Montana Tunnels Mining Inc.
Public Water System

PWSID # MT0003272

SOURCE WATER DELINEATION AND ASSESSMENT REPORT

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Table of Contents

FIGURES

INTRODUCTION

Aubrey Smartt, a Montana Department of Environmental Quality (DEQ) intern, completed the Montana Tunnels Mining Inc. (PWSID# 03272) Source Water Delineation and Assessment Report (SWDAR) under the direction of DEQ Water Quality Specialist Carolyn DeMartino. John Schaefer (#5343) at (406) 933-8314 is the certified operator for the Montana Tunnels Mining Inc. Public Water System (PWS).

Purpose

This Source Water Delineation and Assessment Report is intended to meet the technical requirements for the completion of the delineation and assessment for the Montana Tunnels Mining Inc. Public Water System (PWS) as required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 (P.L. 104-182).

The Montana Source Water Protection Program is intended to be a practical and cost-effective approach to protect public drinking water supplies from contamination. A major component of the Montana Source Water Protection Program is "delineation and assessment". Delineation is a process of mapping source water protection areas, which contribute water used for drinking. Assessment involves identifying locations or regions in source water protection areas where contaminants may be generated, stored, or transported, and then determining the relative potential for contamination of drinking water by these sources. The primary purpose of this source water delineation and assessment report is to provide information that helps Montana Tunnels Mining Inc. to protect its drinking water source.

Limitations

This report was prepared to assess the susceptibility of the Montana Tunnels Mining Inc. PWS to significant potential contaminant sources, and is based on published information and information obtained from individuals familiar with the community. The terms "drinking water supply" or "drinking water source" refer specifically to the source of the Montana Tunnels Mining Inc. public water supply and not any other public or private water supply. Also, not every potential or existing source of groundwater or surface water contamination in the Montana Tunnels Mining Inc. area have been identified. Only potential sources of contamination in areas that contribute water to its drinking water source are considered.

The term "contaminant" is used in this report to refer to constituents for which maximum concentration levels (MCLs) have been specified under the national primary drinking water standards, and to certain constituents that do not have MCLs but are considered to be significant health threats.

CHAPTER 1
BACKGROUND

The Community

Montana Tunnels Mining Inc. is located in the historic Corbin-Wickes mining district approximately 4 miles west of the town of Jefferson City in Jefferson County of southwestern Montana (Figure 1). Jefferson City is located approximately 18 miles south of the city of Helena. According to the Census Bureau the population of Jefferson County in 2000 was 10,049 with the population of Jefferson City at 295. Approximately 182 non-transient individuals utilize the Montana Tunnels Mining Inc. public water supply year-round. No other public water supplies are located near the Montana Tunnels Mining Inc. vicinity.

Historically, the Corbin-Wickes mining district boomed before 1900, producing over $40 million from gold, silver, and lead ores. At least 11 mines, 7 concentrating mills, and 3 smelters refineries operated at various times. Montana Tunnels was created in 1900 when the Corbin Copper Company opened two closely spaced tunnels (adits) on the Montana claim, plus numerous pits, trenches, and short adits on other claims in the immediate vicinity (Montana State Lands, November 1985).

The major transportation route in the Jefferson City area is Interstate 15. Montana Rail Link provides railway transportation.

Montana Tunnels Mining Inc. utilizes a large capacity septic system to treat and dispose of sanitary waste.

Geographic Setting

This section provides an overview of the geographic setting in the vicinity of the Montana Tunnels Mining Inc. Much of the following information is from the draft Montana Tunnels Project Environmental Impact Statement, November 1985.

Montana Tunnels Mining Inc. is located in the northern Boulder Mountains on their eastern flank. The elevation in this area ranges from 5,300 to 6,300 feet. This mountainous region stretches south of Helena to Butte. The legal location of Montana Mining Inc. mill is approximately 4½ miles west of Prickly Pear Creek in Section 9, Township 7 North, Range 4 West (Figure 2). Figure 3 shows an aerial photograph of the Montana Tunnels Mining mill site. The Prickly Pear valley separates the Boulder Mountains and the geologically related Elkhorn Mountains to the east. The Occidental Plateau to the west of Montana Tunnels Mining Inc. is a broad wind-swept ridge exceeding 7,600 feet in elevation.

The Montana Tunnels Mining Inc. project area covers two intermediate-sized stream drainages, both tributaries to Prickly Pear Creek. The extreme northwestern corner of the project area drains northwest into Clancy Creek. The rest of the area is located in three ephemeral tributaries of Spring Creek--Homestake, Pen Yan, and Wood Chute creeks.

Climate

Climate in the Jefferson City area is considered semi-arid. Average daily high and low temperatures in Jefferson City area, based off of Boulder weather records, are 82.4° F and 47.7° F in July and 33.1° F

and 9.1° F. in January. Annual precipitation averages 10.99 inches with May and June being the wettest months. An annual average of 31.6 inches of snow is received in the Boulder area mainly November to April (Western Regional Climate Center, Monthly Climate Summary 7/1/1948 to 3/31/2004).

The Public Water Supply

The Montana Tunnels Mining Inc. PWS is classified as a non-transient non-community system under the Federal Safe Drinking Water Act, because the system is not a community water system, but does regularly serve at least 25 of the same persons over six months per year. The Montana Tunnels Mining Inc. PWS serves 182 non-transient persons via 5 active service connections.

The most recent sanitary survey (Fraser, D., January 2001) indicates that the Montana Tunnels Mining Inc. water system consists of two wells. Well #1 (WL002) is a 6-inch steel well located just east of the warehouse and is for emergency use only. This well was drilled in 1986 to a depth of 149 feet. Well #2 (WL003) is a 4-inch PVC well located northwest of Well #1. This well was drilled in 1988 to a depth of 300 feet. At the time it was drilled, the well had a yield of 120 gallons per minute. A copy of the site layout is located in Appendix A. A copy of both well logs for Montana Tunnels Mining Inc. with information on well lithology and construction is included in Appendix B.

Water from Well #2 is chlorinated with a pellet chlorinator and pumps water to a 110,000 gallon insulated steel storage tank located on the hill above the mining facilities (Fraser, 2001). The sanitary survey is available upon request from the DEQ.

Water Quality

Public water systems must conduct routine monitoring for contaminants in accordance with Federal Safe Drinking Water Act requirements. Parameters such as coliform bacteria, lead, copper, nitrate, nitrite, volatile organic chemicals (including hydrocarbons and chlorinated solvents), inorganic chemicals (including metals), synthetic organic chemicals (including pesticides), and radiological contaminants must be sampled in community PWSs and non-community, non-transient PWSs in accordance with schedules specified in the Administrative Rules of Montana. All contaminant concentrations detected in required samples must comply with numeric maximum contaminant levels (MCLs) specified in the Federal Safe Drinking Water Act.

