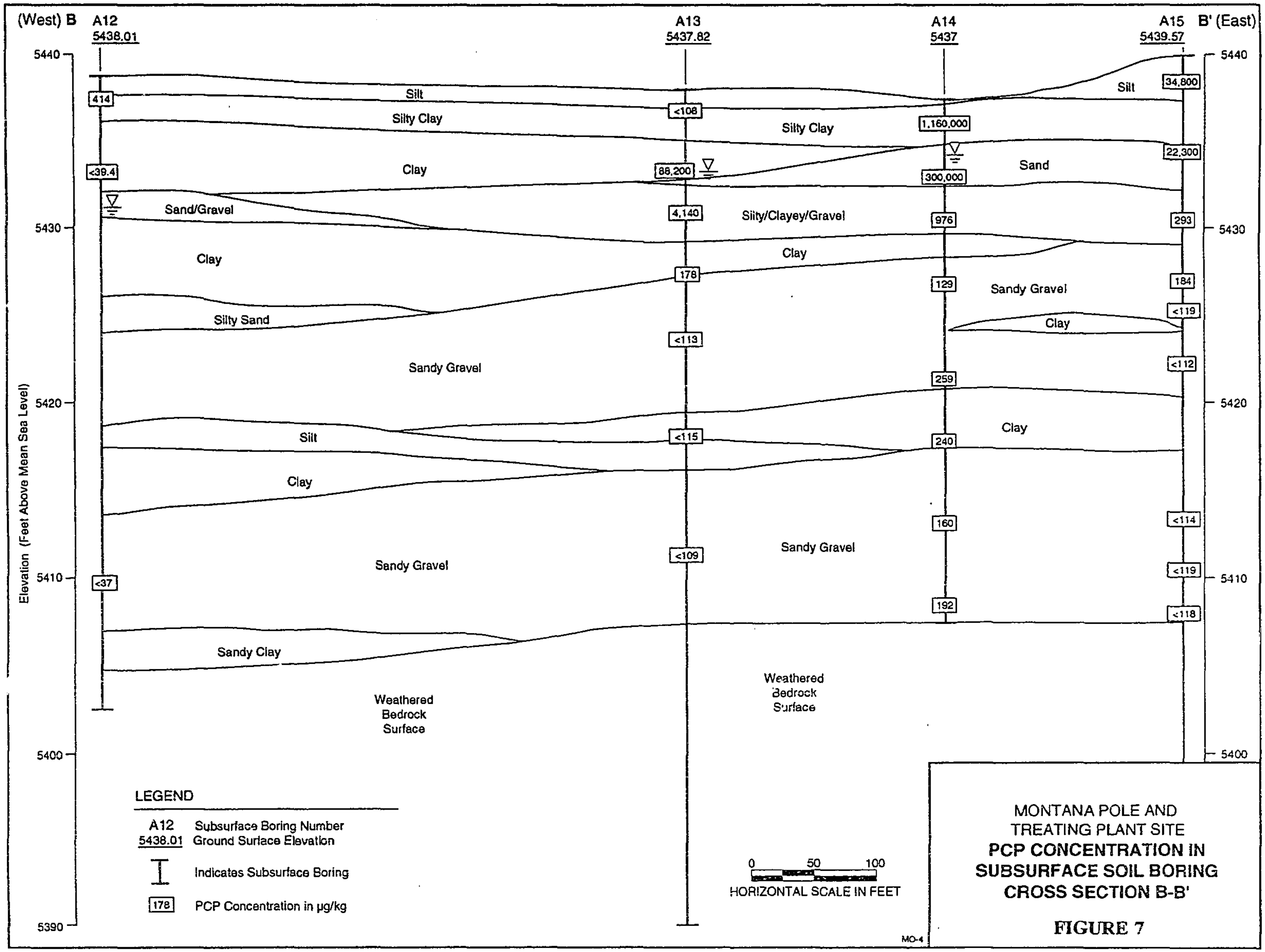
FIGURE 5



MONTANA POLE AND TREATING PLANT SITE

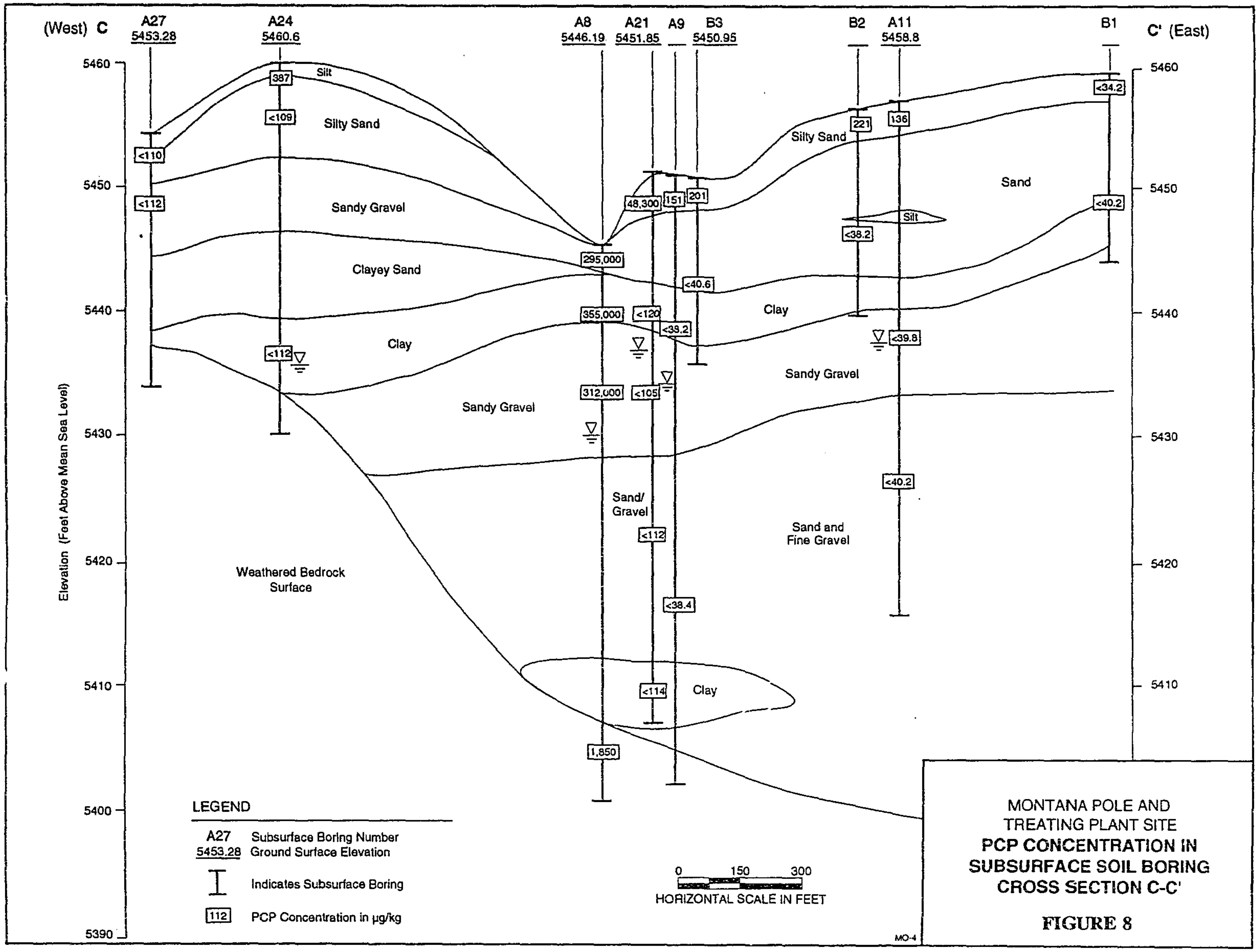
PCP CONCENTRATION IN SUSBSURFACE SOIL BORING CROSS SECTION A-A'

FIGURE 6



MONTANA POLE AND TREATING PLANT SITE
PCP CONCENTRATION IN SUBSURFACE SOIL BORING CROSS SECTION B-B'

FIGURE 7



MONTANA POLE AND TREATING PLANT SITE

PCP CONCENTRATION IN SUBSURFACE SOIL BORING CROSS SECTION C-C'

FIGURE 8

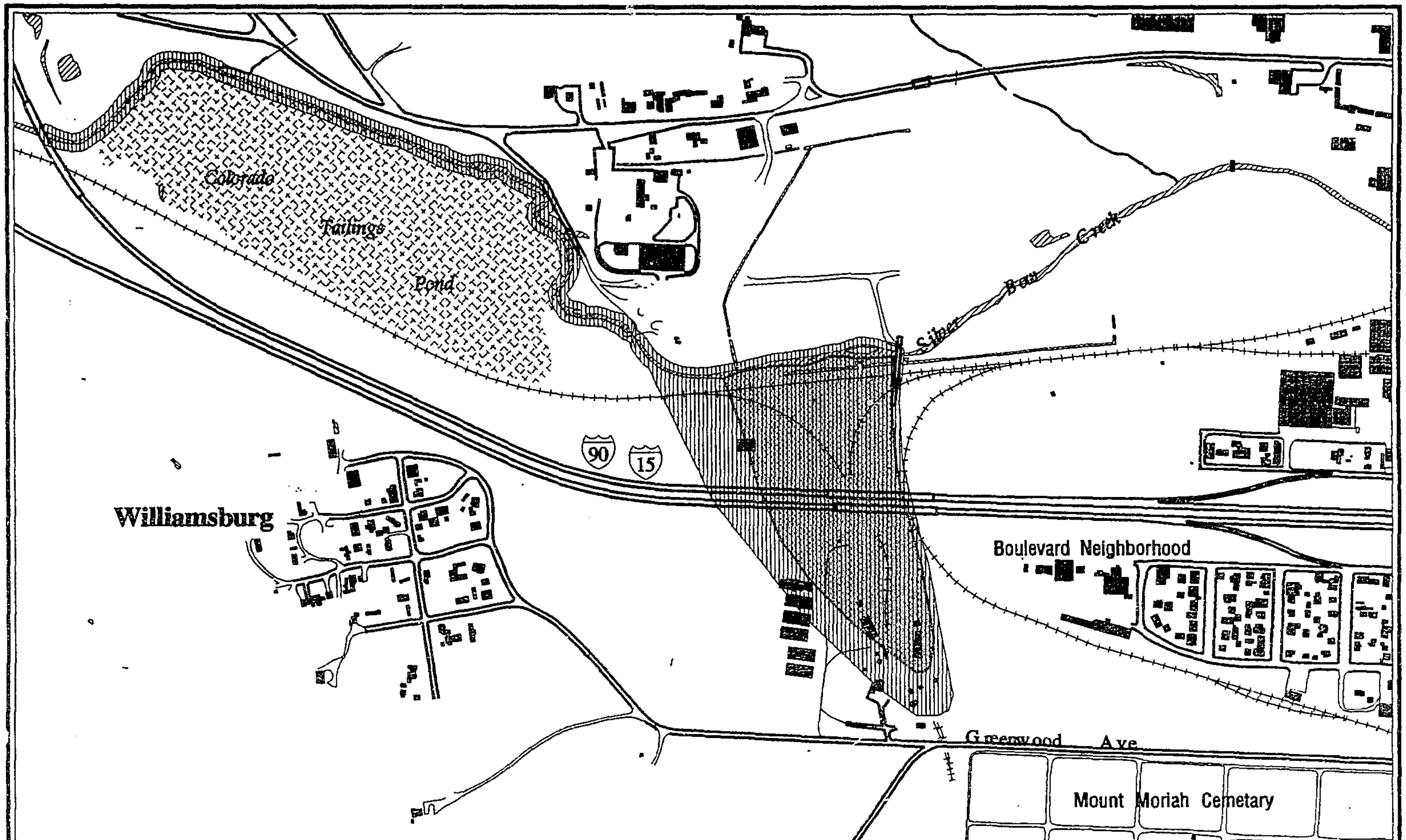
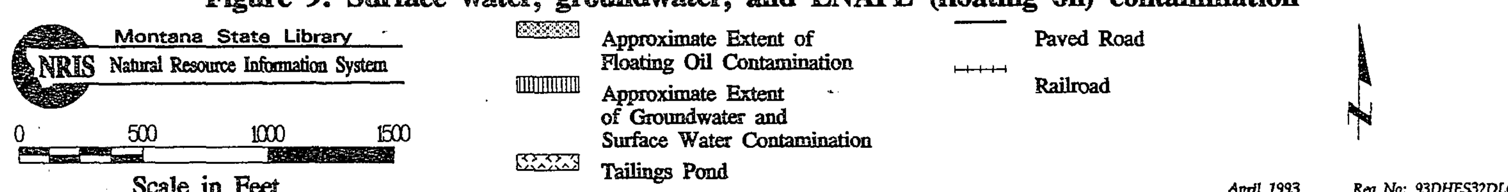
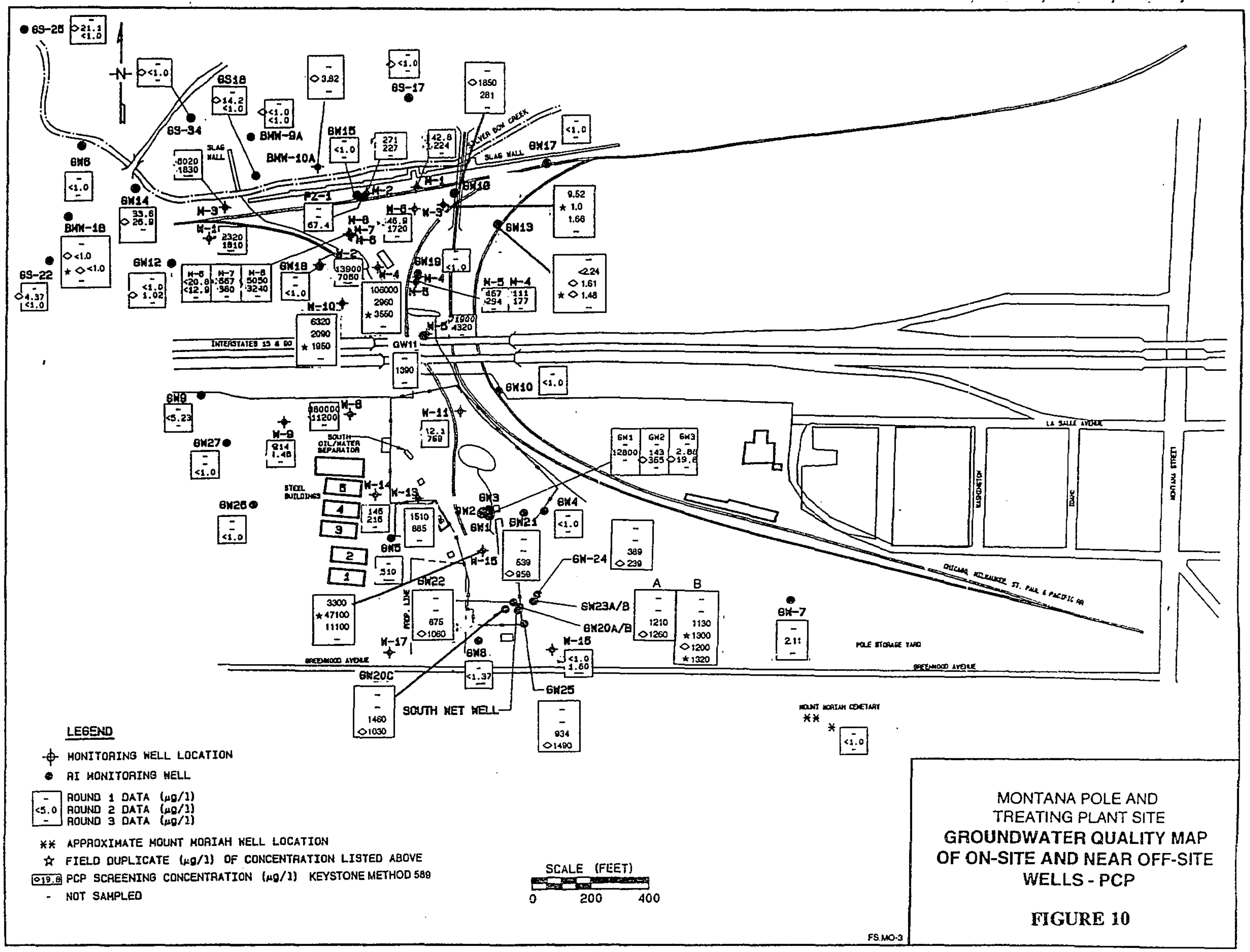


