City of Miles City
Public Water Supply
PWSID # MT0000291

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SOURCE WATER DELINEATION AND ASSESSMENT REPORT

Operator/Manager:

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Table of Contents

APPENDICES

INTRODUCTION

This Delineation and Assessment Report was prepared by Jim Stimson, a hydrogeologist with the Source Water Protection Program of the Montana Department of Environmental Quality (DEQ). Miles City public water supply (PWS) is located in Custer County, Montana, about 145 miles northeast of Billings and about 70 west of Glendive (Figure 1a). The DEQ PWS identification number, operator name, and operator number for the Miles City PWS appear on the title page of this report.

Purpose

This report is intended to meet the technical requirements for the completion of the source water delineation and assessment report for the Miles City 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 the protection of public drinking water supplies from contamination. The primary purpose of this source water delineation and assessment report is to provide information to assist the Miles City PWS operator in the identification of potential contaminant sources near and upstream from the city's surface water intake, and to encourage the development of a source water protection plan to help protect the city's drinking water for the long term.

Delineation and assessment constitute major components of the Montana Source Water Protection Program. Delineation entails mapping the boundaries of source water protection areas, which encompass ground water and/or surface waters contributing to public water supply sources. Assessment involves identifying locations or regions within source water protection areas where contaminants may be generated, stored, transported, or disposed, and determining the relative susceptibility of drinking water to contamination from these sources.

Limitations

This report was prepared to assess threats to the Miles City public water supply and is based on published data including the most recent sanitary survey, and information obtained from local residents familiar with the community. The terms "drinking water supply" and "drinking water source" refer specifically to the sources of Miles City's public water supply, and not any other public or private water supply. Also, not all of the potential or existing sources of groundwater or surface-water contamination in the area of Miles City are identified. Only potential sources of contamination in areas that contribute water to the identified drinking water sources 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 carcinogenic or toxic constituents that do not have MCLs but are considered to be significant health threats.

CHAPTER 1
BACKGROUND

The Community

Miles City is the county seat of Custer County and is located along what is known as the Lewis and Clark Trail, on the banks of the Yellowstone River (Figure 1a). Interstate 94, the Burlington Northern Rail line and the Chicago Milwaukee Rail line run near Miles City. The Chicago Milwaukee line is abandoned. The U.S. Census Bureau estimates the 2000 population of Custer County at 11,372 people, 8,698 of whom reside in Miles City. Custer County's population, as well as Miles City's, has increased by about 1%, since 1990.

Miles City has its beginnings in 1876 when Colonel Nelson, A. Miles of the U.S. Calvary set up camp near the town site. Since that time, Miles City has been at the heart of the cattle industry in eastern Montana and became an important cattle shipping point with the arrival of the Northern Pacific Railroad in 1881. Livestock and agriculture continue to be important industries in the Miles City area today. Transportation, recreation, and the service industry also contribute significantly to the economy of Miles City. The largest revenue-generating industries in Custer County in 2000 are listed as services, 27.1 percent of earnings; state and local government, 18.6 percent; and retail trade, 13.5 percent (www.bea.doc.gov/bea/regional/bearfacts).

Within the city limits, residents obtain their drinking water from the municipal public water supply. The municipal sewer district services all residents within city limits. Sewer service is also available outside the city limits in some areas and is provided by the Custer County Water and Sewer District. The wastewater treatment plant is a mechanical plant with extended aeration oxidation ditches and discharges directly to the Yellowstone River (Allen Kelm, personal communication, 2003). The facility is located about one half mile northeast of town. Residents in areas outlying town limits where sewer services are not available utilize on-site septic systems for waste disposal. There are 15 other public water supplies in the area of which 4 are community systems and the remaining 10 are non-community (Figure 3). Five of the 15 public water supplies purchase water from Miles City and the remainder use groundwater as their source of water.

Table 1. Public Water Supplies in the Miles City area.

PWSID	CLASS	SOURCETYPE	PRIMRYNAME
03041	C	Purchased	Custer Co Water and Sewer District
00291	C	Surface Water	Miles City, City of
00145	C	Groundwater	Palisades Apartments
00292	C	Purchased	Pine Hills Youth Correct Facil
00139	C	Groundwater	Valley Drive Mobile Home Park
01187	N	Groundwater	Airport Inn
03382	N	Purchased	Albertsons #2039
01186	N	Groundwater	Alta Club
02918	N	Groundwater	Big Sky Camp and RV Park
03819	N	Purchased	Cascade Pure Water Service
03739	N	Purchased	County Market
01192	N	Groundwater	Flying J Restaurant
01193	N	Groundwater	Gingham Lady Motel
01196	N	Groundwater	Star Motel
03802	N	Groundwater	Yellowstone Tavern Inc
03178	P	Groundwater	Kircher School District #03

Climate

Based on Western Regional Climatic Center data for the period of record, annual precipitation averages 13.52 inches. Monthly average precipitation ranges from 0.41 inches in February to 2.87 inches in June. Summer thunderstorms and winter snows provide a majority of the precipitation in the area. The annual mean snowfall in Miles City is 30.0 inches. A summary of the available climatic data for the Miles City area is presented in Table 1 below.