Montana Tunnels Mining Inc. Water Quality

The Montana Tunnels Mining Inc.’s water quality is routinely monitored for compliance with drinking water standards. Bacteriological monitoring is conducted monthly. Compliance with other drinking water standards is based on additional sampling on a variety of schedules. Within the past five years there have been two detections of coliform bacteria (10/21/02 and 8/23/99) and no detections of fecal coliform bacteria in the Montana Tunnels Mining Inc. PWS. Nitrate plus nitrite as nitrogen ranging from 0.01 milligrams per liter (mg/L) to 0.05 mg/L has been detected in Montana Tunnels Mining Inc.'s water within the past five years but remains well below the MCL of 10 mg/L (DEQ SDWIS database).

CHAPTER 2
DELINEATION

The source water protection area, the land area that contributes water to Montana Tunnels Mining Inc. PWS well, is identified in this chapter. The management areas identified within the source water protection area included the control zone, inventory region, and recharge region. The control zone is an area at least 100-foot radius around the well. The management goal of the control zone, also known as the exclusion zone, is to protect against the direct introduction of contaminants into the well or in the immediate area surrounding each well.

The inventory region represents the zone of contribution of the well, which approximates a 1000-foot radius. The management goal of the inventory region is to focus on pollution prevention activities at potential contaminant sources where it is likely that contaminated water would flow into the well within a relatively short time frame.

The recharge region represents the entire portion of the aquifer that contributes water to the Montana Tunnels Mining Inc. PWS. Management in the recharge region should focus on maintaining and improving the quality of groundwater that could reach each well over longer timeframes or with increased water usage.

Hydrogeologic Conditions

The geology of the area can be used to determine the locations, boundaries, and hydraulic properties of local aquifers. An understanding of hydrogeologic conditions also provides an explanation for the sensitivity of local aquifers to potential contamination sources.

Elkhorn volcanic ash was deposited approximately 78-68 million years ago. Lowland Creek volcanic ash was deposited over the area approximately 50-48 million years ago. Erosion since that time has removed most of these volcanic ash deposits from the Boulder Mountains, exposing the underlying Boulder Batholith granitic rocks. All that remains of these volcanic ash deposits in the Corbin-Wickes area is a 28 square mile patch of Elkhorn volcanic ash and less than five square miles of Lowland Creek volcanic ash. Based on the Montana Tunnels Mining Inc. well logs, both wells are installed in shallow fractured volcanic bedrock (Figure 4). This aquifer is classified as having a high sensitivity to potential contaminant sources in accordance with SWPP source water sensitivity criteria (DEQ, 1999)

Table 1. Source Water Sensitivity Criteria

Source Water Sensitivity
High Source Water Sensitivity
Surface water and GWUDISW
Unconsolidated Alluvium (unconfined)
Fluvial-Glacial Gravel
Terrace and Pediment Gravel
Shallow Fractured or Carbonate Bedrock
Moderate Source Water Sensitivity
Semi-consolidated Valley Fill sediments

Unconsolidated Alluvium (semi-confined**)**
Low Source Water Sensitivity Consolidated Sandstone Bedrock Deep Fractured or Carbonate Bedrock Semi-consolidated Valley Fill Sediments (confined)

Conceptual Model

Montana Tunnels Mining Inc.'s PWS well is completed in fractured volcanic bedrock. The primary source of groundwater recharge to the wells is from perennial streams. Stream flow is derived primarily from snowmelt in the spring and early summer as well as from intense rainfall events. Bedrock discharge from springs also provides base flow to the perennial streams (Montana State Lands, November 1985).

Well Information

Well information for the Montana Tunnels Mining Inc. wells is presented in Table 2.

Table 2. Source well information for the Montana Tunnels Mining Inc. PWS.

Information	Emergency Well #1	Active Well #2
PWS Source Code	002	003
Well Location (T, R, Sec)	T7N, R4W, 09 BAD	T7N, R4W, 09 ABCB
Latitude/ Longitude	46.3769 / 112.1118	46.3763 / 112.1111
MBMG #	146585	55791
Water Right #	N/A	C070606-00
Date Well was Completed	01/30/1981	04/19/1988
Total Depth	149'	300'
Perforated Interval	70' to 130', 140' to 149'	180' to 200', 280' to 300'
Static Water Level	45'	15'
Pumping Water Level	N/A	N/A
Drawdown	N/A	N/A
Test Pumping Rate	N/A	120 GPM

Methods and Criteria

DEQ's Source Water Protection Program specifies methods and criteria used to delineate subregions of the source water protection area for the Montana Tunnels Mining Inc. PWS well. A control zone, inventory region, and recharge region have been delineated for this well.

Delineation Results

A 100-foot control zone and 1000-foot inventory region have been delineated around the Montana

Tunnels Mining Inc. PWS well (Figure 5). The recharge region for the well was delineated using hydrogeological mapping (Figure 6).

Limiting Factors

The source of groundwater to the Montana Tunnels Inc. PWS wells is deep fractured volcanic bedrock. Therefore, the major assumption that flow in the aquifer is along a uniform gradient and horizontal cannot be used. Additionally, withdrawal rates are assumed to be constant over time while in reality they may vary over time or with increasing pumping.

CHAPTER 3
INVENTORY

An inventory of potential contaminant sources was conducted within the Montana Tunnels Mining Inc. PWS well control zone, inventory region, and recharge region. Potential sources of all primary drinking water contaminants and Cryptosporidium were identified, however, only significant potential contaminant sources were selected for the detailed inventory. Significant potential contaminants in the Montana Tunnels Mining Inc. inventory region include nitrate, pathogens, fuels, solvents, agricultural chemicals, and metals.

The significant potential contaminant source inventory for Montana Tunnels Mining Inc. focuses on all activities in the control zone, certain sites or land use activities in the inventory region, and general land uses and large facilities in the recharge region.

Inventory Method

Available databases were initially searched to identify businesses and land uses that are potential sources of regulated contaminants in the inventory region. The following steps were followed:

Step 1: Urban and agricultural land uses were identified using the United States Geological Survey National Landcover Dataset 2000.

Step 2: EPA's Envirofacts System was queried to identify EPA regulated facilities. This system accesses the following databases: Resource Conservation and Recovery Information System (RCRIS), Biennial Reporting System (BRS), Toxic Release Inventory (TRI), Permit Compliance System (PCS), and Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS). The available reports were browsed for facility information including the Handler/Facility Classification to be used in assessing whether a facility is a significant potential contaminant source.

Step 3: DEQ databases were queried to identify Underground Storage Tanks (UST), hazardous waste contaminated sites, landfills, and abandoned mines.

Step 4: A business phone directory was consulted to identify businesses that generate, use, or store chemicals in the inventory region. Equipment manufacturing and/or repair facilities, printing or photographic shops, dry cleaners, farm chemical suppliers, and wholesale fuel suppliers were targeted by SIC code.