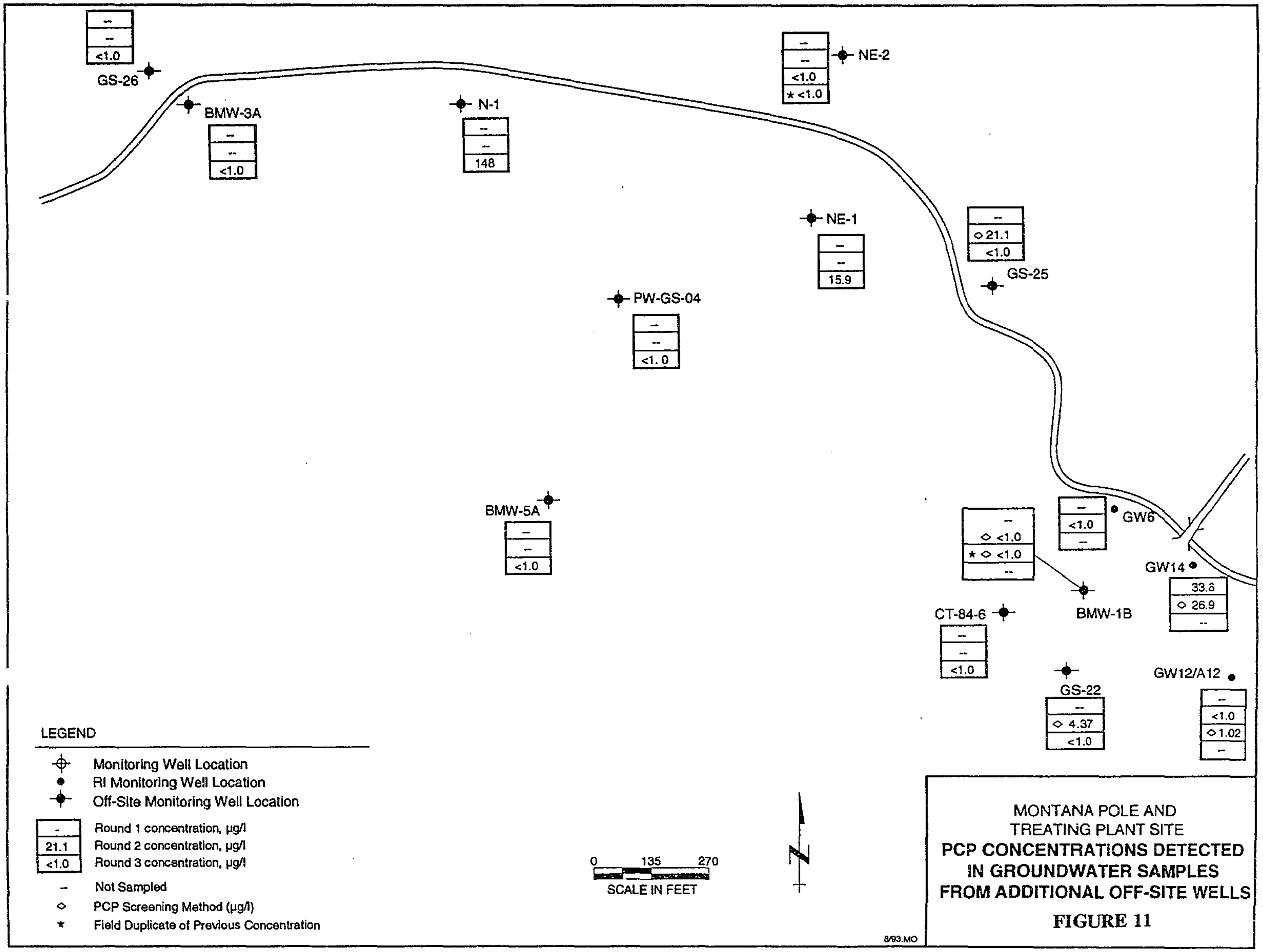
Figure 9: Surface water, groundwater, and LNAPL (floating oil) contamination