Figure 2 Miles City Average Temperatures and Precipitation

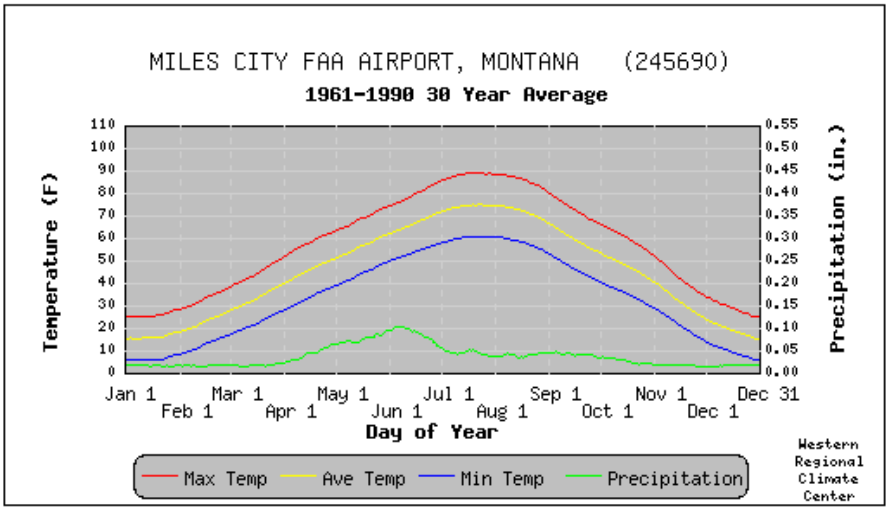


Table 2. Climate Summary for the Miles City Airport.

MILES CITY FAA AIRPORT, MONTANA (245690)
1961-1990 Monthly Climate Summary

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	26.2	33.3	44.8	58.2	69	79.9	88.3	86	73.2	60.1	41.5	29.2	57.7
Average Min. Temperature (F)	6.7	12.9	22.7	33.8	44.5	54.1	60.2	58.1	46.8	35.3	21	9.7	33.9
Average Total Precipitation (in.)	0.56	0.53	0.59	1.32	2.4	2.66	1.45	1.29	1.29	0.86	0.56	0.58	14.09

Western Regional Climate Center, wrcc@dri.edu

Geographic Setting

Miles City is located in the non-glaciated portion of the Great Plains physiographic province of North America (Rocky Mountain Association of Geologists, 1972). This area is also designated as the non-glaciated central ground-water region of the United States (Heath, 1984). The elevation at Miles City is approximately 2,358 feet above mean sea level and the town is located immediately next to the Yellowstone River (Figure 1 and 3). The Yellowstone River valley is about 2 to 2.5 mile wide in the vicinity of Miles City. Topographic relief in the area is low with highlands rising about 200 to 300 feet above the river valley. Many of the creeks and tributaries to the Yellowstone have moderately incised channels.

Geology

This section provides an overview of the geology and hydrology of the vicinity of Miles City. Reports used for this section include Lewis and Roberts (1978), Slagle, 1983, Stoner, 1972, and Vuke et al (2001). 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. Geology is not just important for understanding the hydrologic conditions related to ground water but it is also valuable for public water supplies that use surface water. For example, the timing and runoff patterns of streams are influenced in part by the geology within a watershed. Watersheds with large areas of low hydraulic conductivity bedrock tend to respond quickly to precipitation and snowmelt events. Hydrographs from streams within such a watershed show numerous high flow peaks or spikes. On the other hand, streams within watersheds underlain by bedrock that has high hydraulic conductivity tend to have more subdued hydrographs, that is, fewer and more rounded high flow peaks. Infiltration of precipitation and snowmelt waters makes the high flow events rise more gradually and have more rounded peaks. Surface water quality can also be affected by the geology within a watershed and information in this section can be useful for gaining a better understanding of factors that control erosion and sedimentation.

Unconsolidated alluvium is present in the Yellowstone River valley and in many of the tributaries to the Yellowstone (Figure 4). The alluvium consists of lenses of unconsolidated clay, sand, and gravel. As much as 50 feet of alluvium is present in the Yellowstone and Tongue river valleys and up to 25 feet is present in some of the tributaries (Vuke et al (2001). The Yellowstone River alluvium yields economic quantities of water to wells and in most places represents an unconfined aquifer. Terrace deposits are also present within the main river valley and the tributaries. Some of the terraces are between 2 and 260 ft. above the streams and are considered to be Quaternary age, ranging from Pleistocene to Recent (Vuke et al (2001). These terrace deposits consist of gravel, sand, silt, and clay and range in thickness up to as much as 50 ft. in some places.