Step 5: Major road and rail transportation routes were identified.

Step 6. All significant potential contaminant sources were identified in the inventory region and land uses and facilities that generate, store, or use large quantities of hazardous materials were identified within the recharge region.

Potential contaminant sources are designated as significant if they fall into one of the following categories:

1) Large quantity hazardous waste generators

2) Landfills
3) Hazardous waste contaminated sites
4) Underground storage tanks
5) Major roads or rail transportation routes
6) Cultivated cropland
7) Animal feeding operations
8) Wastewater lagoons or spray irrigation
9) Septic systems
10) Sewered residential areas
11) Storm sewer outflows
12) Floor drains, sumps, or dry wells
13) Abandoned or active mines

Inventory Results/Control Zone

Montana Tunnels Mining Inc. controls the land within the control zones for the PWS wells. There are no significant potential contaminant sources located within the control zones for the wells.

Inventory Results/Inventory Region

Land cover within the Montana Tunnels Inc. PWS wells inventory region consists primarily of grassland (Figure 7). Other types of land cover in the inventory region and their percentages are also identified on Figure 7. Overall, septic density within the inventory region is low. However, an on-site, large capacity septic system is utilized to treat and dispose of sanitary wastes. Significant potential contaminant sources in the inventory region are listed in Table 3.

Table 3. Significant potential contaminant sources in the Montana Tunnels Mining Inc. PWS Inventory Region

Potential Source	Map Figure	Potential Contaminants	Hazard
On-site Large Capacity Septic System	– – – – –	Nitrates and pathogens	Leaching to area groundwater
On-site hazardous material storage and handling	– – – – –	Laboratory chemicals and metals	Accidental spills, leaks, or improper handling of chemicals and wastes generated during ore processing may cause contaminants to migrate into area groundwater
Above ground fuel storage tanks	Figure 3	VOCs	Accidental spills, leaks, or improper handling of fuels may cause the release of contaminants that migrate to area groundwater

On-Site Large Capacity Septic System – Nitrates and pathogens could leach into area groundwater from septic tanks, associated piping, and the drain field if malfunctions occur.

On-site hazardous material storage and handling – Chemicals used in ore processing and at the laboratory if not stored and handled properly may cause contaminants to be released into area groundwater.

Above ground fuel storage tanks – Accidental spills or leaks may allow contaminants in fuel to migrate

into area groundwater.

Inventory Results/ Recharge Region

Land cover in the recharge region for the Montana Tunnels Mining Inc. PWS wells consists primarily of grassland and forest (Figure 8). Additional land cover types and their percentages are identified on Figure 8. Overall, septic density in the recharge region is also low. In addition to the potential contaminant source identified in the inventory region, there are several inactive mines located in the northwest region of the recharge region as well as two industrial wastewater discharges into Clancy Creek and Pen Yan Creek (Figure 9). According to John Schaefer, the Environmental Manager for Montana Tunnels Mining Inc., the industrial wastewater discharge into Clancy Creek has never occurred. This Montana Pollutant Discharge Elimination System (MPDES) permit was established to pump groundwater into Clancy Creek from wells surrounding the mine. This application was never used and the permit was terminated in May 2002. There is an MPDES permit to discharge storm water into the Pen Yan Creek. Although this permit is still in effect, there has never been a discharge to Pen Yan Creek as the mine operation collects all storm water and uses it for water makeup needs in the milling operation (Personal Communication, October 2004).

Inventory Update

The certified operator for the Montana Tunnels Inc. PWS should update the inventory every year. Changes in land uses or potential contaminant sources should be noted and additions made as needed. The complete inventory should be submitted to DEQ every five years to ensure the source water delineation and assessment report remains current.

Inventory Limitations

The potential contaminant inventory was conducted using various databases to acquire readily available information. Information was also obtained where possible, from individuals familiar with Montana Tunnels Mining Inc. Consequently, unregulated activities or unreported contaminant releases may have been overlooked. The use of multiple sources of information, however, should ensure that the major threats to the Montana Tunnels Mining Inc. wells have been identified.

CHAPTER 4
SUSCEPTIBILITY ASSESSMENT

Susceptibility is the potential for a public water supply to draw water contaminated by inventoried sources at concentrations that would pose concern. Susceptibility is assessed in order to prioritize potential pollutant sources for management actions by local entities, in this case Montana Tunnels Mining Inc.

The goal of Source Water Management is to protect the source water by 1) controlling activities in the control zone, 2) managing significant potential contaminant sources in the Inventory Region, and 3) ensuring that land use activities in the Recharge Region pose minimal threat to the source water. Management priorities in the Inventory Region are determined by ranking the significant potential contaminant sources identified in the previous chapter according to susceptibility. Alternative management approaches that could be pursued by the Montana Tunnels Mining Inc. to reduce susceptibility are recommended.

Susceptibility is determined by considering the hazard rating for each potential contaminant source and the existence of barriers that decrease the likelihood that contaminated water will flow to the Montana Tunnels Mining Inc. well (Table 4). Hazard is rated by the proximity of a potential contaminant source to the well(s). Susceptibility ratings are presented individually for each significant potential contaminant source and each associated contaminant (Table 5). The susceptibility of each well to each potential contaminant source is assessed separately.

Table 4. Relative Susceptibility to Specific Contaminant Sources as Determined by Hazard and the Presence of Barriers

	High Hazard Rating	**Moderate Hazard Rating**	**Low Hazard Rating**
No Barriers	Very High Susceptibility	High Susceptibility	Moderate Susceptibility
One Barrier	High Susceptibility	Moderate Susceptibility	Low Susceptibility
Multiple Barriers	Moderate Susceptibility	Low Susceptibility	Very Low Susceptibility

Proximity or density of significant potential contaminant sources and nature of contaminants determines hazard. See Table 5.

Table 5. Hazard of potential contaminant sources associated with proximity to a PWS well or intake or density within a PWS inventory or spill response region.

Type of Contaminant Source		High Hazard	Moderate Hazard	Low Hazard
SURFACE WATER	Point Sources of Nitrate or Microbes	Potential for direct discharge to source water	Potential for discharge to groundwater hydraulically connected to source water	Potential contaminant sources in the watershed region
	Point Sources of VOCs, SOCs, or Metals	Potential for direct discharge of large quantities from roads, rails, or pipelines	Potential for direct discharge of small quantities to source water	Potential for discharge to groundwater hydraulically connected to source water
WELLS	Point Sources of All Contaminants (Unconfined)	Within 1-year TOT	1 to 3 years TOT	Over 3 years TOT
	Point Sources of All Contaminants (Confined)	PWS well is not sealed through the confining layer	Well(s) in the inventory region other than the PWS well are not sealed through the confining layer	All wells in the inventory region are sealed through the confining layer
ALL	Septic Systems	More than 300 per sq. mi.	50 – 300 per sq. mi.	Less than 50 per sq. mi.
	Municipal Sanitary Sewer (% land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region
	Cropped Agricultural Land (% land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region

Susceptibility rankings are presented individually for each significant potential contaminant source and each associated contaminant in Table 6 and in text following the table. Management recommendations that indicate how significant potential contaminant sources could be better managed to prevent impacts to the Montana Tunnels Mining Inc. wells are also provided in Table 6.