MONTANA POLE AND TREATING PLANT SITE
GROUNDWATER QUALITY MAP OF ON-SITE AND NEAR OFF-SITE WELLS - PCP

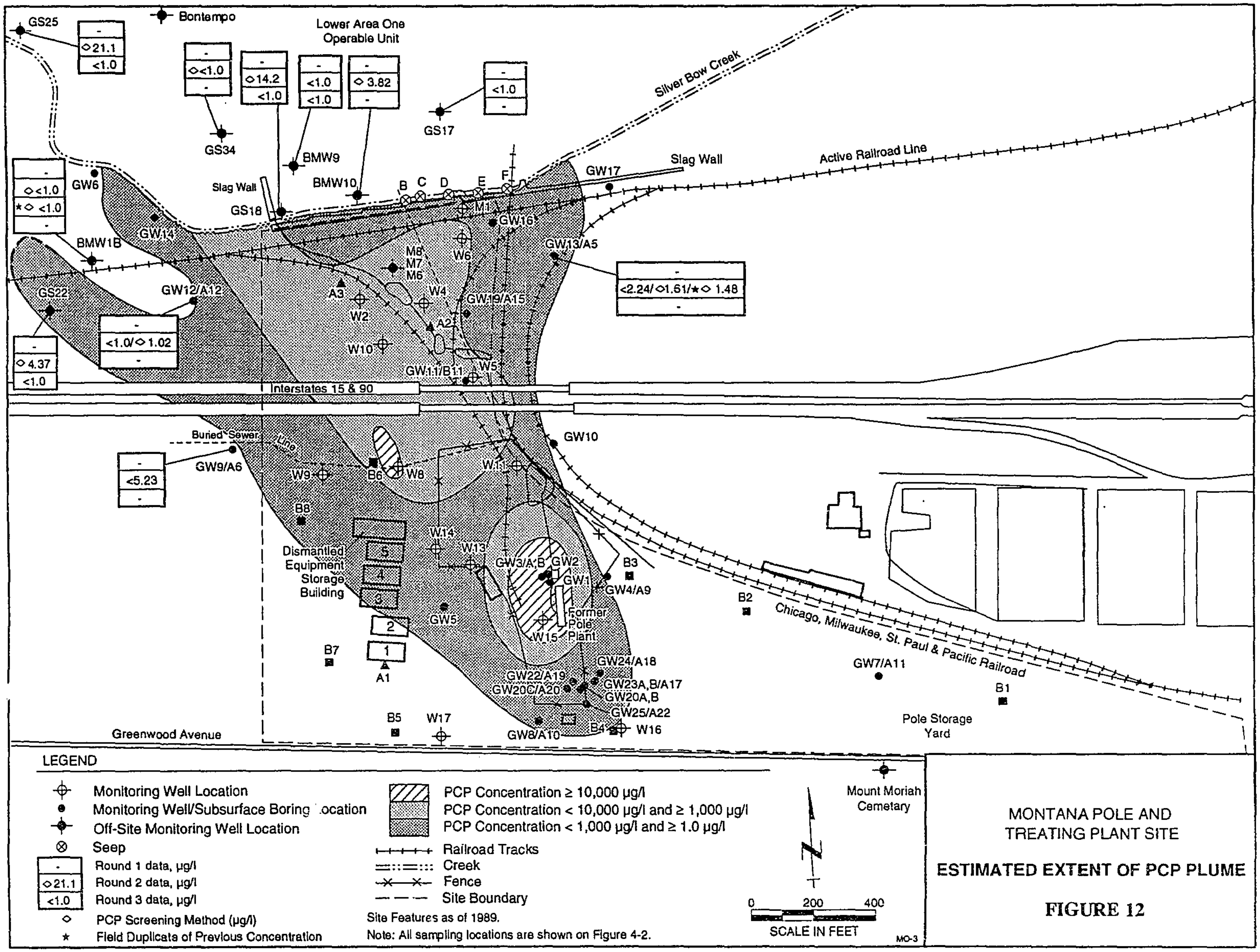
FIGURE 10



MONTANA POLE AND TREATING PLANT SITE

PCP CONCENTRATIONS DETECTED IN GROUNDWATER SAMPLES FROM ADDITIONAL OFF-SITE WELLS

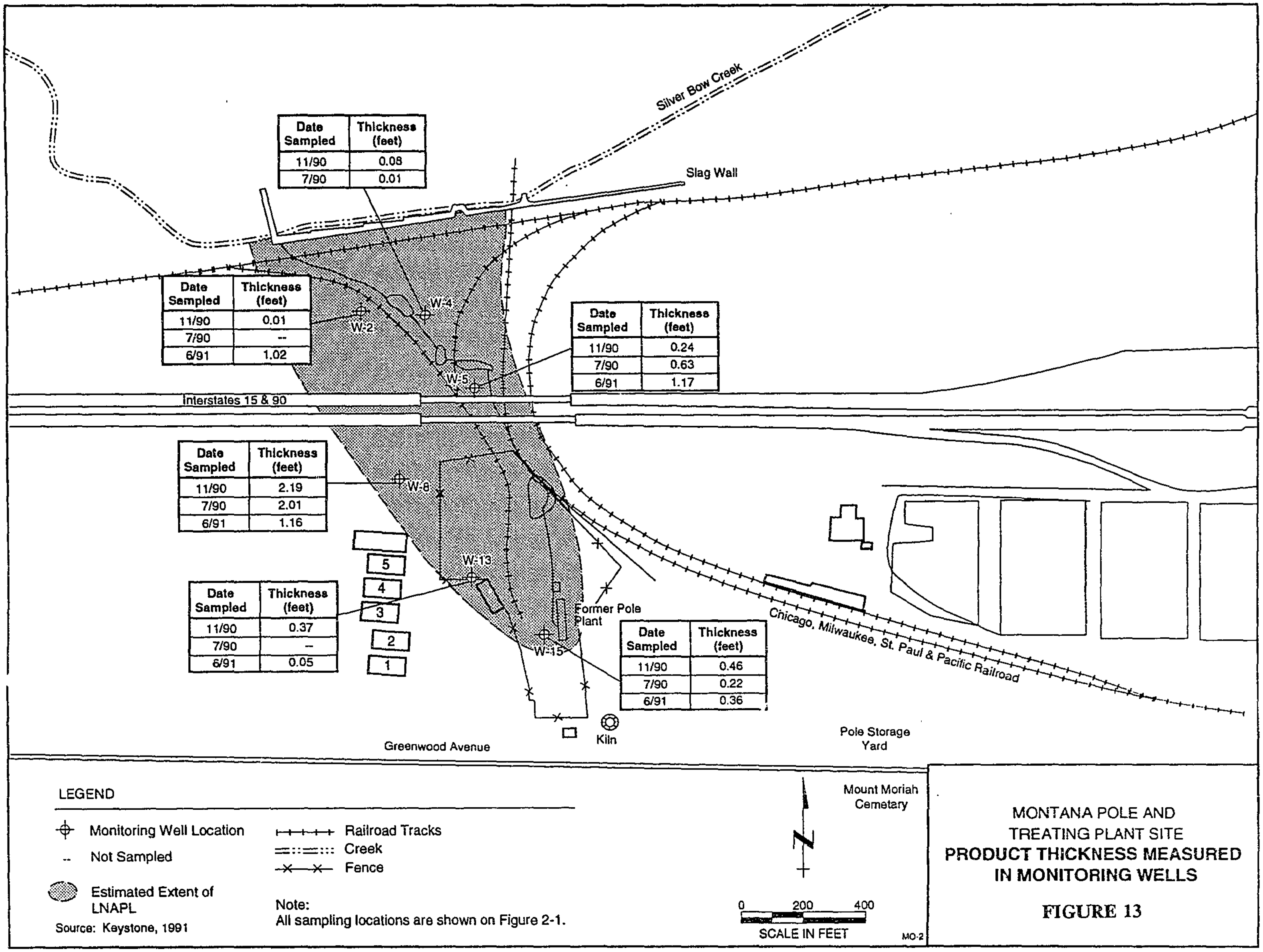
FIGURE 11



MONTANA POLE AND TREATING PLANT SITE

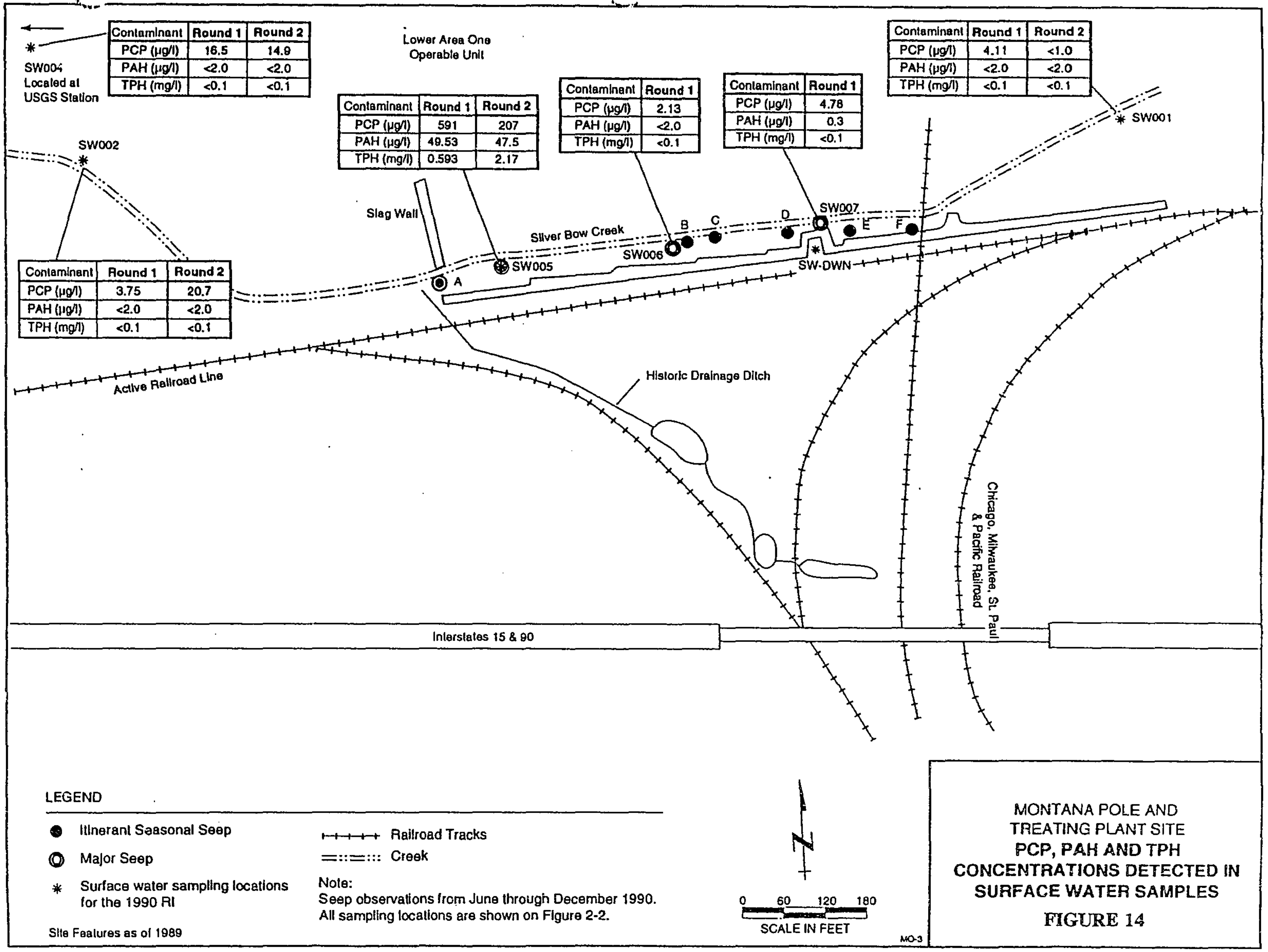
ESTIMATED EXTENT OF PCP PLUME

FIGURE 12



MONTANA POLE AND TREATING PLANT SITE
PRODUCT THICKNESS MEASURED IN MONITORING WELLS

FIGURE 13



SW004:

Contaminant	Round 1	Round 2
PCP (µg/l)	16.5	14.9
PAH (µg/l)	<2.0	<2.0
TPH (mg/l)	<0.1	<0.1

SW002:

Contaminant	Round 1	Round 2
PCP (µg/l)	3.75	20.7
PAH (µg/l)	<2.0	<2.0
TPH (mg/l)	<0.1	<0.1

SW005:

Contaminant	Round 1	Round 2
PCP (µg/l)	591	207
PAH (µg/l)	49.53	47.5
TPH (mg/l)	0.593	2.17

SW006:

Contaminant	Round 1
PCP (µg/l)	2.13
PAH (µg/l)	<2.0
TPH (mg/l)	<0.1

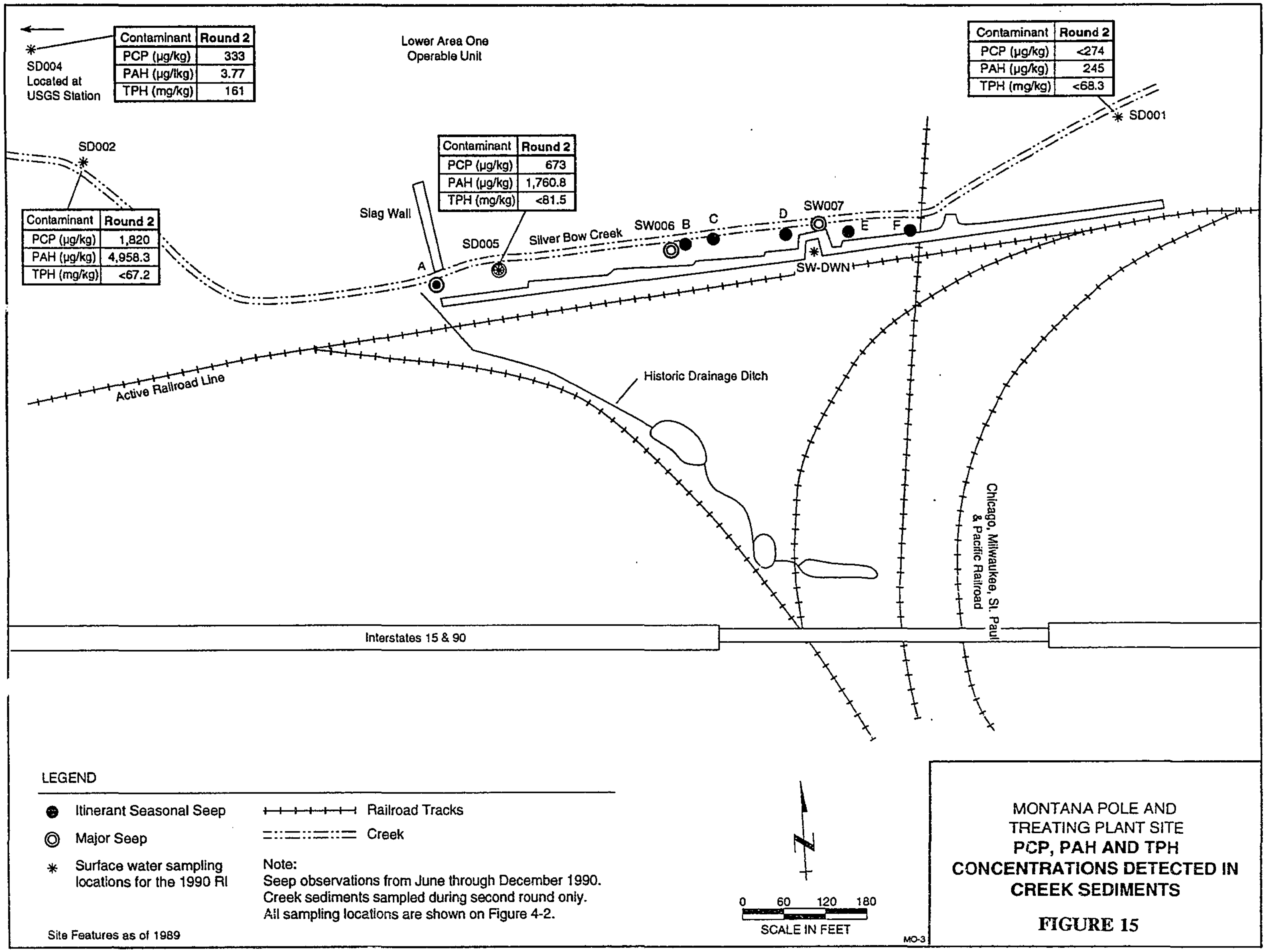
SW007:

Contaminant	Round 1
PCP (µg/l)	4.78
PAH (µg/l)	0.3
TPH (mg/l)	<0.1

SW001:

Contaminant	Round 1	Round 2
PCP (µg/l)	4.11	<1.0
PAH (µg/l)	<2.0	<2.0
TPH (mg/l)	<0.1	<0.1

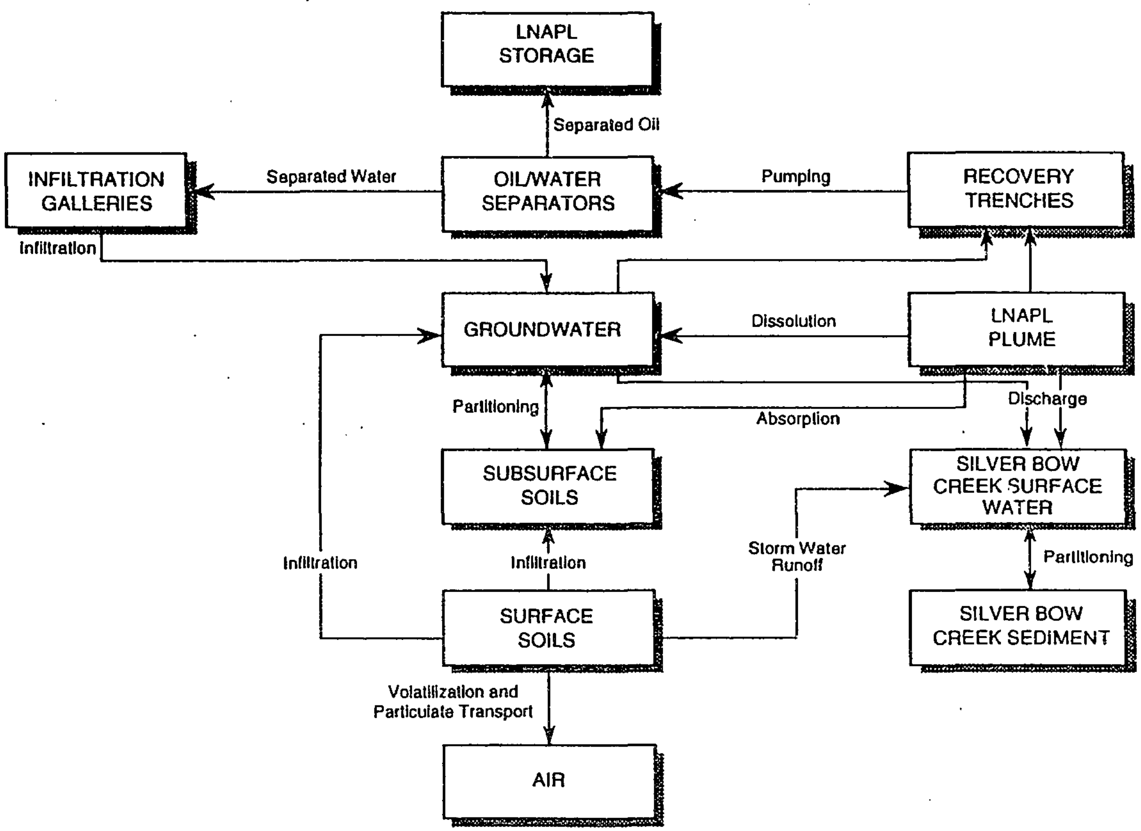
MONTANA POLE AND TREATING PLANT SITE
PCP, PAH AND TPH CONCENTRATIONS DETECTED IN SURFACE WATER SAMPLES
FIGURE 14



MONTANA POLE AND
TREATING PLANT SITE
PCP, PAH AND TPH CONCENTRATIONS DETECTED IN CREEK SEDIMENTS

FIGURE 15

FIGURE 16 : SOURCES OF CONTAMINATION FROM HISTORIC MPTP OPERATIONS, SITE MEDIA, TRANSPORT PATHWAYS, AND LNAPL RECOVERY AND SEPARATED WATER INFILTRATION SYSTEMS



MO 3

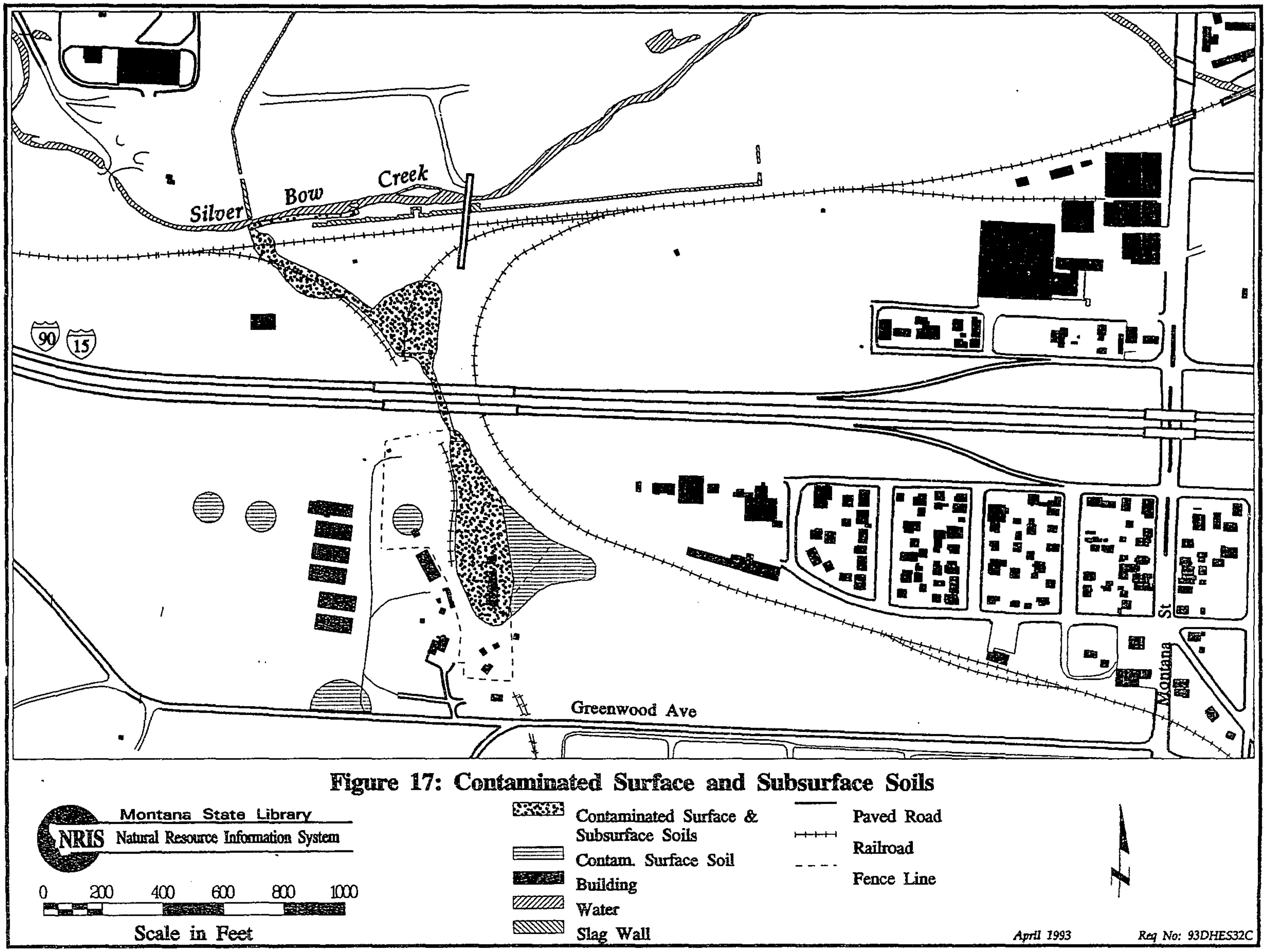


Figure 17: Contaminated Surface and Subsurface Soils

APPENDIX A

ARARS

APPENDIX A

FINAL DETERMINATION AND DESCRIPTION OF
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