Bedrock exposed at the land surface in the vicinity of Miles City ranges in age from Upper Cretaceous to Recent (Vuke et al (2001). Around Miles City the Fort Union Formation dominates the landscape (Figure 4). The Fort Union can be on the order of 1,000 feet thick and can be divided into three members in descending order: the Tullock, Lebo Shale, and Tongue River. There are outcrops of red metamorphosed sedimentary rocks within the Fort Union Formation southeast of town. These beds are referred to as “clinker” and formed when underlying coal beds were ignited and baked the sandstone, siltstone, and shale beds. In some places the heat was so intense that the overlying rocks were metamorphosed into rock resembling volcanic rocks known as scoria. The Hell Creek Formation (Upper Cretaceous) is below the Fort Union, is about 160 feet thick, and contains beds of silty shale, mudstone, sandstone, and coal. The Hell Creek is not exposed at the land surface near Miles City. Generally, the Hell Creek is more fine grained and contains less coal than the overlying Fort Union. Sandstone beds are more abundant in the lower part of the Hell Creek Formation.

The Public Water Supply

The Miles City PWS is classified as a community system under the Federal Safe Drinking Water Act, because the system serves at least 25 year-round residents through at least 15 service connections. The PWS services almost 9,000 residents via approximately 3,480 active service connections.

Yellowstone River water is the source water for Miles City. The intakes for the system are located on the river’s edge on the northwest side of town near the confluence of the Tongue River (Figure 1a and 3).

According to the most recent sanitary survey, the intakes are inspected quarterly. The water from the river is treated through a conventional surface water treatment process and delivered to its customers. There are three above ground storage reservoirs with total capacity of about 1,875,000 gallons. This volume of storage represents approximately 2 days water supply for the City's customers, with restricted use. An inspection of the three tanks occurs every three to five years.

Water treatment consists of coagulation, sedimentation, filtration, disinfection, and corrosion control. Yellowstone water is pumped from the intake to two primary settling basins, then after a time the water is moved to two secondary settling basins. After fine particles are coagulated and settled, the water is moved on to four multi-media filters. Treatment is completed (with the addition of FLUORIDE) and disinfection with chlorine gas and the finished water is pumped to the storage facilities. According to the latest sanitary survey, the distribution system at Miles City is in good condition with few or no leaks detected throughout the year.

Due to the fact that Miles City obtains its drinking water from a surface water supply, the source water is classified as highly sensitive to contamination, in accordance with Montana Source Water Protection Program criteria (1999).

Public water systems must conduct routine monitoring for contaminants in accordance with Federal Safe Drinking Water Act requirements. A community public water supply, like Miles City, must sample in accordance with schedules specified in the Administrative Rules of Montana (ARM). Monitoring includes 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. Transient, non-community PWSs are required to conduct routine monitoring only for pathogens (including coliform bacteria), nitrate, and nitrite. All contaminant concentrations detected in required samples must comply with numeric maximum contaminant levels (MCLs) specified in the Federal Safe Drinking Water Act.

The State of Montana classifies the Yellowstone River mainstem as B-3 surface water. According to the classification, the Yellowstone River is to be maintained suitable for drinking, culinary and food-processing purposes after conventional treatment for the removal of naturally present impurities. These waters must also be maintained as suitable for bathing, swimming, and recreation; growth and propagation of salmonoid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply. These surface water classifications are pursuant to the Administrative Rules of Montana 17.30.600-625.

Miles City PWS Water Quality

Within the past five years, no positive fecal coliform samples were collected during routine contaminant monitoring. No MCL exceedances were noted for any other constituents monitored over the past five years, this includes nitrate. The highest nitrate value recorded at the PWS is 1.05 milligrams per liter (mg/l) which is significantly below the MCL of 10 mg/l.

CHAPTER 2
DELINEATION

The source water protection areas for the Miles City public water system are delineated in this chapter. The purpose of delineation is to map the source of water used by Miles City PWS and to define areas within which to prioritize source water protection efforts. Because Miles City uses the Yellowstone River for its public water supply, two types of management regions are mapped; a spill response region and a watershed region.

The goal of management in the spill response region is to avoid introducing contaminants directly into the river upstream of the public water supply. In addition, this region should be managed to prevent contaminants from reaching the intake or infiltration lines before natural processes reduce their concentrations. The goal of management in the watershed region is to maintain and improve water quality over long periods of time or increased usage.

Figure 5. Daily flow for the Yellowstone River at Miles City.