Table 6. Susceptibility assessment for significant potential contaminant sources in the Montana Tunnels Mining Inc. PWS Inventory Region

Potential Contaminant Sources	Figure ID Number	Potential Contaminants	Hazard	Hazard Rating	Barriers	Susceptibility	Management Recommendations
On-Site Large Capacity Septic System	_ _ _ _ _	Nitrates and pathogens	Leaks in septic tanks, collection lines, drain field malfunction, and infiltration of untreated effluent into area groundwater	High	Groundwater flow gradient, well intake depth	Moderate	Conduct proper maintenance of septic system to ensure that it is operating properly
On-site hazardous material storage and handling	_ _ _ _ _	Laboratory chemicals and metals	Accidental spills, leaks, or improper handling of chemicals and wastes generated during ore processing may cause contaminants to migrate into area groundwater	High	Groundwater flow gradient, well intake depth, emergency spill response plans	Moderate	Keep emergency spill response plan and emergency contacts up-to date
Above ground fuel storage tanks	Figure 3	VOCs	Accidental spills, leaks, or improper handling of fuels may cause the release of contaminants that migrate into area groundwater	High	Groundwater flow gradient, well intake depth, emergency spill response plans	Moderate	Keep emergency spill response plan and emergency contacts up-to date

Susceptibility Assessment Results

On-Site Large Capacity Septic System - Hazard is ranked high, as the septic system is located the inventory region and may act as a point source of contamination. Overall, the susceptibility of the wells is ranked moderate, as multiple barriers to contamination were identified.

On-site hazardous material storage and handling - Hazard is ranked high, as storage and handling of hazardous materials is located the inventory region. Overall, the susceptibility of the wells is ranked moderate, as multiple barriers to contamination were identified.

Above ground fuel storage tanks - Hazard is ranked high, as the above ground fuel storage tanks are located within the inventory region. Overall, the susceptibility of the wells is ranked moderate, as multiple barriers to contamination were identified.

Management Recommendations

The Montana Tunnels Mining Inc. Source Water Delineation and Assessment Report was prepared to assist the Montana Tunnels Mining Inc. owners and PWS operator to protect the wells. The report provides information concerning the aquifer that supplies water to the Montana Tunnels Mining Inc. well, identifies the control zone and inventory region, and within each of these protection areas identifies the significant potential contaminants that may impact the PWS well. If the management recommendations included in Table 6 are implemented by the Montana Tunnels Mining Inc. PWS, they may also be considered as additional barriers that will reduce the susceptibility of Montana Tunnels Mining Inc.'s wells to specific potential contaminant sources and their associated contaminants.

Management recommendations fall into the following categories:

- Education
- Sewage disposal system maintenance and leak detection
- Stormwater management
- Emergency Response Plan

Education - Educational workshops provided to the general public by the mine, county, or state to promote safe handling and proper storage, transport, use, and disposal of hazardous materials. Ongoing training provided to designated emergency personnel such as the Montana Tunnels Mining Inc. PWS operator will promote the efficiency and effectiveness of emergency responses to hazardous material spills that may occur in the vicinity of the wells. Likewise, educational workshops provided to rural homeowners will promote the proper maintenance and replacement of residential septic systems. The EPA and the State of Montana can provide educational materials on these topics.

Sewage Disposal System Maintenance and Leak Detection – Proper operation and maintenance of the on-site septic system will reduce the susceptibility of the Montana Tunnels Mining Inc. well to contamination from this potential contaminant source.

Stormwater Management – Stormwater planning should address potential contaminant sources and drainage control. Source control can be accomplished through educational programs focusing on residential and commercial chemical use, disposal, and recycling. Drainage control and pollutant removal can be accomplished through the use of vegetated detention basins at outfall locations. The

construction of storm runoff wetlands can go a long way to reducing the amount of non-point pollutants.

Emergency Response Plan – An emergency response plan would be of significant benefit to the Montana Tunnels Mining Inc. owners and operator. The usefulness and effectiveness of an emergency response plan are maximized if the plan contains a clear listing of all emergency contacts, emergency numbers, and resources available within Jefferson City and Jefferson County to respond to an emergency situation, such as a hazardous material spill, at Montana Tunnels Mining Inc.

CHAPTER 5
MONITORING WAIVERS

Monitoring Waiver Requirements

The 1986 Amendments to the Safe Drinking Water Act require that community and non-community PWSs sample drinking water sources for the presence of volatile organic chemicals (VOCs) and synthetic organic chemicals (SOCs). The US EPA has authorized states to issue monitoring waivers for the organic chemicals to systems that have completed an approved waiver application and review process. All PWSs in the State of Montana are eligible for consideration of monitoring waivers for several organic chemicals. The chemicals diquat, endothall, glyphosate, dioxins, ethylene dibromide (EDB), dibromochloropropane (DBCP), and polychlorinated biphenyls are excluded from monitoring requirements by statewide waivers. Following are descriptions of the different types of waivers. Monitoring waiver recommendations for Montana Tunnels Mining Inc. follows these descriptions.

Use Waivers

A Use Waiver can be allowed if through a vulnerability assessment, it is determined that specific organic chemicals were not used, manufactured, or stored in the area of a water source (or source area). If certain organic chemicals have been used, or if the use is unknown, the system would be determined to be vulnerable to organic chemical contamination and ineligible for a Use Waiver for those particular contaminants.

Susceptibility Waivers

If a Use Waiver is not granted, a system may still be eligible for a Susceptibility Waiver, if through a vulnerability assessment it is demonstrated that the water source would not be susceptible to contamination. Susceptibility is based on prior analytical or vulnerability assessment results, environmental persistence, and transport of the contaminants, natural protection of the source, wellhead protection program efforts, and the level of susceptibility indicators (such as nitrate and coliform bacteria). The vulnerability assessment of a surface water source must consider the watershed area above the source, or a minimum fixed radius of 1.5 miles upgradient of the surface water intake. PWSs developed in unconfined aquifers should use a minimum fixed radius of 1.0 mile as an area of investigation for the use of organic chemicals. Vulnerability assessment of spring water sources should use a minimum fixed radius of 1.0 mile as an area of investigation for the use of organic chemicals. Shallow groundwater sources under the direct influence of surface water (GUDISW) should use the same area of investigation as surface water systems; that is, the watershed area above the source, or a minimum fixed radius of 1.5 miles upgradient of the point of diversion. The purpose of the vulnerability assessment procedures outlined in this section is to determine which of the organic chemical contaminants are in the area of investigation.