MONTANA POLE & TREATING PLANT NPL SITE
BUTTE, MONTANA

* * *

SEPTEMBER 1993

* * *

TABLE OF CONTENTS

LIST OF ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirements
ATSDR	Agency of Toxic Substances and Disease Registry
BAT	Best Available Technology Economically Achievable
BCT	Best Conventional Pollutant Control Technology
BPCTCA	Best Practicable Control Technology Currently Available
BPJ	Best Professional Judgment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
DNRC	Department of Natural Resources and Conservation (Montana)
DSL	Department of State Lands (Montana)
EPA	U.S. Environmental Protection Agency
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
HWM	Hazardous Waste Management
LNAPL	Light Non-aqueous Phase Liquid
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDHES	Montana Department of Health and Environmental Sciences
MGWPCS	Montana Groundwater Pollution Control System
MPDES	Montana Pollutant Discharge Elimination System
NCP	National Contingency Plan
NESHAPS	National Emissions Standards for Hazardous Air Pollutants
NPL	National Priorities List
NPDES	National Pollutant Discharge Elimination System
PAH	Polynuclear Aromatic Hydrocarbon
PCP	Pentachlorophenol
POHC	Principal Organic Hazardous Constituents
POTW	Publicly Owned Treatment Works
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SHPO	State Historic Preservation Officer (Montana)
SIP	State Implementation Plan
TBC	To Be Considered
TU	Turbidity Unit
UIC	Underground Injection Control

1.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

1.1 ARARS FOR REMEDIAL ACTIONS

Section 121(d)(2) of CERCLA, 42 U.S.C. § 9621(d)(2), requires that cleanup actions conducted under CERCLA achieve a level or standard of control which at least attains "any standard, requirement, criteria or limitation under any Federal environmental law ... or any [more stringent] promulgated standard, requirement, criteria or limitation under a State environmental or facility siting law ... [which] is legally applicable to the hazardous substance concerned or is relevant and appropriate under the circumstances of the release of such hazardous substance or pollutant, or contaminant ..." The standards, requirements, criteria or limitations identified pursuant to this section are commonly referred to as "applicable or relevant and appropriate requirements," or ARARs.

The remedy for the Montana Pole & Treating Plant NPL site must comply with or attain all ARARs unless specific ARAR waivers are invoked. See CERCLA § 121(d)(4), 42 U.S.C. § 9621(d)(4), and the NCP, 40 CFR 300.430(f)(1)(ii)(C). ARARs must be observed both during the conduct of on site clean up activities and at the conclusion of the cleanup activity, unless specifically exempted.[1]

1.2 REQUIREMENTS FOR ARARS

ARARs may be either "applicable" requirements or "relevant and appropriate" requirements. Compliance with both is equally mandatory under CERCLA.[2]

Applicable requirements are those standards, requirements, criteria or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site.

Relevant and appropriate requirements are those standards, standards, requirements, criteria or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to hazardous substances, pollutants, contaminants, remedial actions, locations, or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Factors which may be considered in making this determination, when the factors are pertinent, are presented in 40 CFR § 300.400(g)(2). They include, among other considerations, examination of: the purpose of the requirement and the purpose of the CERCLA action; the medium and substances regulated by the requirement and the medium and substances at the CERCLA site; the actions or activities regulated by the requirement and the remedial action contemplated at the site; and the potential use of

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1 40 CFR § 300.435(b)(2); Preamble to the Proposed NCP, 53 Fed. Reg. 51440 (December 21, 1988); Preamble to the Final NCP, 55 Fed. Reg. 8755-8757 (March 8, 1990).

2 See CERCLA § 121(d)(2)(A), 42 U.S.C. § 9621(d)(2)(A).

resources affected by the requirement and the use or potential use of the affected resource at the CERCLA site.

ARARs are divided into contaminant-specific, location-specific and action-specific requirements. Contaminant-specific requirements govern the release to the environment of materials possessing certain chemical or physical characteristics or containing specific chemical compounds. Contaminant-specific ARARs generally set human or environmental risk-based criteria and protocol which, when applied to site-specific conditions, result in the establishment of numerical action values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment.

Location-specific ARARs relate to the geographic or physical position of the site, rather than to the nature of site contaminants. These ARARs place restrictions on the concentration of hazardous substances or the conduct of cleanup activities due to their location in the environment.

Action-specific ARARs are usually technology- or activity-based requirements, or are limitations on actions taken with respect to hazardous substances. A particular remedial activity will trigger an action-specific ARAR. Unlike chemical-specific and location-specific ARARs, action-specific ARARs do not, in themselves, determine the remedial alternative. Rather, action-specific ARARs indicate how the selected remedy must be achieved.

Only the substantive portions of the requirements are ARARs.[3] Administrative requirements are not ARARs and thus do not apply to actions conducted entirely on-site. Administrative requirements are those which involve consultation, issuance of permits, documentation, reporting, recordkeeping, and enforcement. The CERCLA program has its own set of administrative procedures which assure proper implementation of CERCLA. The application of additional or conflicting administrative requirements could result in delay or confusion.[4] Provisions of statutes or regulations which contain general goals that merely express legislative intent about desired outcomes or conditions but are non-binding are not ARARs.[5]

Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be applicable or relevant and appropriate. To be an ARAR, a state standard must be "promulgated," which means that the standards are of general applicability and are legally enforceable.[6]

Additional documents may be identified as To Be Considered (TBCs). The TBC category consists of advisories, criteria, or guidance that were developed by EPA, other federal

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3 40 CFR § 300.5 (Definitions of "Applicable requirements" and "Relevant and appropriate requirements.") See also Preamble to the Final NCP, 55 Fed. Reg. 8756-8757 (March 8, 1990).

4 Preamble to the Final NCP, 55 Fed. Reg. 8756-8757 (March 8, 1990); Compliance with Other Laws Manual, Vol. I, pp. 1-11 through 1-12.

5 Preamble to the Final NCP, 55 Fed. Reg. 8746 (March 8, 1990).

6 40 C.F.R. § 300.400(g)(4).

agencies, or states that may be useful in developing CERCLA remedies. These may be considered as appropriate in selecting and developing cleanup actions.[7]

1.3 ARARS APPLICABLE TO THE MONTANA POLE NPL SITE

This document constitutes MDHES' and EPA's final determination and detailed description of ARARs for remedial action at the Montana Pole NPL site. The descriptions which follow include summaries of the legal requirements which are provided to allow the user a reasonable understanding of the requirements without having to refer constantly back to the statute or regulation itself. However, in the event of any inconsistency between the law and the summary provided in this document, the applicable or relevant and appropriate requirement is ultimately the requirement as set out in the law, rather than any paraphrase of the law provided here.

The ARARs analysis is based on section 121(d) of CERCLA, 42 U.S.C. § 9621(d); "CERCLA Compliance with Other Laws Manual, Volume I," OSWER Dir. 9234.1-01 (August 8, 1988); "CERCLA Compliance with Other Laws Manual, Volume II," OSWER Dir. 9234.1-02 (August, 1989); the Compendium of CERCLA ARARs Fact Sheets and Directives, OSWER Dir. 9347.3-15 (October 1991); the Preamble to the Proposed National Contingency Plan, 53 Fed. Reg. 51394, et. seq. (December 21, 1988); the Preamble to the Final National Contingency Plan, 55 Fed. Reg. 8666-8813 (March 8, 1990); and the Final National Contingency Plan, 40 CFR Part 300 (55 Fed. Reg. 8813-8865, March 8, 1990) (hereinafter referred to as "the NCP").

[7] 40 C.F.R. § 300.400(g)(3); 40 C.F.R. § 300.415(i); Preamble to the Final NCP, 55 Fed. Reg. 8744-8746 (March 8, 1990).

2.0 FEDERAL ARARS

Potential Federal applicable or relevant and appropriate requirements for the Montana Pole NPL site are discussed below.

2.1 FEDERAL CONTAMINANT-SPECIFIC ARARS

2.1.1 Safe Drinking Water Act (Relevant and Appropriate)

The National Primary and Secondary Drinking Water Standards (40 CFR Parts 141, 143), better known as "maximum contaminant levels" (MCLs), are not applicable to remedial activities at the site because the aquifer underlying the site is not a public water supply. These standards may be applicable in the future should the EPA detect an exceedance at a public water outlet.

These drinking water standards are, however, relevant and appropriate because there is groundwater in the area which is a potential source of drinking water and because the aquifer feeds Silver Bow Creek, which is a potential drinking water source. The determination that the drinking water standards are relevant and appropriate at the site is fully supported by EPA regulations and guidance. The Preamble to the National Contingency Plan (NCP) clearly states the MCLs are relevant and appropriate for groundwater that is a current or potential source of drinking water, 55 Fed. Reg. 8750 (March 8, 1990), and this determination is further supported by requirements in the RI/FS section of the NCP, 40 CFR § 300.430(e)(2)(i)(B). EPA's Guidance on Remedial Action For Contaminated Groundwater at Superfund Sites states that "MCLs developed under the Safe Drinking Water Act generally are ARARs for current or potential drinking water sources".

Certain institutional controls may be implemented by the agreement of Butte/Silver Bow County government and some of the PRPs. If such controls are implemented to prevent the use of groundwater at the site as a drinking water source, the need to comply with MCLs throughout groundwater plumes at the site may be obviated. Thus, if sufficient institutional controls are implemented to prevent the use of groundwater at the site as a drinking water source, the point of compliance for the MCL ARARs will be the boundary of the waste management unit at the site, as discussed in the ROD.

The MCLs are relevant and appropriate standards for the remedial action to be conducted at this site. In addition, the non-zero maximum contaminant level goals (MCLGs) are relevant and appropriate (55 Fed. Reg. 8750-8752 (March 8, 1990)). The points of compliance for these standards are described in the ROD. The time for compliance is as soon as feasible, and consistent compliance is necessary for completion of remedial action. Once achieved, standards must be maintained.

The MCLs and the MCLGs are:[8]

Chemical	MCLG (mg/l)	MCL (mg/l)
Inorganics:		
Arsenic	N.A.	.05[9]
Cadmium	.005[10]	.005[11]
Chromium	N.A.[12]	.05[13]
Copper	1.3[14]	1.3[15]
Lead	N.A.[16]	.015[17]

[8] EPA has granted to the State of Montana primacy in enforcement of the Safe Drinking Water Act. Thus the law commonly enforced in Montana is the state law, rather than the federal law. However, since the federal MCLs are also ARARs for the site, the more stringent of the federal or state standards is the relevant standard for each substance.

[9] 40 CFR § 141.11; ARM 16.20.203.

[10] 40 CFR § 141.51.

[11] 40 CFR § 141.51. The current state MCL is less stringent at 0.010 mg/l. See ARM 16.20.203.

[12] The chromium MCLG, at .1 mg/l, see 40 CFR § 141.51, is not as stringent as the state MCL for Chromium. See footnote 13 below.

[13] ARM 16.20.203. The recently revised federal MCL for chromium, .1 mg/l, see 40 CFR § 141.62, is less stringent than the current state MCL.

[14] 40 CFR § 141.51.

[15] This level is an "action level" similar to the lead level described in footnote 17 below. See 40 CFR Subpart I (§ 141.80(c)(2)). In addition, a secondary MCL of 1.0 mg/l is identified for copper at 40 CFR § 143.3. However, the secondary MCLs are not enforceable as federal standards and are provided only as guidelines for the states. These standards are not generally considered ARARs unless the state adopts them as enforceable standards. See CERCLA Compliance With Other Laws Manual, Volume I (August 1988), p. 4-8. Montana has not adopted the secondary MCLs as enforceable standards.

[16] Lead is among the acutely toxic substances for which the MCLG is zero. See 40 CFR § 141.51. However, the zero MCLGs are not generally considered "appropriate" requirements for CERCLA cleanups, primarily for reasons of practicability. See 40 CFR § 300.430(e)(2)(i)(C); see also Preamble to the Final NCP, 55 Fed. Reg. 8750-8753 (March 8, 1990).

[17] 40 CFR § 141.80(c)(1). The level specified is not an MCL, but rather an "action level." The standard is normally measured at the taps of users of the water to account for additional lead contamination resulting from corrosion in the water supply lines. See 40 CFR Subpart I, (40 CFR §§ 141.80-141.91).

Organics:

Benzene	N.A.[18]	0.005[19]
Dichlorobenzene (para)	0.075[20]	0.075[21]
Dichlorobenzene (ortho)	0.6	0.6
Ethylbenzene	0.7	0.7
Monochlorobenzene	0.1	0.1
Toluene	1.	1.
Xylenes (total)	10.	10.
Pentachlorophenol	N.A.[22]	0.001[23]
Benzo(a)pyrene	N.A.	0.0002[24]
2,3,7,8-TCDD (Dioxin)	N.A.	$3. \times 10^{-8}$

MCLs also form the basis for certain discharge standards and instream standards for surface water, when those standards are more stringent than water quality criteria or state water quality standards. Where this is the case, those standards are identified in Tables 26, Surface Water Cleanup Levels and Corresponding Risks, and 27, Discharge to Surface Water Cleanup Levels and Corresponding Risks, of the ROD.

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18 The MCLG for benzene is zero. See 40 CFR § 141.50.

19 40 CFR § 141.61; ARM 16.20.204(3)(e).

20 40 CFR § 141.50.

21 40 CFR § 141.61; ARM 16.20.204(3)(f).

22 40 CFR § 141.50(a).

23 40 CFR § 141.61.

24 MCLs for Benzo(a)pyrene and 2,3,7,8-TCDD (Dioxin) were finalized July 17, 1992, at 57 Fed. Reg 31846. These standards become effective January 17, 1994. However, as promulgated MCLs they are still relevant and appropriate standards. The MCLG for both of these compounds is zero, and accordingly is not considered an appropriate standard.

2.1.2 Resource Conservation and Recovery Act (RCRA)

2.1.2.1 Groundwater Protection Standards (Applicable)

Under 40 CFR Part 264, Subpart F[25], concentration limits are set for hazardous constituents in groundwater. These standards are applicable to remedial actions at the site. The limits specified for groundwater protection are the same as or less stringent than the MCLs or MCLGs identified above for those substances.[26]

2.1.2.2 Hazardous Waste Management (Relevant and Appropriate)

The Resource Conservation and Recovery Act of 1980, 42 U.S.C. § 6901, et seq., and accompanying regulations set forth the standards for hazardous waste. The EPA has stated that the test for determining whether such standards are applicable to cleanups at superfund sites is:

> RCRA Subtitle C requirements for the treatment, storage, or disposal of hazardous waste will be applicable if a combination of the following requirements are met: a) the waste is listed or characteristic waste under RCRA; and b) either (1) the waste was treated, stored, or disposed of after the effective date of the RCRA requirements (November 8, 1980); or (2) the activity at the CERCLA site constitutes treatment, storage or disposal as defined under RCRA. (42 U.S.C. § 6901, et seq.)