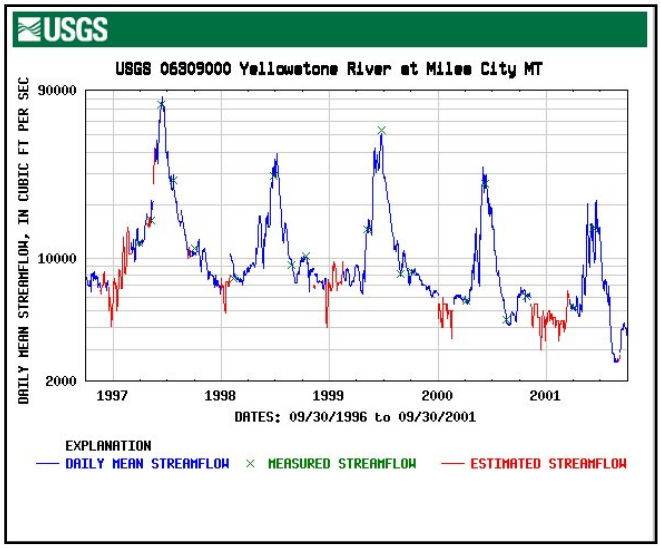
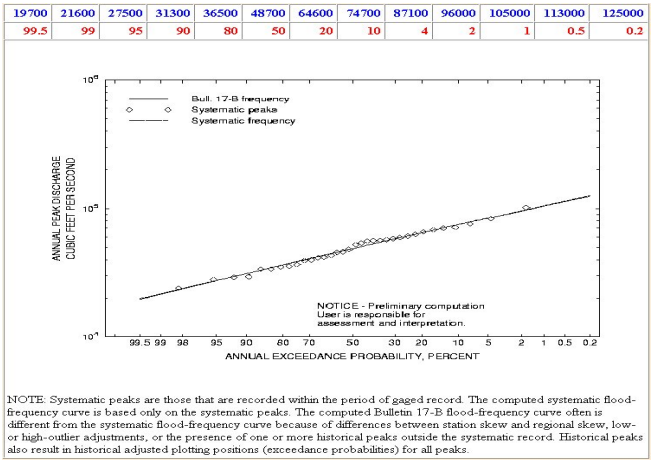


Figure 6. Flood Frequency Analysis for the Yellowstone River at Miles City.



Hydrogeologic Conditions

The U.S. Geological Survey operates a stream gauging station at Miles City MT (Station 06309000). The station has a period of record extending from September 1922 to present. Annual average flow for the Yellowstone River at this station is 11,483 cubic feet per second (cfs). Maximum and minimum annual discharge for the same period are 17,990 and 5,938 cfs (NWISWeb Data for the Nation). A hydrograph for the last 5 years of record is shown to the right (Figure 5).

The hydrograph shows a pattern of low flows in the fall and winter months and high flows during the spring and early summer.

Figure 6 shows the flood frequency curve with exceedance flows probability shown as a percent.

Using DEQ Source Water Protection Program criteria for ranking aquifer/source water sensitivity (Table 3 below), the Miles City PWS source water is considered highly sensitive to contamination. The sensitivity ranking is a result of the surface water source for the Miles City PWS.

Table 3. Source water sensitivity criteria (DEQ, 1999).

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 and Assumptions

The headwaters of the Yellowstone River and its tributaries originate in the mountain ranges to the west and southwest of Miles City including: the Bridger Range, Crazy Mountains, Absaroka-Beartooth Range, Prior Mountains, and Bighorn Mountains (Figure 1b). Significant tributaries to the Yellowstone draining these land areas include the Shields River, Boulder River, Stillwater River, Clarks Fork of the Yellowstone, and the Bighorn River.

Annual precipitation for the Miles City area is about 14 inches, however, precipitation is much higher in the mountainous headwaters. Annual precipitation can range between 40 and 60 inches in the higher mountain ranges. A significant portion of that precipitation occurs as snow during the winter months and as spring rain, both of which contribute to high streamflow events (Figure 2). Peak flows for the Yellowstone River commonly occur in spring and early summer, and low flows are more common in late summer through the winter months.

Certain land uses and businesses located along the Yellowstone River and its tributaries upstream from Miles City represent potential contaminant sources for the public water supply (Figures 7, 8, and 9). However, spills and leaks of contaminants are considered to represent a high hazard to the public water supply if they are located so that they result in direct discharge into Yellowstone River or into one of the its tributaries upstream in the vicinity of the Miles City intake (Table 8). The concern is that spills or leaks occurring in closer proximity to the Miles City could reach the intake before plant operators can close or isolate the intake. Other contaminant sources may discharge to the river and its tributaries in a less direct manner. These contaminant sources are within the watershed but are farther from the river and contaminants can be flushed into the streams during spring snowmelt or storm events. Indirect discharge to streams can also come from contaminants that infiltrate into aquifers adjacent the river that then discharge to streams via hydraulic connections. Because these contaminants are not discharged directly into the river, they tend to pose a less immediate threat to the public water supply and are usually assigned a lower hazard rating.

Seasonal timing of direct contaminant discharges into rivers and streams can complicate the potential threat to the public water supply. Spills occurring during high water periods will tend to travel toward the surface water intake faster than during low water conditions. However, dilution during high flows in the spring and early summer may help reduce the hazard posed to the public water supply. Direct discharges to the river during low flow conditions will have less chance to be diluted before reaching the surface water intake.

Delineation Results

Spill Response Region

The Spill Response Region for the City of Miles City extends 1/2 mile downstream and approximately 10 miles upstream of the surface water intake (Figures 7). It encloses the shoreline of the Yellowstone River and also parts of several larger tributaries.

Watershed Region

The Watershed Region for the Miles City intake encompasses the land area within the Lower Yellowstone Watershed (HUC 1010000) upstream of Miles City (Figures 8 and 9). The watershed has an area of 4,800 square miles.