Given the wide range of landforms, land uses, and the diversity of groundwater and surface water sources across the state, additional information is often required during the review of a waiver application. Additional information may include well logs, pump test data, or water quality monitoring data from surrounding public water systems; delineation of zones of influence and contribution to a well; Time-of-Travel or attenuation studies; vulnerability mapping; and the use of computerized groundwater flow and transport models. Review of an organic chemical monitoring waiver application

will be conducted by DEQ's PWS Section and DEQ's Source Water Protection Program. Other state agencies may be asked for assistance.

Susceptibility Waiver for Confined Aquifers

Confined groundwater is isolated from overlying material by relatively impermeable geologic formations. A confined aquifer is subject to pressures higher than atmospheric pressure that would exist at the top of the aquifer if the aquifer were not geologically confined. A well that is drilled through the impervious layer into a confined aquifer will enable the water to rise in the borehole to a level that is proportional to the water pressure (hydrostatic head) that exists at the top of a confined aquifer.

The susceptibility of a confined aquifer relates to the probability of an introduced contaminant to travel from the source of contamination to the aquifer. Susceptibility of an aquifer to contamination will be influenced by the hydrogeologic characteristics of the soil, vadose zone (the unsaturated geologic materials between the ground surface and the aquifer), and confining layers. Important hydrogeologic controls include the thickness of the soil, the depth of the aquifer, the permeability of the soil and vadose zones, the thickness and uniformity of low permeability and confining layers between the surface and the aquifer, and hydrostatic head of the aquifer. These factors will control how readily a contaminant will infiltrate and percolate toward the groundwater.

The Susceptibility waiver has the objective of assessing the potential of contaminants reaching the groundwater used by the PWS. A groundwater source that appears to be confined from surface infiltration in the immediate area of the wellhead may eventually be affected by contaminated groundwater flow from elsewhere in the recharge area. Contaminants could also enter the confined aquifer through improper well construction or abandonment where the well provides a hydraulic connection from the surface to the confined aquifer. The extent of confinement of an aquifer is critical to limiting susceptibility to organic chemical contamination. Regional conditions that define the confinement of a groundwater source must be demonstrated by the PWS in order to be considered for a confined aquifer susceptibility waiver. Confinement of an aquifer can be demonstrated by pump test data (storage coefficient), geologic mapping, and well logs. Site-specific information is required to sufficiently represent the recharge area of the aquifer and the zone of contribution to the PWS well. The following information should be provided:

- Abandoned wells in the region (zone of contribution to the well),
- Other wells in the region (zone of contribution to the well),
- Nitrate/Coliform bacteria analytical history of the PWS well,
- Organic chemical analytical history of the PWS well,

Susceptibility Waiver for Unconfined Aquifers

Unconfined aquifers are the most common source of usable groundwater. Unconfined aquifers differ from confined aquifers in that the groundwater is not regionally contained within relatively impervious geologic strata. As a result, the upper groundwater surface or water table in an unconfined aquifer is not under pressure that produces hydrostatic head common to confined aquifers.

Unconfined aquifers are usually locally recharged from surface water or precipitation. In general, groundwater flow gradients in unconfined aquifers reflect surface topography, and the residence time of water in the aquifer is comparatively shorter than for water in confined aquifers. Similar water chemistry

often exists between unconfined groundwater and area surface water, and physical parameters and dissolved constituents can be an indicator of the hydraulic connection between groundwater and surface water. Consequently, unconfined aquifers can be susceptible to contamination by organic chemicals migrating from the ground surface to groundwater.

The objective of the susceptibility waiver application is to assess the potential of organic chemical migration from the surface to the unconfined aquifer. The general procedures make use of a combination of site_ specific information pertaining to the location and construction of the source development, monitoring history of the source, geologic characteristics of the unsaturated soil and vadose zones, and chemical characteristics of the organic chemicals pertaining to their mobility and persistence in the environment. The zone of contribution of the unconfined groundwater source must be defined and plotted. This should describe the groundwater flow directions, gradients, and a 3-year time-of-travel. All surface bodies within 1,000 feet of the PWS well(s) must be plotted. Analytical monitoring history of the PWS well and those nearby should be provided as well.

Waiver Recommendation

Currently, Montana Tunnels Mining Inc. has no waivers. For waiver consideration, based on monitoring history or a demonstration that certain chemicals were/ are not used in the inventory region, the Montana Tunnels Mining Inc. PWS will need to send a letter to the DEQ Public Water Supply Section requesting monitoring waivers. Additional information regarding chemical use on adjacent properties in the inventory region must accompany the waiver request letter.

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GLOSSARY*

Acute Health Effect. A negative health effect in which symptoms develop rapidly.

Alkalinity. The capacity of water to neutralize acids.

Aquifer. A water-bearing layer of rock or sediment that will yield water in usable quantity to a well or spring.

Barrier. A physical feature or management plan that reduces the likelihood of contamination of a water source from a potential contaminant source

Best Management Practices (BMPs). Methods for various activities that have been determined to be the most effective, practical means of preventing or reducing non-point source pollution.

Biennial Reporting System (BRS). An EPA database that contains information on hazardous waste sites. The data can be accessed through the EPA Envirofacts website.

Chronic Health Effect. A negative health effect in which symptoms develop over an extended period of time.

Class V Injection Well. Any pit or conduit into the subsurface for disposal of waste waters. The receiving unit for an injection well typically represents the aquifer, or water-bearing interval.

Coliform Bacteria. A general type of bacteria found in the intestinal tracts of animals and humans, and also in soils, vegetation and water. Their presence in water is used as an indicator of pollution and possible contamination by pathogens**.**

Community. A town, neighborhood or area where people live and prosper.

Comprehensive Environmental Cleanup and Responsibility Act (CECRA). Passed in 1989 by the Montana State Legislature, CECRA provides the mechanism and responsibility to clean up hazardous waste sites in Montana.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Enacted in 1980. CERCLA provides a Federal "Superfund" to clean up uncontrolled or abandoned hazardous-waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment. Through the Act, EPA was given power to seek out those parties responsible for any release and assure their cooperation in the cleanup.

Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS). A database that provides information about specific sites through the EPA Envirofacts website.

Confined Animal Feeding Operation (CAFO). Any agricultural operation that feeds animals within specific areas, not on rangeland. Certain CAFOs require permits for operation.

Confined Aquifer. A fully saturated aquifer overlain by a confining unit such as a clay layer. The static

water level in a well in a confined aquifer is at an elevation that is equal to or higher than the **base of the** overlying confining unit.

Confining Unit. A geologic formation present above a confined aquifer that inhibits the flow of water and maintains the pressure of the ground water in the aquifer. The physical properties of a confining unit may range from a five-foot thick clay layer to shale that is hundreds of feet thick.

Delineation. The process of determining and mapping source water protection areas.