Because of the location of the Montana Pole site, and the historical mining activities which took place in this area, contaminated soil materials being addressed at the site may include material derived during the extraction and beneficiation processes. Wastes from ore extraction and beneficiation are specifically excluded from Subtitle C under the mining waste (Bevill) exclusion, (RCRA Section 3001(b)(3)(A)(ii)). Therefore, RCRA is probably not applicable to mine waste found at the site. Process waste, which is not excluded by the Bevill exclusion, may also be present at the site; no determination on that issue is made in this ROD.

Despite this situation, the EPA has determined that certain RCRA standards, and their state counterparts, are relevant and appropriate to potential remedial actions planned. The EPA's determination is based on the current definition of "relevant and appropriate" found in the most recent version of the NCP at 40 CFR § 300.5. For mining waste, certain provisions of RCRA can be relevant and appropriate if they meet the definition of "relevant and appropriate" found in the NCP; if the activities contemplated at the Montana Pole site will result in discrete areas of mining waste which resemble traditional RCRA management units;

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[25] The State of Montana implements an authorized RCRA program which includes the groundwater protection standards of 40 CFR Part 264, Subpart F, (1990) as incorporated by reference in ARM 16.44.702.

[26] The maximum groundwater concentrations specified are (1) for arsenic and lead: the same as the MCL, .05 mg/l; (2) for cadmium: the same as the old MCL, .010 mg/l, but not as stringent as the new MCL or the MCLG, .005 mg/l. No solid waste groundwater standard is specified for copper.

and if the mining wastes are located in areas where exposure is likely to occur, are toxic, are close to groundwater, or are otherwise distinguishable from EPA's generic determination of low toxicity/high volume for RCRA-excluded mining waste. See Preamble to Final NCP, 55 Fed. Reg. 8763-8764 (March 8, 1990); CERCLA Compliance With Other Laws Manual, Volume II (August 1989)(OSWER Dir. No. 9234.1-02) p.6-4; Preamble to Proposed NCP, 53 Fed. Reg. 51447 (Dec. 21, 1988); and guidance entitled "Consideration of RCRA Requirements in Performing CERCLA Responses at Mining Wastes Sites," August 19, 1986 (OSWER).

At Montana Pole, if mining wastes are controlled in place as discrete units, or are actively collected and managed as discrete units, the following RCRA standards will be ARARs:

> 40 CFR § 264.18(a) and (b), which impose siting restrictions and conditions on the treatment, storage, or disposal of wastes;
>
> certain provisions of 40 CFR Part 263, which govern the transportation of wastes;
>
> 40 CFR §§ 264.116 and 264.119, regarding notification and filing requirements;
>
> 40 CFR § 264.228(a)(2)(i), addressing dewatering of wastes;
>
> 40 CFR § 264.228(a)(2)(iii)(B),(C), and (D), and 40 CFR § 264.251(c),(d), and (f), regarding run-on and run-off controls; and
>
> 40 CFR §§ 257.3-1(a), 257,3-2, 257.3-3, and 257.3-4, which impose general requirements on waste handling, storage, and disposal.

Land disposal restrictions, discussed below with respect to organic substances at the site, are not identified as relevant and appropriate for these mining wastes, in accordance with current EPA guidance.

2.1.2.3 Land Disposal Restrictions

In December 1990, EPA listed new hazardous wastes consisting of waste waters, process residuals, preservative drippage, and spent formulations of wood preserving processes generated at plants using chlorophenolic and creosote formulations for wood preserving waste nos. F032 and F034. 55 Fed. Reg. 50,450; 50,482, to be codified at 40 CFR § 261.31(a). Because the site is a wood treating site that used pentachlorophenol and creosote, these newly-listed wastes are found in various locations throughout the site. Land disposal restrictions (LDRs) may be applicable to site soils contaminated with FO32 and FO34 waste if placement of those soils occurs.

LDRs typically set concentration levels or treatment standards that hazardous wastes must meet before they can be land disposed. These treatment standards represent best demonstrated available treatment technology (BDAT) for these wastes. In some cases, however, hazardous wastes and appropriate treatment levels may differ significantly even within the same class of hazardous waste. See 40 CFR § 268.44. Consequently, a variance from an LDR treatment standard may be appropriate when a waste "differs significantly from waste analyzed in developing the treatment standard." 40 CFR §§ 268.44(a) and (h). The Corrective Action Management Units (CAMU) rule, see 58 Fed. Reg. 8658 (February 16, 1993), provides that remediation wastes from anywhere at a facility or from releases outside of the facility can be placed into either a corrective action management unit or a temporary unit without triggering land disposal restrictions and minimum technology requirements. Therefore, with regard to the placement of F032 and F034 wastes at the site, the CAMU rule is applicable. Thus, wastes which are excavated can be placed in treatment units in compliance with RCRA requirements, even if the wastes are at levels above land ban standards.

2.1.3 Clean Air Act (Applicable)

Section 109 of the Clean Air Act, 42 U.S.C. § 7409, and implementing regulations found at 40 CFR Part 50 set national primary and secondary ambient air quality standards.[27] National primary ambient air quality standards define levels of air quality which are necessary, with an adequate margin of safety, to protect the public health. National secondary ambient air quality standards define levels of air quality which are necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. The ambient air quality standards and other standards set out below are applicable for releases into the air resulting from remedial action.[28] These standards must be met both during the design and implementation phases of the remedial action.

2.1.3.1 Particulate Matter

The ambient air quality standard for particulate matter of less than or equal to 10 micrometers in diameter (PM-10) is 150 micrograms per cubic meter, 24 hour average concentration; 50 micrograms per cubic meter, annual arithmetic mean. 40 CFR § 50.6[29] (Applicable).

In addition, state law provides an ambient air quality standard for settled particulate matter. Particulate matter concentrations in the ambient air shall not exceed the following 30-day average: 10 grams per square meter. ARM § 16.8.818 (Applicable).

The Butte area has been designated by EPA as non-attainment for total suspended particulates. 40 CFR § 81.327. ARM 16.8.1401 (Applicable) requires that any new source

27 The ambient air quality standards established as part of Montana's approved State Implementation Plan in many cases provide more stringent or additional standards. Moreover, the federal regulations apply the standards only to "major sources;" the state regulations are fully applicable throughout the state and are not limited to "major sources." See ARM 16.8.808 and 16.8.811 - 821. As part of an EPA-approved State Implementation Plan, the state standards are also federally enforceable. Thus, the state standards are identified in this section together with the federal standards.

28 Ambient air quality standards are also provided for carbon monoxide, hydrogen sulfide, nitrogen dioxide, sulfur dioxide, and ozone. If emissions of these compounds were to occur at the site in connection with any remedial action, these standards would also be applicable. See ARM 16.8.811 - 820.

29 The state air quality regulations provide an equivalent standard, see ARM 16.8.821, which is enforceable in Montana as part of the State Implementation Plan.

of airborne particulate matter that has the potential to emit less than 100 tons per year of particulates shall apply best available control technology (BACT); any new source of airborne particulate matter that has the potential to emit more than 100 tons per year of particulates shall apply lowest achievable emission rate (LAER). The BACT and LAER standards are defined in ARM 16.8.1401.

2.1.3.2 Lead

ARM § 16.8.815 (Applicable). Lead concentrations in the ambient air shall not exceed the following 90-day average (annual arithmetic mean): 1.5 micrograms Pb per cubic meter of air. 40 CFR § 50.12[30] (Applicable).

2.1.3.3 Asbestos

The National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61) designate certain air pollutants that cause serious adverse health effects. Subpart M (§§ 61.141-157) specifies control requirements for asbestos. 40 CFR §§ 61.145 and 61.150 (Applicable) cover demolition and waste disposal for demolition operations and would be applicable if asbestos is encountered during implementation of the remedy.

2.1.4 Federal Insecticide, Fungicide, and Rodenticide Act (Applicable)

This statute (7 U.S.C. § 136 et seq.) regulates the sale, distribution and use of all pesticide products in the United States and is applicable to any alternative involving the recycling and reuse of pentachlorophenol and other wood-treating pesticides. Under FIFRA, use of a registered pesticide product in a manner inconsistent with its labeling is a violation of the Act (7 U.S.C. § 136j). Recovered pesticides may be reused provided they meet new product labelling specifications, which include concentration limits for pesticides in solution.

2.2 FEDERAL LOCATION-SPECIFIC ARARS

2.2.1 Fish and Wildlife Coordination Act (Applicable)

This standard (16 USC §§ 1531-1566, 40 CFR § 6.302(g)) requires that federal agencies or federally funded or authorized projects ensure that any modification of any stream or other water body affected by any action authorized or funded by the federal agency provide for adequate protection of fish and wildlife resources. Compliance with this ARAR requires EPA and MDHES to consult with the U.S. Fish and Wildlife Service and the Wildlife Resources Agency of the affected State. Further consultation will occur during the remedial design process and specific mitigative measures may be identified in consultation with the appropriate agencies.

[30] The state air quality regulations provide an equivalent standard, see ARM 16.8.815, which is enforceable in Montana as part of the State Implementation Plan.

2.2.2 Floodplain Management Order (Applicable)

This requirement (40 CFR Part 6, Appendix A, Executive Order No. 11,988) mandates that federally-funded or authorized actions within the 100 year floodplain avoid, to the maximum extent possible, adverse impacts associated with development of a floodplain. Compliance with this requirement is detailed in EPA's August 6, 1985 "Policy on Floodplains and Wetlands Assessments for CERCLA Actions." Specific measures to minimize adverse impacts may be identified following consultation with the appropriate agencies.

If the remedial action is found to potentially affect the floodplain, the following information will be produced: a Statement of Findings which will set forth the reasons why the proposed action must be located in or affect the floodplain; a description of significant facts considered in making the decisions to locate in or affect the floodplain or wetlands including alternative sites or actions; a statement indicating whether the selected action conforms to applicable state or local floodplain protection standards; a description of the steps to be taken to design or modify the proposed action to minimize potential harm to or within the floodplain and a statement indicating how the proposed action affects the natural or beneficial values of the floodplain.

2.2.3 Protection of Wetlands Order (Applicable)

This requirement (40 CFR Part 6, Appendix A, Executive Order No. 11,990) mandates that federal agencies and PRPs avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practicable alternative exists. Section 404(b)(1), 33 U.S.C. § 1344(b)(1), also prohibits the discharge of dredged or fill material into waters of the United States. Together, these requirements create a "no net loss" of wetlands standard.

In order to comply with this ARAR, EPA and MDHES will consult with the U.S. Army Corps of Engineers (COE) or the U.S. Fish and Wildlife Service to determine whether wetlands exist at the site and, if present, what category of wetland they represent. Compliance will be addressed by assessment of existing wetlands at the site, followed by replacement of any wetlands destroyed by the remedial action.

2.2.4 Resource Conservation and Recovery Act (Applicable and Relevant and Appropriate)

The requirements set forth at 40 CFR § 264.18(a) and (b)[31] provide that (a) any hazardous waste facility must not be located within 61 meters (200 feet) of a fault (see Appendix VI of Part 264), and (b) any hazardous waste facility within the 100 year floodplain must be designed, constructed, operated and maintained to avoid washout. Any discrete disposal or storage facilities which remain on-site as part of remedial activities must meet these standards.

[31] These requirements are applicable through their incorporation by reference in Montana's regulations for its authorized RCRA program. ARM 16.44.702.

2.2.5 Endangered Species Act (Applicable)

This statute and implementing regulations (16 USC §§ 1531-1543, 50 CFR § 402, 40 CFR § 6.302(h)) require that any federal activity or federally authorized activity may not jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify a critical habitat.

Compliance with this requirement involves consultation between EPA and the U.S. Fish and Wildlife Service, resulting in a determination as to whether there are listed or proposed species or critical habitats present on the site, and, if so, whether any proposed activities will impact such wildlife or habitat. At this time, the U.S. Fish and Wildlife Service has not identified any threatened or endangered species or critical habitat on the site. Therefore, no further activities are required by this ARAR.

2.2.6 National Historic Preservation Act (Applicable)

This statute and implementing regulations (16 U.S.C. § 470, 40 CFR § 6.310(b), 36 CFR Part 800), require federal agencies or federal projects to take into account the effect of any federally-assisted undertaking or licensing on any district, site, building, structure or object that is included in, or eligible for, the Register of Historic Places. To comply with this ARAR, EPA and MDHES may consult the State Historic Preservation Officer (SHPO), who can assist in identifying cultural resources and assessing whether proposed cleanup actions will impact the resources. If remedial action is likely to have an adverse effect on any cultural resources which are on or near the site, EPA and MDHES must examine whether feasible alternatives exist that would avoid such effects. If effects cannot reasonably be avoided, measures should be implemented to minimize or mitigate the potential effect.

NHPA regulations reserve formal determination of eligibility for the National Register of Historic Places and "no adverse effects" determinations for Federal agencies. The EPA is using the Cultural Resource Inventory for the Montana Pole and Treating Plant NPL Site completed by ARCO and supplementing this with site-specific historical inventory and adverse effects determinations. The EPA will continue to consult with the SHPO to identify specific mitigative measures, if necessary.

Research into the Montana Pole and Treating Plant revealed that the facility began operations in July 1946 and remained in business until May 17, 1984 (Camp, Dresser, & McKee 1990). Subsequent salvage and cleanup operations conducted by the EPA on the site removed most of the plant's facilities. The area was surveyed for prehistoric cultural remains but due to the disturbed condition of the site area, the potential for the existence of such materials is minimal and none have been observed. In addition, the plant is less than 50 years old and therefore it does not qualify as a historic site. No further cultural resource inventory or evaluation has been conducted on the site.

In April 1992, ARCO, EPA, MDHES, the Advisory Council on Historic Preservation, the State Historic Preservation Officer, and the local governments of Butte/Silver Bow, Anaconda/Deer Lodge, and Walkerville entered into a Programmatic Agreement to ensure the consideration of cultural and historic values in a systematic and comprehensive manner throughout the Clark Fork Basin in connection with remedial action at the four Clark Fork Superfund sites. This Programmatic Agreement may provide additional consideration of the factors to be addressed under the National Historic Preservation Act, and the other two cultural resources statutes that are ARARs, the Archaeological and Historic Preservation Act and the Historic Sites, Buildings and Antiquities Act, discussed below.

2.2.7 Archaeological and Historic Preservation Act (Applicable)

This statute and implementing regulations (16 U.S.C. § 469, 40 CFR § 6.301(c)) establish requirements for the evaluation and preservation of historical and archaeological data, which may be destroyed through alteration of terrain as a result of federal construction project or a federally licensed activity or program. This requires the EPA or the PRP to survey the site for covered scientific, prehistorical or archaeological artifacts. The results of this survey will be reflected and documented in the administrative record. As noted above, that survey revealed no covered artifacts. Nevertheless, preservation of appropriate data concerning the artifacts is hereby identified as an ARAR requirement, to be completed during the implementation of this remedial action, if any covered artifacts are discovered.