Limiting Factors

The delineations for the Miles City PWS Spill Response Region and Watershed Region are based on fixed-distance and watershed mapping. The Spill Response Region represents an approximation of the distance required for contaminants released upstream to reach the surface water intake with relatively short lag time. Numerous assumptions are associated with the Source Water Protection Program (SWPP) criteria for Spill Response Region delineations. Contaminant transport rates and concentrations will vary depending on stream/river flow conditions, groundwater flux into the river, contributions from overland flow, soil types, slope, characteristics of riparian vegetation, the extent of riparian vegetation buffer zones, the extent and duration of contamination, contaminant solution density, adsorption, mechanical dispersion, biological transformation, dilution, molecular diffusion, precipitation, oxidation, complexation, and volatilization. As a result, some areas within the Spill Response Region may be more conducive to contaminant transport than others, and should be designated as higher priority areas for source water protection efforts.

CHAPTER 3
INVENTORY

An inventory of potential sources of contamination was conducted to assess the susceptibility of the Miles City PWS to contamination, and to identify priorities for source water protection planning. Inventories were conducted within the delineated Spill Response and Watershed Regions. The inventory focuses on facilities that generate, use, store, transport, or dispose of potential contaminants, and on land types on which potential contaminants are generated, used, stored, transported, or disposed. Additionally, the inventory identifies potential sources of all primary drinking water contaminants and Cryptosporidium. Only significant potential contaminant sources were selected for detailed inventory. The significant contaminants posing potential threats to the Miles City PWS include hazardous materials transported on railroads, interstates, and secondary roads; nitrate, pathogens, herbicides, and pesticides. The inventory for Miles City also focuses on all activities in the Spill Response Region, as well as general land uses and large potential contaminant sources in the Watershed 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: Land cover is identified from the National Land Cover Dataset compiled by the U.S. Geological Survey and U.S. Environmental Protection Agency (U.S.G.S., 2000). Land cover types in this dataset were mapped from satellite imagery at 30-meter resolution using a variety of supporting information.

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 Standard Industrial Codes.

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, transport, or dispose 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/Spill Response Region

Table 4 summarizes the significant potential contaminant sources that are located within the Spill Response Region (Figure 7). Interstate 94, Montana Highways 12 and 59, and the Burlinigton Northern Railroad tracks are considered potential sources of contamination. The railroads, interstate, and secondary highways cross or are in close proximity to the Yellowstone River at multiple locations up stream from the Miles City PWS intake (Figure 9). Large volumes of hazardous materials are transported, especially by rail, along the transportation routes within the Spill Response Region and could pose a threat to the water supply. There is an abandoned rail crossing on the Yellowstone River approximately 2.5 miles above the Miles City PWS intake and a secondary road bridge that crosses the river less than one mile above the intake. However both bridges are closed to the public and are used only by the Fort Keogh Livestock and Research Station personnel (Allen Kelm, personal communication 2003). Although both crossings are a concern due to their relatively close proximity to the surface water intake, they likely do not pose a threat to the public water supply as long as access is restricted.

Two State of Montana Superfund sites, and a wastewater discharge site this is operated by BFI Inc. are located outside but in fairly close proximity to the Spill Response Region boundary (Figures 3 and 7). The Miles City Livestock Center and the Fort Keogh Livestock and Research Lab are the two State Superfund sites. The cattle dipping site at the Livestock Center is apparently inactive and represented contamination on between 1 to 5 acres of land. This site is ranked “medium priority” by the State Superfund Program which indicates the site is a potential long-term threat to surface or ground water that requires action. The research lab location was less than 5 acres and is ranked as “low priority” by the State Superfund Program, indicating the site has a minimal potential for long-term threat. The BFI Inc. wastewater discharge site, which is not associated with the superfund sites, is apparently in compliance with its permit according to DEQ records.

Land areas within the spill response and watershed region are sparsely populated and fairly rural (Figure 7). The principal land cover in the Spill Response Region is grassland (73%), ag-land (12%) and forest land (4%). Open water (8%) and wetland (3%) make up the remaining types of landcover in the area. According to the Source Water Program criteria, the low percentage of agricultural land in this region indicates that activities on agricultural land represent a low potential threat to the Miles City PWS. On the other hand, the ag-land use is concentrated along the Yellowstone River alluvial valley both within the Spill Response and the Watershed regions (Figure 8). The concern here is the potential for mismanagement or over- application of fertilizers and/or pesticides on the agricultural lands. Due to the location of ag-lands within the watershed, there would be potential benefit to Miles City PWS, and other public water supplies in the watershed to participate in and encourage the use of best management practices (BMPs) by the agricultural industry.

Other businesses and land uses in the area are also considered as potential sources of contamination. Some of these sites are located down-stream from the intake location (Figure 3). Potential contaminant sources downstream of the intake are not considered to pose a threat to the Miles City PWS. This includes several industrial and municipal wastewater discharge points and a State Superfund Sites (the Miles City Rail Yard). It also includes a hazardous spill site at the Montana Department of Transportation facility and the Miles City Oil Refinery (the refinery is not shown on the maps). A full listing of businesses in and around the Miles City, based on the Standard Industrial Codes (SIC) codes is presented in Appendix A, along with a list of other businesses that did not appear on the SIC search results (Allen Kelm, personal communication, 2003). Some of these potential contaminant sources may pose a threat to other public water supplies in the area due to their location relative to those public water supplies (Figure 3 and Table 1). Source Water Delineation and Assessment Reports (SWDARs) for these public water supplies address hazards and concerns with these significant potential contaminant sources.