Glacial. Of or relating to the presence and activities of ice or glaciers. Also, pertaining to distinctive features and materials produced by or derived from glaciers.

Geographic Information Systems (GIS). A computerized database management and mapping system that allows for analysis and presentation of geographic data.

Hardness. Characteristic of water caused by presence of various calcium and magnesium salts. Hard water may interfere with some industrial processes and prevent soap from lathering.

Hazard. A relative measure of the potential of a contaminant from a facility or associated with a land use to reach the water source for a public water supply. The location, quantity and toxicity of significant potential contaminant sources determine hazard.

Hydraulic Conductivity. A constant number or coefficient of proportionality that describes the rate water can move through an aquifer material.

Hydrology. The study of water and how it flows in the ground and on the surface.

Hydrogeology. The study of geologic formations and how they effect ground water flow systems**.**

Inventory Region. A source water management area for ground water systems that encompasses the area expected to contribute water to a public water supply within a fixed distance or a specified three year ground water travel time.

Lacustrine. Pertaining to, produced by, or formed in a lake or lakes.

Leaking Underground Storage Tank (LUST). A release from a UST and/or associated piping into the subsurface.

Maximum Contaminant Level (MCL). Maximum concentration of a substance in water that is permitted to be delivered to the users of a public water supply. Set by EPA under authority of the Safe Drinking Water Act to establish concentrations of contaminants in drinking water that are protective of human health.

Montana Bureau of Mines and Geology – Ground Water Information Center (MBMG/GWIC). The database of information on all wells drilled in Montana, including stratigraphic data and well construction data, when available.

Montana Pollutant Discharge Elimination System (MPDES). A permitting system that utilizes a

database to track entities that discharge wastewater of any type into waters of the State of Montana.

National Pollutant Discharge Elimination System (NPDES). A national permitting system that utilizes a database to track entities that discharge wastewater into waters of the United States.

Nitrate. An important plant nutrient and type of inorganic fertilizer that can be a potential contaminant in water at high concentrations. In water the major sources of nitrates are wastewater treatment effluent, septic tanks, feed lots and fertilizers.

Nonpoint-Source Pollution. Pollution sources that are diffuse and do not have a single point of origin or are not introduced into a receiving stream from a specific outlet. Examples of nonpoint- source pollution include agriculture, forestry, and run-off from city streets. Nonpoint sources of pollution, such as the use of herbicides, can concentrate low levels of these chemicals into surface and/or ground waters at increased levels that may exceed MCLs.

Pathogens. A microorganism typically found in the intestinal tracts of mammals, capable of producing disease.

Permit Compliance System (PCS). An EPA database that provides information on the status of required permits for specific activities for specific facilities. The data can be accessed through the EPA Envirofacts website.

Phase II (and IIb) Rules. EPA updated or created legal limits on 38 contaminants. The rules became effective July 30, 1992 and January 1, 1993. Some of these contaminants are frequently-applied agricultural chemicals such as nitrate and others are industrial solvents.

Phase V Rule. EPA set standards for 23 contaminants in addition to those addressed by the Phase II Rules. The Phase V Rule became effective January 17, 1994. Some of these contaminants include inorganic chemicals such as cyanide and other Phase V contaminants are pesticides that enter water supplies through run-off from fields where farmers have applied them or by leaching through the soil into ground water. Six are probable cancer-causing agents. Others can cause liver and kidney damage, or problems of the nervous system and brain.

Point Source. A stationary location or a fixed facility from which pollutants are discharged. This includes any single identifiable source of pollution, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fracture, container, rolling stock (tanker truck), or vessel or other floating craft, from which pollutants are or may be discharged.

Pollutant. Generally, any substance introduced into the environment that adversely affects the usefulness of a resource (e.g. groundwater used for drinking water).

Public Water System (PWS). A system that provides water for human consumption through at least 15 service connections or regularly serves 25 individuals.

Pumping Water Level. Water level elevation in a well when the pump is operating.

Recharge Region. A source water management region that is generally the entire area that could contribute water to an aquifer used by a public water supply. Includes areas that could contribute water

over long time periods or under different water usage patterns.

Resource Conservation and Recovery Act (RCRA). Enacted by Congress in 1976. RCRA's primary goals are to protect human health and the environment from the potential hazards of waste disposal, to conserve energy and natural resources, to reduce the amount of waste generated, and to ensure that wastes are managed in an environmentally sound manner.

Resource Conservation and Recovery Information System (RCRIS). Is a database that provides information about specific sites through the EPA Envirofacts website.

Secondary Maximum Contaminant Levels (SMCL). The maximum concentration of a substance in water that is recommended to be delivered to users of a public water supply based on aesthetic qualities. SMCLs are non-enforceable guidelines for public water supplies, set by EPA under authority of the Safe Drinking Water Act. Compounds with SMCLs may occur naturally in certain areas, limiting the ability of the public water supply to treat for them.

Section Seven Tracking System (SSTS). SSTS is an automated system EPA uses to track pesticide producing establishments and the amount of pesticides they produce.

Source Water. Any surface water, spring, or ground water source that provides water to a public water supply.

Source Water Delineation and Assessment Report (SWDAR). A report for a public water supply that delineates source water protection areas, provides an inventory of potential contaminant sources within the delineated areas, and evaluates the relative susceptibility of the source water to contamination from the potential contaminant sources under “worst-case” conditions.

Source Water Protection Areas. For surface water sources, the land and surface drainage network that contributes water to a stream or reservoir used by a public water supply. For ground water sources, the area within a fixed radius or three-year travel time from a well, and the land area where the aquifer is recharged.

Spill Response Region. A source water management area for surface water systems that encompasses the area expected to contribute water to a public water supply within a fixed distance or a specified four-hour water travel time in a stream or river.

Standard Industrial Classification (SIC) Code. A method of grouping industries with similar products or services and assigning codes to these groups.

Static Water Level (SWL). Water level elevation in a well when the pump is not operating.

Susceptibility (of a PWS). The relative potential for a PWS to draw water contaminated at concentrations that would pose concern. Susceptibility is evaluated at the point immediately preceding treatment or, if no treatment is provided, at the entry point to the distribution system.

Synthetic Organic Compounds (SOC). Man made organic chemical compounds (e.g. herbicides and pesticides).

Total Dissolved Solids (TDS). The dissolved solids collected after a sample of a known volume of water is passed through a very fine mesh filter.

Total Maximum Daily Load (TMDL). The total pollutant load to a surface water body from point, nonpoint, and natural sources. The TMDL program was established by section 303(d) of the Clean Water Act to help states implement water quality standards.

Toxicity. The quality or degree of being poisonous or harmful to plants, animals, or humans.

Toxicity Characteristic Leachate Procedure. A test designed to determine whether a waste is hazardous or requires treatment to become less hazardous.