2.2.8 Historic Sites, Buildings and Antiquities Act (Applicable)

This requirement (16 U.S.C. § 461 et seq.; 40 CFR § 6.301(a)) states that "[i]n conducting an environmental review of a proposed EPA action, the responsible official shall consider the existence and location of natural landmarks using information provided by the National Park Service pursuant to 36 CFR § 62.6(d) to avoid undesirable impacts upon such landmarks." "National natural landmarks" are defined under 36 CFR § 62.2 as:

> [A]rea(s) of national significance located within [the U.S.] that contains(s) an outstanding representative example(s) of the nation's natural heritage, including terrestrial communities, aquatic communities, landforms, geological features, habitats of natural plant and animal species, or fossil evidence of development of life on earth.

Under the Historic Sites Act of 1935, the Secretary of the Interior is authorized to designate areas as National Natural Landmarks for listing on the National Registry of Natural Landmarks. To date no such landmarks are identified in the area. Therefore, no further actions are necessary to comply with this requirement.

2.2.9 Migratory Bird Treaty Act of 1918, as amended (Applicable)

This requirement (16 U.S.C. §§ 703 et seq.) establishes a federal responsibility for the protection of the international migratory bird resource and requires continued consultation with the U.S. Fish and Wildlife Service during remedial design and remedial construction to ensure that the cleanup of the site does not impact migratory birds. Specific mitigative measures may be identified for compliance with this requirement.

2.2.10 Bald Eagle Protection Act of 1940, as amended (Applicable)

This requirement (16 U.S.C. §§ 668 et seq.) establishes a federal responsibility for protection of the bald and golden eagle and requires continued consultation with the U.S. Fish and Wildlife Service during remedial design and remedial construction to ensure that the cleanup of the site does not adversely affect the bald and golden eagle. To date, bald and golden eagles have not been identified at the site. Accordingly, no further actions are required for compliance with this requirement, unless bald or golden eagles are identified.

2.3 FEDERAL ACTION-SPECIFIC ARARS

2.3.1 Safe Drinking Water Act (Applicable)

The underground injection control (UIC) program requirements found at 40 CFR Part 144 would be applicable for alternatives that involve reinjection of pumped and treated groundwater. The program divides wells into five classes for permitting purposes. Class I wells are used to inject hazardous waste or fluids beneath the lower-most formation containing, within one-quarter mile, an underground source of drinking water. Class IV wells are used to dispose of hazardous waste into or above a formation which contains, within one-quarter mile of the well, an underground source of drinking water. Class IV wells are generally prohibited, except for reinjection of treated groundwater into the same formation from which it was withdrawn, as part of a CERCLA cleanup or RCRA corrective action. Class II and III wells deal with mining and oil and gas production and so are inapplicable to any remedial action at the site. Class V wells constitute all other injection wells. There is no regulation of Class V wells.

The aquifer underlying the site is considered an underground source of drinking water, so any well injecting above the aquifer would be a Class IV well. Generally, the construction, operation, and maintenance of a Class IV well is prohibited by 40 CFR § 144.13. However, wells used to inject contaminated ground water that has been treated and is being reinjected into the same formation from which it was drawn are not prohibited if such injection is approved by EPA pursuant to provisions for cleanup of releases under CERCLA, or pursuant to requirements and provisions under RCRA. 40 CFR § 144.23 requires that Class IV wells be plugged or otherwise closed in a manner acceptable to the EPA Regional Administrator.

2.3.2 Resource Conservation and Recovery Act (Applicable/Relevant and Appropriate)

2.3.2.1 Criteria for Classification of Solid Waste Disposal Facilities Practices (Applicable)

The criteria contained in 40 CFR Part 257 set requirements for management of solid waste disposal. Part 257.3-1(a) states that facilities or practices in the floodplain shall not result in the washout of solid waste so as to pose a hazard to human life, wildlife, or land or water resources. Part 257.3-2 provides for the protection of threatened or endangered species. Part 257.3-3 provides that a facility shall not cause the discharge of pollutants into waters of the United States. Part 257.3-4 states that a facility or practice shall not contaminate underground drinking water.

2.3.2.2 Standards Applicable to Transporters of Hazardous Waste (Applicable)

The regulations at 40 CFR Part 263[32] establish standards that apply to persons that transport hazardous waste within the United States. If hazardous waste is transported on a rail-line or public highway on-site, or if transportation occurs off-site, these regulations will be applicable.

2.3.2.3 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (Applicable)

In considering hazardous waste regulations at the site, the nature of the hazardous wastes involved may affect the RCRA regulations that apply to the particular wastes. As discussed in the contaminant-specific ARARs above, the site includes F032 and F034 listed wastes, other wastes which may be characteristic hazardous waste under RCRA, and certain wastes which are Bevill-excluded mining wastes for which certain RCRA regulations are prescribed as relevant and appropriate. In addition, the site includes wastes which are most appropriately characterized as K001 wastes, listed in 40 CFR § 261.32 as "bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol." A water treatment plant is currently operating on site and is separating the wastes which would fall within the K001 listing from water before that water is discharged to Silver Bow Creek. These wastes are collected in carbon filters which are used for the treatment process. Accordingly, the spent carbon containing these wastes should be classified as K001 listed waste.

A. Releases from Solid Waste Management Units

The regulations at 40 CFR 264, Subpart F,[33] establish requirements for groundwater protection for RCRA-regulated solid waste management units (i.e., waste piles, surface impoundments, land treatment units, and landfills). Subpart F provides for three general types of groundwater monitoring: detection monitoring (40 CFR § 264.98); compliance monitoring (40 CFR § 264.99); and corrective action monitoring (40 CFR § 264.100). Monitoring wells must be cased according to § 264.97(c).

Monitoring is required during the active life of a hazardous waste management unit. At closure, if all hazardous waste, waste residue, and contaminated subsoil is removed, no monitoring is required. If hazardous waste remains, the monitoring requirements continue during the 40 CFR § 264.117 closure period.

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[32] See also the substantially equivalent regulations at ARM 16.44.401-425 which are implemented as part of Montana's authorized RCRA program.

[33] These regulations are incorporated by reference and are implemented by DHES as part of Montana's authorized RCRA program. See ARM 16.44.702.

B. Closure and Post-Closure

40 CFR Part 264, Subpart G,[34] establishes that hazardous waste management facilities must be closed in such a manner as to (a) minimize the need for further maintenance and (b) control, minimize or eliminate, to the extent necessary to protect public health and the environment, post-closure escape of hazardous wastes, hazardous constituents, leachate, contaminated runoff or hazardous waste decomposition products to the ground or surface waters or to the atmosphere.

Closure includes appropriate caps for the waste management unit. Facilities requiring post-closure care must undertake appropriate monitoring and maintenance actions, control public access, and control post-closure use of the property to ensure that the integrity of the final cover, liner, or containment system is not disturbed. 40 CFR § 264.117. In addition, all contaminated equipment, structures and soil must be properly disposed of or decontaminated unless exempt. 40 CFR § 264.114. A survey plat should be submitted to the local zoning authority and to the EPA Regional Administrator indicating the location and dimensions of landfill cells or other hazardous waste disposal units with respect to permanently surveyed benchmarks. 40 CFR § 264.116. 40 CFR § 264.228(a) requires that at closure, free liquids must be removed or solidified, the wastes stabilized, and the waste management unit covered. If permanent waste management units are required because biodegradation treatment does not achieve risk based cleanup requirements, these requirements will be applicable to above ground units containing the waste.

C. Waste Piles (Applicable)

40 CFR Part 264, Subpart L,[35] establishes a framework for the safe operation of a waste pile until permanent disposal occurs. The framework includes a run-on control system, and a run-off control system and collection and holding systems to prevent the further release of contaminants from the waste pile. These requirements are applicable to areas where contaminated soils or materials are temporarily stored or placed prior to treatment or other disposal.

D. Land Treatment (Applicable)

The requirements of 40 CFR Part 264, Subpart M,[36] regulate the management of "land treatment units"[37] that treat or dispose of hazardous waste; these requirements are applicable for any land treatment units established at the site.

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34 These regulations are incorporated by reference and are implemented by DHES as part of Montana's authorized RCRA program. See ARM 16.44.702.

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36 These regulations are incorporated by reference and are implemented by DHES as part of Montana's authorized RCRA program. See ARM 16.44.702.

37 Land treatment occurs when hazardous waste is applied onto or incorporated into the soil surface.

The owner or operator of a land treatment unit must design treatment so that hazardous constituents placed in the treatment zone are degraded, transformed, or immobilized within the treatment zone. "Hazardous constituents" are those identified in Appendix VIII of 40 CFR Part 261 that are reasonably expected to be in, or derived from, waste placed in or on the treatment zone. Design measures and operating practices must be set up to maximize the success of degradation, transformation, and immobilization processes. The treatment zone is the portion of the unsaturated zone below and including the land surface in which the owner or operator intends to maintain the conditions necessary for effective degradation, transformation, or immobilization of hazardous constituents. The maximum depth of the treatment zone must be no more than 1.5 meters (five feet) from the initial soil surface; and more than one meter (three feet) above the seasonal high water table.

Subpart M also requires the construction and maintenance of control features that prevent the run-off of hazardous constituents and the run-on of water to the treatment unit. The unit must also be inspected weekly and after storms for deterioration, malfunctions, improper operation of run-on and run-off control systems, and improper functioning of wind dispersal control measures.

An unsaturated zone monitoring program must be established to monitor soil and soil-pore liquid to determine whether hazardous constituents migrate out of the treatment zone. Specifications related to the monitoring program are contained in section 264.278.

E. Landfills (Applicable)

40 CFR Part 264, Subpart N,[38] applies to entities that dispose of hazardous waste in landfills.[39] The regulations specify appropriate liner systems and leachate collection systems for landfills, run-on and run-off management systems, and wind dispersal controls for landfills. These regulations set forth specific requirements for landfill monitoring and inspection, surveying and recordkeeping, and closure and post-closure care. If permanent waste management units are required because biodegradation treatment does not achieve risk based cleanup requirements, these requirements will be applicable to above ground units containing the waste.

F. Incineration (Applicable)

The regulations at 40 CFR §§ 264.340 - 351 and 40 CFR Part 265, Subpart O,[40] will be ARARs for any alternative involving on-site incineration of hazardous waste. Since permits are not required for on-site incineration, only the substantive standards of the Part 264 permit requirements would be applicable. The standards require an owner or operator of a hazardous

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[38] These regulations are incorporated by reference and are implemented by DHES as part of Montana's authorized RCRA program. See ARM 16.44.702.

[39] These regulations are incorporated by reference and are implemented by DHES as part of Montana's authorized RCRA program. See ARM 16.44.702.

[40] These regulations are incorporated by reference and are implemented by DHES as part of Montana's authorized RCRA program. See ARM 16.44.702 and 16.44.609 (Interim status).

waste incinerator to conduct a waste analysis in conjunction with obtaining a treatment, disposal, and storage permit for the incinerator. A permit designates one or more Principal Organic Hazardous Constituents (POHCs) from those constituents listed in 40 CFR Part 261, Appendix VIII. A POHC designation is based on the degree of difficulty of incineration of the organic constituents in the waste feed from trial burns. Organic constituents that represent the greatest degree of difficulty are most likely to be designated a POHC. Incineration of POHCs designated in the permit must achieve a 99.99% destruction and removal efficiency. Incineration of dioxins must achieve a destruction and removal efficiency of 99.9999%. 40 CFR § 264.343(a).

An incinerator burning hazardous waste and producing stack emissions of more than 1.8 kilograms per hour (4 pounds per hour) of hydrogen chloride (HCl) must control HCl emissions such that the rate of emission is no greater than the larger of either 1.8 kilograms per hour of 1% of the Hcl in the stack gas prior to entering any pollution control equipment. 40 CFR § 264.343(b). A permitted incinerator must not emit particulate matter in excess of 180 milligrams per dry standard cubic meter (40 CFR § 264.343(c)). The owner or operator must monitor combustion temperature, waste feed rate, CO emissions, and combustion gas velocity. The incinerator must be visually inspected daily, and the emergency waste feed cutoff system and associated alarms must be tested weekly. At closure, all hazardous waste residues must be removed from the incinerator site.

2.3.3 Hazardous Materials Transportation Act (Applicable)

The Hazardous Materials Transportation Act (49 USC §§ 1801-1813), as implemented by the Hazardous Materials Transportation Regulations (49 CFR Parts 10, 171-177), regulates the transportation of hazardous materials. The regulations apply to any alternatives involving the transport of hazardous waste off-site, on public highways on-site, or by rail line.

2.4 FEDERAL STANDARDS TO BE CONSIDERED (TBC's)

2.4.1 Federal Guidance Documents

Many of the procedures and standards to be used in a CERCLA action are set forth in guidance documents issued by EPA. A list of the types of guidance that are TBC is included in the preamble to the Final NCP, 55 Fed. Reg. 8765 (March 8, 1990). That guidance, along with current updates of and additions to that guidance, is to be considered in conducting the RI/FS and selecting and implementing the remedy at the site.

3.0 STATE OF MONTANA ARARS

3.1 MONTANA CONTAMINANT-SPECIFIC ARARS

3.1.1 Water Quality

3.1.1.1 Surface Water Quality Standards (Applicable)

Under the state Water Quality Act, §§ 75-5-101 et seq., MCA, the state has promulgated regulations to preserve and protect the quality of surface waters in the state. These regulations classify state waters according to quality, place restrictions on the discharge of pollutants to state waters and prohibit the degradation of state waters. The requirements listed below would be applicable to any discharge to surface waters in connection with the remedial action.

ARM 16.20.604(1)(b)[41] (Applicable) provides that Silver Bow Creek (mainstem) from the confluence of Blacktail Deer Creek to Warm Springs Creek is classified "I" for water use.

The "I" classification standards are contained in ARM 16.20.623 (Applicable) of the Montana water quality regulations. This section states:

> [T]he goal of the state of Montana is to have these waters fully support the following uses: drinking, culinary, and food processing purposes after conventional treatment; bathing, swimming, and recreation; growth and propagation of fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply.

In order to achieve this goal the I classification standards limit discharges of toxic or deleterious substances from new point sources to the larger of either Gold Book levels[42] or one-half of the mean instream concentrations immediately upstream of the discharge point.[43] The effect of this requirement is to require eventual attainment of the Gold Book levels, while allowing consideration of the site specific stream quality (1/2 the mean instream concentration). As the quality of the stream improves due to control of other sources, dischargers will be required to improve the quality of their discharges down to the Gold Book levels.

Table 26 of the ROD identifies surface water standards which must be met in-stream near the site for remedial action to be complete. These standards should be met as soon as feasible and maintained once they are met. Table 27 identifies standards for point source discharges

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41 Unless otherwise specified, all regulatory citations are to the Administrative Rules of Montana.

42 ARM 16.20.603(10) defines Gold Book levels as "the freshwater acute or chronic levels or the levels for water and fish ingestion that are listed in Update Number Two (5/1/87) of Quality Criteria for Water 1986 (EPA 440/5-86-001)."