Table 4. Significant potential contaminant sources in the Spill Response Region Miles City PWS.

Potential Source	ID Number On Maps	Potential Contaminants	Hazard
Railroad	10	Pesticides, fertilizers, VOCs, other	Spills, storm water runoff, infiltration into ground water
Highway	11	Pesticides, fertilizers, VOCs, other	Spills, storm water runoff, infiltration into ground water
Pipelines	9	Petroleum Products	Spills and leaks
Hazardous Waste Site	2	Pesticides	Inactive livestock treatment site
Cultivated Cropland	Not Numbered	Fertilizers, pesticides, pathogens, nitrate	Spills, over application, surface runoff

From the above list of potential contaminant sources, some are considered significant based upon the following factors: the volume of potential releases, the volume of hazardous materials typically handled, the potential of the released materials to impact nearby surface water or groundwater, and the proximity of the sources to the PWS surface water intakes. Significant potential contaminant sources from the above list are discussed individually in the following section on susceptibility assessment and they are listed in Table 8.

Inventory Results/Watershed Region

Transportation corridors for rail and highways within the watershed represent significant potential sources of contamination (Figure 9). As in the Spill Response Region, the concern is that accidents and spills along transportation routes where they cross or where they are in close proximity to the Yellowstone River could result in relatively large volumes of hazardous material entering the river upstream from the public water supply intake. Spills occurring in the distal up-stream portions of the watershed pose less of a threat than those occurring closer to the intake. Petroleum pipelines within the watershed also represent significant potential contaminant sources due to the fact that they transport large volumes of petroleum products, and they cross or are in close proximity to the Yellowstone and some of its tributaries. In addition, breaks in pipelines may not be detected immediately and can result in large volume releases.

It should be noted that assessing the hazard of spills and releases from any of the above sources could be complicated by the flow conditions present when the contaminants enter the river. Spills that reach the river during low flow conditions would tend to remain more intact and concentrated because there is less river water to dilute the contaminant plume. Low flow conditions are usually less turbulent and accomplish less mixing. On the other hand, spills occurring during low flow conditions would move more slowly which would give public water supply operators more time to respond to the threat. Spills entering the river during high flow conditions would move more rapidly downstream but more turbulent flow would result in more effective mixing and dilution of the contaminant plume into the river water.

Predominant land covers in the Watershed Region include grassland (84%), ag-land (11%), and forest (4%) (Figure 8). A large portion of the agricultural landcover within the watershed is concentrated in the river and stream valleys (Figure 8). For this reason, activities on agricultural land are considered be a significant potential contaminant source within the watershed region.

Most of the other significant potential contaminant point sources in the watershed are located west of Miles City's intake (Figure 9). These include a number of storm and wastewater discharges, landfills, underground fuel storage tanks, a crude oil pipeline, mining claims and sites, oil and gas test wells, and others (Table 5). If spills or releases occur at some these locations, it could result in a contaminants being released directly into the river or into the shallow aquifer system that very likely is in hydraulic connection with the Yellowstone River. Under certain flow conditions, the contaminants could be discharged from the shallow aquifer system into the river. Unless the quantities release were large, the majority of the potential contaminant sources in the watershed are located far enough away from Miles City so as not to pose an acute threat to the public water supply (Figure 9). A full listing of businesses in the City of Miles City (based on SIC codes) was compiled and is present in Appendix A.

Low septic densities occur over the entire Watershed Region. The Miles City Wastewater Treatment Plant, which is an extended aeration oxidation ditch facility, appears to be located almost two miles downstream from the public water supply intake and does not pose a threat to the public water supply (Figure 3). Table 5 below lists the significant potential contaminant sources identified in the Watershed Region.

Table 5. Significant potential contaminant sources in the Watershed Region Miles City PWS

Potential Source	ID Number on Maps	Potential Contaminants	Hazard
Railroad	10	Pesticides, fertilizers, VOCs, other	Spills, storm water runoff, infiltration into ground water
Highways, roads, and pipelines	9, 11	Pesticides, fertilizers, VOCs, other	Spills, storm water runoff, infiltration into ground water
Cultivated Cropland	Not Numbered	Fertilizers, pesticides, pathogens, nitrate	Spills, over application, surface runoff
Storm Water / Wastewater Discharges	Not Numbered	VOCs, SOCs, pathogens, nitrate, TDS	Leaks, spills, improper handling and disposal/discharge of chemicals used by various businesses and are released to systems that allow discharge of contaminants with wastewater to surface

Table 5. Significant potential contaminant sources in the Watershed Region Miles City PWS