Toxic Release Inventory (TRI). An EPA database that compiles information about permitted industrial releases of chemicals to air and water. Information about specific sites can be obtained through the EPA Envirofacts website.

Transmissivity. A number that describes the ability of an aquifer to transmit water. The transmissivity is determined by multiplying the hydraulic conductivity time the aquifer thickness.

Turbidity. The cloudy appearance of water caused by the presence of suspended matter.

Unconfined Aquifer. An aquifer containing water that is not under pressure. The water table is the top surface of an unconfined aquifer.

Underground Storage Tanks (UST). A tank located at least partially underground and designed to hold gasoline or other petroleum products or chemicals, and the associated plumbing system.

Volatile Organic Compounds (VOC). Chemicals such as petroleum hydrocarbons and solvents or other organic chemicals which evaporate readily to the atmosphere.

Watershed. The land area that drains into a stream; the watershed for a major river may encompass a number of smaller watersheds that ultimately combine at a common delivery point.

* With the exception of the definitions for Lacustrine, Phase II and Phase V Rules, and Standard Industrial Classification Code, definitions were adapted from EPA's Term References System (formerly known as Glossary of Selected Terms and Abbreviations) which can be found at: http://www.epa.gov/trs/index.htm

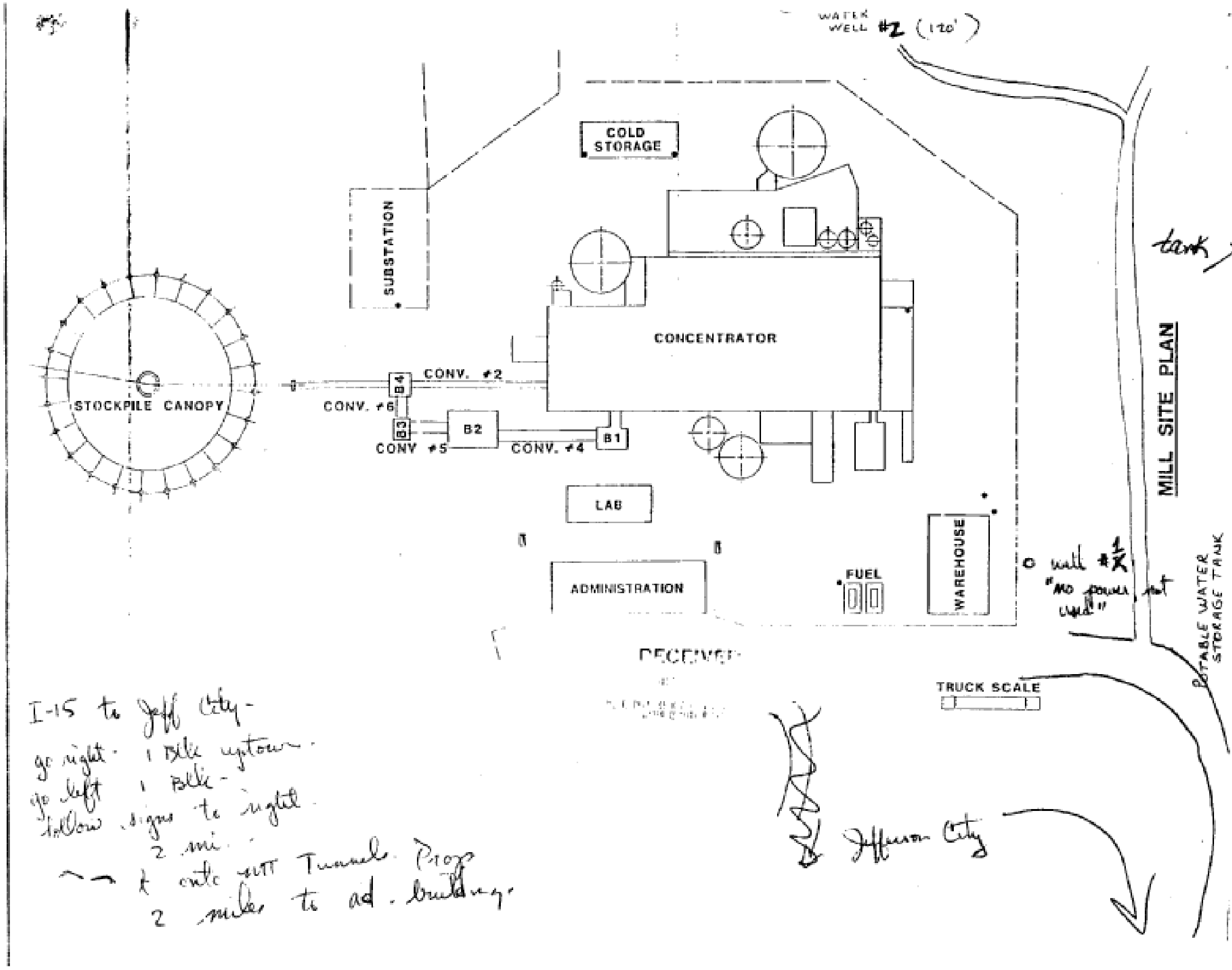
The definitions of glacial and lacustrine were taken from the Glossary of Geology by Robert L. Bates and Julia A. Jackson.

The definitions for Phase II and Phase V Rules were adapted from:
http://www.epa.gov/OGWDW/source/therule.html#PhaseII
http://www.epa.gov/OGWDW/source/therule.html#PhaseV

The definition for Standard Industrial Classification Code was adapted from:
EPA/Office of Enforcement and Compliance Assurance: Guide to Environmental Issues: Glossary of Terms & Acronyms *Term Detail*)

APPENDICES

APPENDIX A: Site Layout

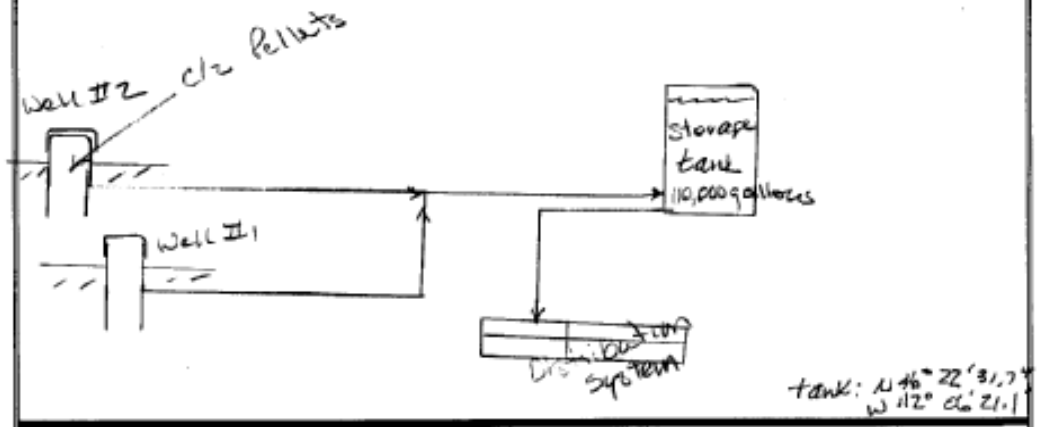


WATER WELL #2 (120')
COLD STORAGE
SUBSTATION
CONCENTRATOR
STOCKPILE CANOPY
CONV. #2
CONV. #6
CONV #5
CONV. #4
B4
B3
B2
B1
LAB
ADMINISTRATION
FUEL
WAREHOUSE
TRUCK SCALE
tank
MILL SITE PLAN
POTABLE WATER STORAGE TANK
I-15 to Jeff City -
go right - 1 Blk uptown -
go left 1 Blk -
follow signs to right -
2 mi -
Jefferson City