43 Mean instream concentration is the monthly instream concentration, as defined by the MDHES Water Quality Bureau.

and run-off water for actions at the site, and these standards must be met for any discharge prior to discharge.

Short term exceedances of the standards associated with construction activities and environmental remediation may be allowed. In-stream standards identified in Table 26 are to be met as soon as feasible and maintained thereafter, and consistent compliance with the standards is a necessary component of remedial action completion. However, activities at the Lower Area One operable unit of the Silver Bow Creek NPL site, including possible dewatering at LAO, may influence the hydrological balance of the area and cause temporary increases in organic contamination in Silver Bow Creek above current conditions and the Table 26 standards. Such exceedances shall not be considered a violation of the Table 26 in-stream standards, so long as Best Management Practices are implemented to avoid or minimize such increases at both Lower Area One and the Montana Pole site during dewatering. This determination is consistent with the provisions of Chapter 340, Section 2, Laws of Montana 1993 and is consistent with a temporary ARAR waiver found in section 121(d)(4)(A) and (C) of CERCLA, 42 U.S.C. § 9621(d)(4)(A) and (C).

I classification standards also include the following criteria:

1. Dissolved oxygen concentration must not be reduced below 3.0 milligrams per liter.

2. Hydrogen ion concentration (Ph) must be maintained within the range of 6.5 to 9.5.

3. No increase in naturally occurring turbidity, temperature, concentrations of sediment and settleable solids, oils, floating solids, or true color is allowed which will or is likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish or other wildlife.

4. No discharges of toxic or deleterious substances may commence or continue which lower or are likely to lower the overall water quality of these waters.

Additional standards for any discharge to surface waters are included in:

ARM 16.20.631 (Applicable), which requires that, in designing a disposal system for industrial waste,[44] stream flow dilution requirements must be based on the minimum consecutive 7-day average flow which may be expected to occur on the average of once in 10 years.

ARM 16.20.633 (Applicable), which prohibits discharges containing substances that will:

[44] Section 75-5-103, MCA, defines "Industrial waste" as "any waste substance from the process of business or industry or from the development of any natural resource, together with any sewage that may be present."

(a) settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines;
(b) create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter) or globules of grease or other floating materials;
(c) produce odors, colors or other conditions which create a nuisance or render undesirable tastes to fish flesh or make fish inedible;
(d) create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or aquatic life;
(e) create conditions which produce undesirable aquatic life.

ARM 16.20.925 (Applicable), which adopts and incorporates the provisions of 40 C.F.R. Part 125 for criteria and standards for the imposition of technology-based treatment requirements in MPDES permits. Although the permit requirement would not apply to on-site discharges, the substantive requirements of Part 125 are applicable, i.e., for toxic and nonconventional pollutants treatment must apply the best available technology economically achievable (BAT); for conventional pollutants, application of the best conventional pollutant control technology (BCT) is required. Where effluent limitations are not specified for the particular industry or industrial category at issue, BCT/BAT technology-based treatment requirements are determined on a case by case basis using best professional judgment (BPJ). See CERCLA Compliance with Other Laws Manual, Vol. I, August 1988, p. 3-4 and 3-7.

3.1.1.2 Montana Groundwater Pollution Control System (Applicable)

ARM 16.20.1002 (Applicable) classifies groundwater into Classes I through IV based on the present and future most beneficial uses of the groundwater, and states that groundwater is to be classified according to actual quality or actual use, whichever places the groundwater in a higher class. Class I is the highest quality class; class IV the lowest. The groundwater at the Montana Pole site is at least Class II groundwater.

ARM 16.20.1003 (Applicable) establishes the groundwater quality standards applicable with respect to each groundwater classification. Concentrations of dissolved substances in Class I or II groundwater (or Class III groundwater which is used as a drinking water source) may not exceed Montana MCL values for drinking water. This requirement effectively makes the current MCL values applicable and not just relevant and appropriate requirements. Concentrations of other dissolved or suspended substances must not exceed levels that render the waters harmful, detrimental or injurious to public health. Maximum allowable concentration of these substances also must not exceed acute or chronic problem levels that would adversely affect existing or designated beneficial uses of groundwater of that classification.

The range of MCLs specified by Montana law is much more limited than the federal MCLs and does not include many of the primary contaminants of concern at the Montana Pole site. The groundwater standards that are specified, including the Montana MCLs for arsenic, cadmium, chromium, lead, benzene and para-dichlorobenzene, are to be attained throughout

(a) settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines;
(b) create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter) or globules of grease or other floating materials;
(c) produce odors, colors or other conditions which create a nuisance or render undesirable tastes to fish flesh or make fish inedible;
(d) create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or aquatic life;
(e) create conditions which produce undesirable aquatic life.

ARM 16.20.925 (Applicable), which adopts and incorporates the provisions of 40 C.F.R. Part 125 for criteria and standards for the imposition of technology-based treatment requirements in MPDES permits. Although the permit requirement would not apply to on-site discharges, the substantive requirements of Part 125 are applicable, i.e., for toxic and nonconventional pollutants treatment must apply the best available technology economically achievable (BAT); for conventional pollutants, application of the best conventional pollutant control technology (BCT) is required. Where effluent limitations are not specified for the particular industry or industrial category at issue, BCT/BAT technology-based treatment requirements are determined on a case by case basis using best professional judgment (BPJ). See CERCLA Compliance with Other Laws Manual, Vol. I, August 1988, p. 3-4 and 3-7.

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The range of MCLs specified by Montana law is much more limited than the federal MCLs and does not include many of the primary contaminants of concern at the Montana Pole site. The groundwater standards that are specified, including the Montana MCLs for arsenic, cadmium, chromium, lead, benzene and para-dichlorobenzene, are to be attained throughout the contaminated plume. If such standards are not attainable, an ARAR waiver may be appropriate.

ARM 16.20.1011 (Applicable) provides that any groundwater whose existing quality is higher than the standard for its classification must be maintained at that high quality unless the board is satisfied that a change is justifiable for economic or social development and will not preclude present or anticipated use of such waters.

3.2 MONTANA LOCATION-SPECIFIC ARARS

3.2.1 Floodplain and Floodway Management

3.2.1.1 Floodplain and Floodway Management Act (Applicable or Relevant and Appropriate)

Section 76-5-401, MCA, (Applicable) specifies the uses permissible in a floodway and generally prohibits permanent structures, fill, or permanent storage of materials or equipment.

Section 76-5-402, MCA, (Applicable) specifies uses allowed in the floodplain, excluding the floodway, and allows structures meeting certain minimum standards.

Section 76-5-403, MCA, (Applicable) lists certain uses which are prohibited in a designated floodway, including:

1. any building for living purposes or place of assembly or permanent use by human beings,

2. any structure or excavation that will cause water to be diverted from the established floodway, cause erosion, obstruct the natural flow of water, or reduce the carrying capacity of the floodway, or

3. the construction or permanent storage of an object subject to flotation or movement during flood level periods.

3.2.1.2 Floodplain Management Regulations (Applicable or Relevant and Appropriate)

ARM 36.15.216 (Relevant and Appropriate) specifies factors to consider in determining whether a permit should be issued to establish or alter an artificial obstruction or nonconforming use in the floodplain or floodway While permit requirements are not directly applicable to activities conducted entirely on site, the criteria used to determine whether to approve establishment or alteration of an artificial obstruction or nonconforming use should be applied by the decision-makers in evaluating proposed remedial alternatives which involve artificial obstructions or nonconforming uses in the floodway or floodplain. Thus the following criteria are relevant and appropriate considerations in evaluating any such obstructions or uses:

1. the danger to life and property from backwater or diverted flow caused by the obstruction;

2. the danger that the obstruction will be swept downstream to the injury of others;

3. the availability of alternative locations;

4. the construction or alteration of the obstruction in such a manner as to lessen the danger;

5. the permanence of the obstruction; and

6. the anticipated development in the foreseeable future of the area which may be affected by the obstruction.

ARM 36.15.603 (Relevant and Appropriate) provides that proposed diversions or changes in place of diversion must be evaluated by the DNRC to determine whether they may significantly affect flood flows and, therefore, require a permit. While permit requirements are not applicable for remedial actions conducted entirely on site, the following criteria used to determine when a permit shall not be granted are relevant and appropriate:

1. the proposed diversion will increase the upstream elevation of the 100-year flood a significant amount (½ foot or as otherwise determined by the permit issuing authority);

2. the proposed diversion is not designed and constructed to minimize potential erosion from a flood of 100-year frequency; and

3. any permanent diversion structure crossing the full width of the stream channel is not designed and constructed to safely withstand up to a flood of 100-year frequency.

ARM 36.15.604 (Relevant and Appropriate) precludes new construction or alteration of an artificial obstruction that will significantly increase the upstream elevation of the flood of 100-year frequency (½ foot or as otherwise determined by the permit issuing authority) or significantly increase flood velocities.

ARM 36.15.605(1) (Relevant and Appropriate) and ARM 36.15.605(2) (Applicable) enumerate artificial obstructions and nonconforming uses that are prohibited within the designated floodway except as allowed by permit and includes "a structure or excavation that will cause water to be diverted from the established floodway, cause erosion, obstruct the natural flow of water, or reduce the carrying capacity of the floodway ... ." Solid and hazardous waste disposal and storage of toxic, flammable, hazardous, or explosive materials are also prohibited.

ARM 36.15.606 (Relevant and Appropriate) enumerates flood control works that are allowed within designated floodways pursuant to permit. Although the permit requirements are not applicable for activities conducted entirely on site, the following conditions are relevant and appropriate:

1. flood control levies and flood walls are allowed if they are designed and constructed to safely convey a flood of 100-year frequency and their cumulative effect combined with allowable flood fringe encroachments does not increase the unobstructed elevation of a flood of 100-year frequency more than ½ foot at any point;

2. riprap, if not hand placed, is allowed if it is designed to withstand a flood of 100-year frequency, does not increase the elevation of the 100-year frequency flood, and will not increase erosion upstream, downstream, or across stream from the riprap site;

3. channelization projects are allowed if they do not significantly increase the magnitude, velocity, or elevation of the flood of 100-year frequency downstream from such projects;

4. dams are allowed if they are designed and constructed in accordance with approved safety standards and they will not increase flood hazards downstream either through operational procedures or improper hydrologic design.

ARM 36.15.703 (Applicable) is applicable in flood fringe areas (i.e., areas in the floodplain but outside of the designated floodway) of the site and prohibits, with limited exceptions, solid and hazardous waste disposal and storage of toxic, flammable, hazardous, or explosive materials.

3.2.1.3 <u>Solid Waste Management Regulations (Applicable)</u>

ARM 16.14.505 (Applicable), in establishing standards for solid waste disposal sites, provides that such sites may not be located in a 100 year floodplain.

3.2.2 Natural Streambed and Land Preservation Standards (Applicable)

ARM 36.2.404 (Applicable) establishes minimum standards which would be applicable if a remedial action alters or affects a streambed, including any channel change, new diversion, riprap or other streambank protection project, jetty, new dam or reservoir or other commercial, industrial or residential development. No such project may be approved unless reasonable efforts will be made consistent with the purpose of the project to minimize the amount of stream channel alteration, insure that the project will be as permanent a solution as possible and will create a reasonably permanent and stable situation, insure that the project will pass anticipated water flows without creating harmful erosion upstream or downstream, minimize turbidity, effects on fish and aquatic habitat, and adverse effects on the natural beauty of the area and insure that streambed gravels will not be used in the project unless there is no reasonable alternative. Soils erosion and sedimentation must be kept to a minimum. See also § 75-7-102, MCA.

3.3 MONTANA ACTION-SPECIFIC ARARS

In the following action-specific ARARs, the nature of the action triggering applicability of the requirement is stated in parenthesis as part of the heading for each requirement.

3.3.1. Water Quality

3.3.1.1 Groundwater Act (Applicable) (Construction and maintenance of groundwater wells)

Section 85-2-505, MCA, (Applicable) precludes the wasting of groundwater. Any well producing waters that contaminate other waters must be plugged or capped, and wells must be constructed and maintained so as to prevent waste, contamination, or pollution of groundwater.

3.3.1.2 Public Water Supply Regulations (Applicable) (Reconstruction or modification of public water or sewer lines on the site)

If remedial action at the site requires any reconstruction or modification of any public water supply line or sewer line, the construction standards specified in ARM 16.20.401(3) (Applicable) must be observed. A public sewer line crosses the Montana Pole site, and the sewer line bedding is considered a potential pathway of contamination.

3.3.2 Air Quality[45]

3.3.2.1 Air Quality Regulations (Applicable) (Excavation/earth-moving; transportation; incineration; storage of petroleum distillates)

Dust suppression and control of certain substances likely to be released into the air as a result of earth moving, transportation and similar actions may be necessary to meet air quality requirements. The ambient air standards for specific contaminants and for particulates are set forth in the federal contaminant-specific section above. Additional air quality regulations under the state Clean Air Act, §§ 75-2-101 et seq., MCA, are discussed below.

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[45] The air quality ARARs included in this analysis are identified on the assumption that no remedial action at the site will constitute a "major stationary source," or "major modification," as defined in ARM 16.8.921. Should any part of a remedy constitute such a source, some additional requirements would be applicable, including the ambient air increments of ARM 16.8.925 et seq.

Similarly, if any part of a remedy should constitute a new or altered source of air pollution which has the potential to emit more than 25 tons per year of any pollutant addressed by the Clean Air Act regulations, the owner or operator must install the maximum air pollution control capability which is technically practicable and economically feasible, as provided by ARM 16.8.1103 (best available control technology shall be utilized).

ARM 16.8.1302 (Applicable) lists certain wastes that may not be disposed of by open burning[46], including oil or petroleum products, RCRA hazardous wastes, chemicals, and treated lumber and timbers. Any waste which is moved from the premises where it was generated and any trade waste (material resulting from construction or operation of any business, trade, industry or demolition project) may be open burned only in accordance with the substantive requirements of 16.8.1307 or 1308.

ARM 16.8.1401(3) and (4) (Applicable) states that no person shall cause or authorize the production, handling, transportation or storage of any material unless reasonable precautions to control emissions of airborne particulate matter are taken.

ARM 16.8.1404 (Applicable) states that "no person may cause or authorize emissions to be discharged in the outdoor atmosphere ... that exhibit an opacity of twenty percent (20%) or greater averaged over six consecutive minutes."

ARM 16.8.1406 (Applicable) prohibits certain emissions from incinerators, including emissions of particulate matter in excess of 0.10 grains per standard cubic foot of dry flue gas, adjusted to twelve percent carbon dioxide and calculated as if no auxiliary fuel had been used, emissions which exhibit an opacity of ten percent (10%) or greater averaged over six consecutive minutes.