Potential Source	ID Number on Maps	Potential Contaminants	Hazard
			water
Gas and Oil Wells	Not Numbered	Total Dissolved Solids, Petroleum Hydrocarbons	Migration of brine wastewater into shallow groundwater discharging to surface water, surface runoff to surface water
Landfills	Not Numbered	Metals, Inorganics, VOCs, SOCs, pathogens, nitrate	Infiltration of leachate into shallow groundwater and subsequent discharging to the Yellowstone River; unauthorized dumping
Mining Operations	Not Numbered	Metals	Erosion and mobilization of metals in sediment and/or leached into surface water and groundwater
On-site residential septic systems	Not Numbered	Nitrate, pathogens	Leaks in septic tanks, leaks in collection lines, system failure, infiltration of untreated effluent into shallow ground water, which may in turn reach surface water
Large capacity septic systems	Not Numbered	Nitrate, pathogens	Leaks in septic tanks, leaks in collection lines, system failure, infiltration of untreated effluent into shallow ground water, which may in turn reach surface water
Municipal Sewer	Not Numbered	Nitrate, pathogens	Leaks in mains/lines, system failure, infiltration of untreated effluent into shallow ground water, which may in turn reach surface water
USTs/LUSTs	Not Numbered	VOCs, petroleum hydrocarbons	Spills, leaks impacting groundwater and or reaching surface water
Assorted businesses in town	Not Numbered	VOCs, SOCs, petroleum hydrocarbons, metals, pathogens, nitrate	Releases or spills, mishandling of chemicals, improper disposal of chemicals anywhere near the river
Class V Injection Wells (existence and locations are not known) where storm and/or wastewater is concentrated and recharges groundwater.	Not Numbered	VOCs, SOCs, petroleum hydrocarbons, metals, pathogens, nitrate	Leaks, spills, improper handling and disposal/discharge of chemicals used by various businesses and are released to systems that allow infiltration of contaminants to the subsurface or to the storm water system

From the above list of potential contaminant sources, some are considered significant based upon the following factors: volume of potential releases, the volume of hazardous materials typically handled,

the potential of the released materials to impact nearby surface water or groundwater, and the proximity of the sources to the PWS surface water intakes.

Inventory Update

To make this SWDAR a useful document in the years to come, the owners, manager, or the certified water system operator(s) for the public water supply for the Miles City should update the inventory for their records 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 at least every 5 years to ensure that this report/plan stays current in the public record.

Inventory Limitations

The extent of the potential contaminant source inventory is limited in several respects. The inventory is based on data readily available through state documents, published reports, and GIS data. Documentation may not be readily available on some potential sources. As a result, all potential contaminant sources may not have been identified. In some instances, inadequate location information precluded the inclusion of potential sources in the inventory.

CHAPTER 4
SUSCEPTIBILITY ASSESSMENT

Susceptibility of the Miles City PWS's source water is determined by two factors: the potential of a contaminant reaching the intake and the resulting health hazard. Susceptibility is assessed in order to prioritize potential pollutant sources in the Spill Response Region in order to guide management actions undertaken by local entities, in this case Miles City and Custer County.

The goal of source water management is to protect the source water, manage significant potential contaminant sources in the Spill Response Region, and ensure that land use activities in the Watershed Region pose minimal threats to the source water. Management priorities in the Spill Response 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 Miles City PWS operators and the community to reduce susceptibility are also included in this section of the report.

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 reach the PWS intake. The hazard presented by point sources of contaminants in Miles City's Spill Response Region depends on whether contaminants can discharge directly into the Yellowstone River or into its tributaries. Point source hazard is also dependent on the health affects associated with potential contaminants. Hazard ratings for point and nonpoint sources are assigned based on criteria listed in Table 6. Barriers can be anything that decreases the likelihood that contaminated water will reach Miles City's surface water intake. Examples of barriers include: a vegetated riparian area, protective forest management practices, and dilution.

Table 6. Hazard of Potential Contaminant Sources, Determination of For Surface Water Sources

Potential Contaminant Sources	High Hazard Rating	Moderate Hazard Rating	Low Hazard Rating
Point Sources of Nitrates or Pathogens	Potential for direct discharge to surface water	Potential for discharge to groundwater hydraulically connected to surface 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 surface water	Potential for discharge to groundwater hydraulically connected to surface water
Septic Systems (density)	More than 300 per sq. mi.	50 – 300 per sq. mi.	Less than 50 per sq. mi.
Municipal Sanitary Sewer (percent land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region

Table 6. Hazard of Potential Contaminant Sources, Determination of For Surface Water Sources

Potential Contaminant Sources	High Hazard Rating	Moderate Hazard Rating	Low Hazard Rating
Cropped Agricultural Land (percent land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region

Barriers to contamination can be anything that decreases the likelihood that contaminants will reach a spring or well. Barriers can be engineered structures, management actions, or natural conditions. Examples of engineered barriers are spill catchment structures for industrial facilities and leak detection for underground storage tanks. Emergency planning and best management practices are considered management barriers. Thick clay-rich soils, a deep water table or a thick saturated zone above the well intake can be natural barriers.

Table 7. Susceptibility of Source Water based on Hazard rating 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

Susceptibility ratings are presented individually for each significant potential contaminant source and each associated contaminant on the following page (Table 8).