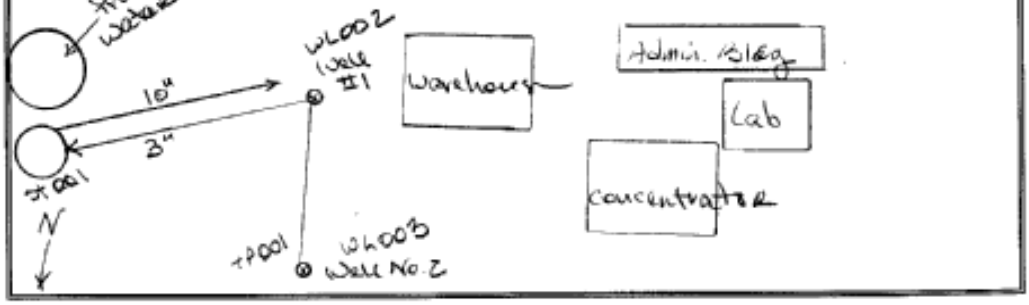
SANITARY SURVEY FORM - DIAGRAMS

Page ____ of ____

Draw brief site plan showing location of well(s), springs(s), water storage, distribution system, pumphouse(s), entry point(s), treatment, etc.



Draw Brief schematic of placement of filters and disinfection equipment in relation to the source, entry point and distribution system below



APPENDIX B: Well Logs

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
MONTANA TUNNELS MINING INC – Well #2

Location Information

GWIC Id:	55791	Source of Data:	LOG
Location (TRS):	07N 04W 09 ABCB	Latitude (dd):	46.3763
County (MT):	JEFFERSON	Longitude (dd):	-112.1111
DNRC Water Right:	C070606-00	Geomethod:	MAP
PWS Id:	03272003	Datum:	NAD27
Block:		Altitude (feet):	
Lot:		Certificate of Survey:	
Addition:		Type of Site:	WELL

Well Construction and Performance Data

Total Depth (ft):	300.00	How Drilled:	FORWARD ROTARY
Static Water Level (ft):	15.00	Driller's Name:	H AND L
Pumping Water Level (ft):		Driller License:	334
Yield (gpm):	120.00	Completion Date (m/d/y):	4/19/1988
Test Type:	AIR	Special Conditions:	
Test Duration:	2.00	Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	Not Reported
Recovery Time (hrs):		Well/Water Use:	PUBLIC WATER SUPPLY
Well Notes:			

Hole Diameter Information

From	To	Diameter
0.0	19.0	12.0
19.0	300.0	6.0

Casing Information[1]

From	To	Dia	Wall Thickness	Pressure Rating	Joint	Type
-2.0	19.0	6.0				17 LB STEEL
10.0	300.0	4.0		200.00		PVC

Annular Seal Information

From	To	Description
0.0	19.0	CEMENT

Completion Information[1]

From	To	Dia	# of Openings	Size of Openings	Description
180.0	200.0	4.0			1/4 X 6 INCH PERFS
280.0	300.0	4.0			1/4 X 6 INCH PERFS

Lithology Information

From	To	Description
0.0	3.0	TOP SOIL
3.0	27.0	DECOMPOSED BEDROCK
27.0	300.0	BEDROCK

[1] - All diameters reported are inside diameter of the casing.

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
MONTANA TUNNELS * PLANT WELL 1

Location Information

GWIC Id:	146585	Source of Data:	LOG
Location (TRS):	07N 04W 09 BAD	Latitude (dd):	46.3769
County (MT):	JEFFERSON	Longitude (dd):	-112.1118
DNRC Water Right:		Geomethod:	TRS-TWN
PWS Id:		Datum:	NAD27
Block:		Altitude (feet):	
Lot:		Certificate of Survey:	
Addition:		Type of Site:	WELL

Well Construction and Performance Data

Total Depth (ft):	149.00	How Drilled:	ROTARY
Static Water Level (ft):	45.00	Driller's Name:	H & L
Pumping Water Level (ft):		Driller License:	
Yield (gpm):		Completion Date (m/d/y):	1/30/1986
Test Type:		Special Conditions:	
Test Duration:		Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	Not Reported
Recovery Time (hrs):		Well/Water Use:	INDUSTRIAL
Well Notes:			

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

From	To	Dia	Wall Thickness	Pressure Rating	Joint	Type
0.0	21.0	6.0				STEEL
9.0	149.0	4.0				PVC

Annular Seal Information

From	To	Description
7.0	21.0	CEMENT

Completion Information[1]

From	To	Dia	# of Openings	Size of Openings	Description
70.0	130.0	4.0			SAWCUTS
140.0	149.0	4.0			SAWCUTS

Lithology Information

From	To	Description
0.0	2.0	TOPSOIL BROWN SANDY SCATTERED ANGULAR FRAGMENTS
2.0	70.0	IGNIMBRITE VOLCANIC BEDROCK WEATHERED BROWN-GRAY CLAYEY ZONES HEMATITE STAINED LESS WEATHERING WITH DEPTH PRIMARILY QUARTZ FELDSPAR HORNBLENDE MOIST AT ABOUT 30 FEET.
70.0	149.0	SAME AS ABOVE (IGNIMBRITE) HARD NOT WEATHERED OR OXIDIZED GRAY-GREEN MAKING 1-2 GPM AT 70' MAKING 15 GPM QUICKLY AT 80' APPARENT FRACTURE ZONE 30 GPM AT 100' APPARENT FRACTURES 85/95' HARD DRILLING 100-149' INITIALLY MAKING ABOUT 35 GPM

[1] - All diameters reported are inside diameter of the casing.

These data represent the contents of the GWIC databases at the Montana Bureau of Mines and Geology at the time and date of the retrieval. The information is considered unpublished and is subject to correction and review on a daily basis. The Bureau warrants the accurate transmission of the data to the original end user. Retransmission of the data to other users is discouraged and the Bureau claims no responsibility if the material is retransmitted. Note: non-reported casing, completion, and lithologic records may exist in paper files at GWIC.

APPENDIX C: Concurrence Letter