Two bills were passed by the 53rd Montana Legislature directly addressing the issue of incineration of wastes. Section 75-2-215, MCA, as amended by 1993 Laws of Montana, Chapter 129, provides that solid or hazardous wastes may be incinerated only after a determination that the projected emissions and ambient concentrations of air pollutants from the proposed incineration will constitute a negligible risk to the public health, safety, and welfare, and to the environment, and such incineration shall require the application of air pollution control equipment, engineering, or other operating procedures as necessary to provide reductions of air pollutants, equivalent to or more stringent than those achieved through the best available control technology.

Also, in order to minimize the potential creation or release of dioxins, furans, heavy metals or carcinogens, Chapter 639, Laws of Montana 1993, requires the Board of Health to adopt rules that require hazardous waste incinerators to achieve the lowest achievable emission rate, except when best available control technology is adequate to prevent exceeding established federal allowable daily intake standards for dioxins, furans, heavy metals, and other carcinogens. Although the rules have not yet been promulgated, the directive is sufficiently clear that, if wastes were incinerated on-site, this standard for emissions should be met. This act also sets out a number of additional administrative requirements, including additional public notice and meeting requirements and procedures for the monitoring, testing, and inspection of the waste stream, including possible precursors to the formation of dioxins, furans, and carcinogens. Although these administrative requirements are not ARARs, they should be considered if any on-site incineration were to become necessary.

46 "'Open burning' means combustion of any material directly in the open air without a receptacle, or in a receptacle other than a furnace, multiple chambered incinerator or wood waste burners ..." ARM 16.8.1301(5).

ARM 26.4.761 (Relevant and Appropriate) specifies measures that must be implemented to control fugitive dust emissions during certain mining and reclamation activities. Such measures are relevant and appropriate requirements to control fugitive dust emissions during excavation, earth moving and transportation activities conducted as part of the remedy at the site.

3.3.2.2 Reclamation and Revegetation Requirements (Relevant and Appropriate) (Excavation)

ARM 26.4.501 and 501A (Relevant and Appropriate) give general backfilling and final grading requirements.

ARM 26.4.514 (Relevant and Appropriate) sets out contouring requirements.

ARM 26.4.519 (Relevant and Appropriate) provides that an operator may be required to monitor settling of regraded areas.

ARM 26.4.638 (Relevant and Appropriate) specifies sediment control measures to be implemented during operations.

ARM 26.4.702 (Relevant and Appropriate) requires that during the redistributing and stockpiling of soil (for reclamation):

1. regraded areas must be deep-tilled, subsoiled, or otherwise treated to eliminate any possible slippage potential, to relieve compaction, and to promote root penetration and permeability of the underlying layer; this preparation must be done on the contour whenever possible and to a minimum depth of 12 inches;
2. redistribution must be done in a manner that achieves approximate uniform thicknesses consistent with soil resource availability and appropriate for the postmining vegetation, land uses, contours, and surface water drainage systems; and
3. redistributed soil must be reconditioned by subsoiling or other appropriate methods.

ARM 26.4.703 (Relevant and Appropriate) When using materials other than, or along with, soil for final surfacing in reclamation, the operator must demonstrate that the material (1) is at least as capable as the soil of supporting the approved vegetation and subsequent land use, and (2) the medium must be the best available in the area to support vegetation. Such substitutes must be used in a manner consistent with the requirements for redistribution of soil in ARM 26.4.701 and 702.

ARM 26.4.714 (Relevant and Appropriate) requires use of a mulch or cover crop or both until an adequate permanent cover can be established. Use of mulching and temporary cover may be suspended under certain conditions.

ARM 26.4.716 (Relevant and Appropriate) establishes the required method of revegetation, and provides that introduced species may be substituted for native species as part of an approved plan.

ARM 26.4.718 (Relevant and Appropriate) requires the use of soil amendments and other means such as irrigation, management, fencing, or other measures, if necessary to establish a diverse and permanent vegetative cover.

3.4 OTHER LAWS

The following "other laws" are included here to provide a reminder of other legally applicable requirements for actions being conducted at the site. They do not purport to be an exhaustive list of such legal requirements, but are included because they set out related concerns that must be addressed and, in some cases, may require some advance planning. They are not included as ARARs because they are not "environmental or facility siting laws." As applicable laws other than ARARs, they are not subject to ARAR waiver provisions.

Section 121(e) of CERCLA exempts removal or remedial actions conducted entirely on an NPL site from federal, state or local permit requirements, and this exemption appears broad enough to cover even permits required under "other laws." However, the administrative/substantive distinction used in identifying ARARs applies only to ARARs and not to other applicable laws. Thus even the administrative requirements, e.g., notice requirements, of these other laws must be complied with in this action. Similarly, fees that are based on something other than issuance of a permit are applicable.

3.4.1 Groundwater Act

Section 85-2-516, MCA, states that within 60 days after any well is completed a well log report must be filed by the driller with the DNRC and the appropriate county clerk and recorder.

3.4.2 Water Rights

Section 85-2-101, MCA, declares that all waters within the State are the State's property, and may be appropriated for beneficial uses. The wise use of water resources is encouraged for the maximum benefit to the people and with minimum degradation of natural aquatic ecosystems.

Parts 3 and 4 of Title 85, MCA, set out requirements for obtaining water rights and appropriating and utilizing water. All requirements of these parts are laws which must be complied with in any action using or affecting waters of the state. Some of the specific requirements are set forth below.

Section 85-2-301, MCA, of Montana law provides that a person may only appropriate water for a beneficial use.

Section 85-2-302, MCA, specifies that a person may not appropriate water or commence construction of diversion, impoundment, withdrawal or distribution works therefor except by applying for and receiving a permit from the Montana Department of Natural Resources and Conservation. While the permit itself may not be required under federal law, appropriate notification and submission of an application should be performed and a permit should be applied for in order to establish a priority date in the prior appropriation system. A 1991 amendment imposes a fee of $1.00 per acre foot for appropriations of ground water, effective until July 1, 1993.

Section 85-2-306, MCA, specifies the conditions on which groundwater may be appropriated, and, at a minimum, requires notice of completion and appropriation within 60 days of well completion.

Section 85-2-311, MCA, specifies the criteria which must be met in order to appropriate water and includes requirements that:

1. there are unappropriated waters in the source of supply;
2. the proposed use of water is a beneficial use; and
3. the proposed use will not interfere unreasonably with other planned uses or developments.

Section 85-2-402, MCA, specifies that an appropriator may not change an appropriated right except as provided in this section with the approval of the DNRC.

Section 85-2-412, MCA, provides that, where a person has diverted all of the water of a stream by virtue of prior appropriation and there is a surplus of water, over and above what is actually and necessarily used, such surplus must be returned to the stream.

3.4.3 Occupational Health Act, §§ 50-70-101 et seq., MCA

ARM § 16.42.101 addresses occupational noise. In accordance with this section, no worker shall be exposed to noise levels in excess of the levels specified in this regulation. This regulation is applicable only to limited categories of workers and for most workers the similar federal standard in 29 CFR § 1910.95 applies.

ARM § 16.42.102 addresses occupational air contaminants. The purpose of this rule is to establish maximum threshold limit values for air contaminants under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. In accordance with this rule, no worker shall be exposed to air contaminant levels in excess of the threshold limit values listed in the regulation. This regulation is applicable only to limited categories of workers and for most workers the similar federal standard in 29 CFR § 1910.1000 applies.

3.4.4 Federal Occupational Health and Safety Act

On-site work must comply with the provisions of 29 CFR § 1910.95.

3.4.5 Montana Safety Act

Sections 50-71-201, 202 and 203, MCA, state that every employer must provide and maintain a safe place of employment, provide and require use of safety devices and safeguards, and ensure that operations and processes are reasonably adequate to render the place of employment safe. The employer must also do every other thing reasonably necessary to protect the life and safety of its employees. Employees are prohibited from refusing to use or interfering with the use of safety devices.

3.4.6 Employee and Community Hazardous Chemical Information Act

Sections 50-78-201, 202, and 204, MCA, state that each employer must post notice of employee rights, maintain at the work place a list of chemical names of each chemical in the work place, and indicate the work area where the chemical is stored or used. Employees must be informed of the chemicals at the work place and trained in the proper handling of the chemicals.

APPENDIX B

ADMINISTRATIVE RECORD INDEX

Locations of the Administrative Record:

Montana Department of Health and Environmental Sciences
Solid and Hazardous Waste Bureau
Superfund Program
616 Helena Avenue, Room 302
Helena, Montana 59601

Montana Tech Library
West Park Street
Butte, Montana 59701

Updated: September 21, 1993

Administrative Record Site File Index

Montana Pole Superfund Site
Administrative Record For
Selection of Remedial Action

Notes: 1. Only sections appearing below in **Bold** type are presently contained in the administrative record. Those listings appearing in ordinary type are anticipated for a later stage in the proceedings.

2. The Removal Response section consists primarily of documents appearing in the EPA Administrative Record for the Removal Actions. This EPA record was compiled during the removal action conducted at the Montana Pole site in 1985-1987 and during the removal action conducted at the site in 1992-1993. For consistency, these files are arranged in this record essentially the same as they appear in the EPA record.

1.0 SITE IDENTIFICATION
- **1.01 Background Information including RCRA**
- **1.02 Site Inspection/Site Investigation Reports**
- **1.03 Preliminary Assessment (PA) Report**
- **1.04 Sampling and Analytical Data**
- **1.05 Site Photographs/Slides**

2.0 REMOVAL RESPONSE
- **2.01 Site Investigation**
- **2.02 Pollution Reports (POLREPS)**
- **2.03 Action Memorandum**
- **2.04 Work Plans**
- **2.05 Site Safety**
- **2.06 Applications/Permits**
- **2.07 Meetings/Schedules**

2.0 (Removal Response)

- 2.08 Sampling Plans
- 2.09 Sampling and Analysis Data/Chain of Custody Forms
- 2.10 Technical Assistance Team (TAT) Report
- 2.11 Engineering Evaluation/Cost Analysis (EE/CA)
- 2.12 Emulsion/Recovery System
- 2.13 Status Reports/Monthly Reports
- 2.14 Logbooks/Notes
- 2.15 Community Relations
- 2.16 Requests under the Freedom of Information Act (FOIA)
- 2.17 General Correspondences
- 2.18 Liquid Dioxin Disposal Proposals
- 2.19 Technical Information
- 2.20 Post Removal Issues
- 2.21 1992 Time Critical Removal Action (TCRA)
  - 2.21.1 General Correspondence
  - 2.21.2 Pollution Reports (POLREPS)
  - 2.21.3 Action Memorandum
  - 2.21.4 ARCO Submittal for Administrative Record
  - 2.21.5 Community Relations
  - 2.21.6 Status Reports/Monthly Reports
  - 2.21.7 Engineering Evaluation/Cost Analysis (EE/CA)

3.0 RI/FS PLANNING

- 3.01 RI/FS Scoping
- 3.02 Workplans
  - 3.02.1 Volume I
  - 3.02.2 Volume II (Includes Sampling and Analysis Plan and Schedule)
  - 3.02.3 Standard Operating Procedures (SOPs)
  - 3.02.4 Supplemental or Additional Work Plans
  - 3.02.5 Dismantled Equipment Work Plans
- 3.03 Quality Assurance Project Plan (QAPP)
- 3.04 Data Management Plan
- 3.05 Site Management Plan
- 3.06 Health and Safety Plan
- 3.07 Review Comments
- 3.08 Response to Comments

4.0 REMEDIAL INVESTIGATION

- 4.01 Historical and Archaeological Resources Reports
- 4.02 Endangered Species Report
- 4.03 Floodplain Report
- 4.04 Wetland Report
- 4.05 Monthly Reports
- 4.06 Sampling and Analysis Data/Chain of Custody Forms
  - 4.06.1 Round 1 Raw Data
  - 4.06.2 Round 1 and 2 Data Validation Report

4.0 (Remdedial Investigation)

- 4.06.3 Round 2 Raw Data
- 4.06.4 Supplemental Raw Data
- 4.06.5 Supplemental Data Validation Reports
- 4.06.6 Split Sample Data

4.07 Remedial Investigation Reports

- 4.07.1 Preliminary Draft RI Report
- 4.07.2 Draft RI Reports
- 4.07.3 Final RI Report

4.08 Review Comments

4.09 Response to Comments

5.0 FEASIBILITY STUDY

5.01 Technologies Screening Document

5.02 Alternatives Screening Document

5.03 Treatability Work Plan

5.04 Treatability Reports

5.05 ARAR Determinations

- 5.05.1 Preliminary Identification of Contaminant-specific ARARs
- 5.05.2 ARCO ARARs Scoping Documents
- 5.05.3 Screening and Description of Potential ARARs

5.06 Institutional Controls Reports

5.07 Preliminary Remediation Goals

5.08 Draft FS Reports

5.09 Final FS Report

5.10 ARCO RI/FS Position Paper

* **5.11 Proposed Plan**

5.12 Public Comments

6.0 RECORD OF DECISION (ROD)

* **6.01 ROD (Declaration and Decision Summary)**

6.02 Responsiveness Summary

7.0 STATE COORDINATION

7.01 EPA/State Cooperative Agreement

8.0 ENFORCEMENT

8.01 ARCO/State Administrative Order on Consent

* **8.02 PRP Responses**

8.03 Notice Letters

8.04 Enforcement History-Correspondence [Miner's Bank prior to 1992] (may contain non-Miner's Bank correspondence in 1992 and later)

8.05 Pleadings in Injunction Action (State v. Miners Bank and Montana Pole)

8.06 Miner's Bank Liability/Settlement (1992 & forward)

8.07 Complaint and Depositions (Montana Pole v. Laucks)

9.0 PUBLIC HEALTH AND ENVIRONMENTAL ASSESSMENTS (PHEA)

- **9.01** **Agency for Toxic Substances and Disease Registry (ATSDR) Health Assessments**
- **9.02** **Preliminary Endangerment Assessment (PEA)**
- **9.03** **ARCO Risk Assessment Scoping Documents**
- **9.04** **Baseline Risk Assessment**
  - **9.04.1** **Baseline Risk Assessment Report (CDM, August 1992)**
  - **9.04.2** **Revised Final Baseline Risk Assessment**

10.0 NATURAL RESOURCE TRUSTEES

- **10.01** **Notices Issued**
- **10.02** **Correspondence**

11.0 PUBLIC PARTICIPATION

- **11.01** **Community Relations Plan**
- **11.02** **Press Releases**
- **11.03** **Press Clipping**
- **11.04** **Fact Sheets**
- **11.05** **Public Notice(s) (Availability of the Administrative Record File and Proposed Plan, Public Hearings)**
- **11.06** **Public Hearings/Transcripts**
- **11.07** **Documentation of Other Public Meetings**
- **11.08** **Comments on Administrative Record**
- **11.09** **Response to Comments on Administrative Record**

12.0 TECHNICAL SOURCES AND GUIDANCE DOCUMENTS

- **12.01** **State Guidance/Bibliography of Guidance Documents**
- **12.02** **EPA Removal Action Administrative Record Index**
- **12.03** **Soil Washing Studies**
- **12.04** **Other Technical Information**

* **Additional information is located in a confidential file. A summary or explanation of this material is included in this record.**