Susceptibility Assessment Results

Table 8. Susceptibility Assessment Significant Potential Contaminant Sources in the Spill Response and Watershed Regions Miles City PWS surface water intakes

Source	ID Number on Maps	Contaminant	Hazard	Hazard Rating	Barriers	Susceptibility	Management Recommendations
Petroleum Pipelines	9	Fuels, Hydrocarbons	Spills, leaks, and releases	**High**	-Dilution at some locations farther away from the intake; County Emergency Response Plan, training and preparation of local response personnel	**High**	Maintain preparedness of local emergency personnel through active training, storm water diversion
Railroad	10	Pesticides, fertilizers, VOCs	Spills, storm water runoff, infiltration into ground water	**Moderate to High**	-Dilution at locations farther away from the intake; County Emergency Response Plan, training and preparation of local response personnel.	**Moderate**	Maintain preparedness of local emergency personnel through active training, runoff diversion, continued remediation of former release sites
Highway	11	Pesticides, fertilizers, VOCs, other	Spills, storm water runoff, infiltration into groundwater	**Moderate to High**	-Dilution at some locations farther away from the intake; County Emergency Response Plan, training and preparation of local response personnel	**Moderate**	Maintain preparedness of local emergency personnel through active training, storm water diversion
Cultivated Cropland	Not Numbered	Fertilizers, pesticides, pathogens, nitrate	Spills, over application, surface runoff adjacent the Yellowstone River and larger tributaries	**Moderate**	-Dilution	**Moderate**	Provide educational information, materials and resources to land owners on the proper application and storage of pesticide and fertilizers; implement agricultural BMPs
Oil Wells and Test Holes	Not Numbered	Total Dissolved Solids (TDS), Petroleum, Hydrocarbons	Improperly sealed or abandoned wells facilitating contaminant transport to shallow aquifers and possibly surface water bodies.	**Low**	-Concentrated exploratory drilling is located in the distal portions of the watershed	**Low**	Monitor drilling activities and oil field development near or adjacent the Spill Response Region.
UST/LUSTs	Not Numbered	VOCs, petroleum hydrocarbons	Spills, leaks impacting groundwater	**Low**	-Spill prevention, dilution, ongoing monitoring of groundwater, monitoring for	**Very Low**	Spill response planning, tank and groundwater monitoring, spill catchment, active and ongoing remediation of spill sites

Table 8. Susceptibility Assessment Significant Potential Contaminant Sources in the Spill Response and Watershed Regions Miles City PWS surface water intakes

Source	ID Number on Maps	Contaminant	Hazard	Hazard Rating	Barriers	Susceptibility	Management Recommendations
			and/or reaching surface water		spills, ongoing remediation of spill sites -Located downstream of the PWS intake		
Assorted Businesses in Town	Not Numbered	VOCs, SOCs, petroleum hydrocarbons, metals, pathogens, nitrate	Releases or spills, mishandling of chemicals, improper disposal of chemicals anywhere near the river	**Low**	-Located downstream of the PWS intake	**Very Low**	Educational workshops provided to the general public by the city, county, or state promote safe handling and proper storage, transport, use, and disposal of hazardous materials. Scheduled days for the collection of hazardous wastes from the public
Mining Operations	Not Numbered	Metals	Erosion and mobilization of metals in sediment and/or leached into surface water and groundwater	**Low**	- Small size - Most metal and coal mining in the watershed is a considerable distance from the intake (dilution)	**Low**	Continue monitoring for metals and participate in watershed-wide efforts to maintain water quality and clean up high priority abandoned mines.
Wastewater Discharges	Not Numbered	VOCs, SOCs, pathogens, nitrate, TDS	System failure, exceeding effluent limits	**Moderate**	-Dilution -Discharge points are significant distances upstream, others are more downstream.	**Low to Very Low**	Ensure proper maintenance and operation of system; monitor leaks in system; develop an alternative treatment plan in the event of system failure
Rail Car Cleaner	13	Variety of hazardous materials	Releases or spills, mishandling of chemicals, improper disposal of chemicals	**Moderate**	-Dilution -Discharge points is over two miles downstream from the intake.	**Low to Very Low**	Continue to use safe handling procedures and proper storage, transport, and disposal of hazardous materials.
Municipal Sewer System	Not Numbered	Pathogens, nitrate	Leaks in sewer mains to groundwater, which may reach surface water	**Low**	-City's lines and treatment facilities are down-stream from the intake	**Low to Very Low**	Ongoing testing and maintenance of lines and system, replacement of old lines, compliance with current regulations for discharges
Class V Injection Wells	Not Numbered	VOCs, SOCs, pathogens, nitrate	Infiltration of contaminants into aquifer	**Low**	-Spill prevention, dilution, ongoing monitoring of groundwater, monitoring for spills, ongoing remediation of	**Very Low**	Inventory; Provide educational information, materials and resources to business owners and the public on proper waste disposal and recycling

Table 8. Susceptibility Assessment Significant Potential Contaminant Sources in the Spill Response and Watershed Regions Miles City PWS surface water intakes

Source	ID Number on Maps	Contaminant	Hazard	Hazard Rating	Barriers	Susceptibility	Management Recommendations
					spill sites		

The susceptibility assessment results for each significant potential contaminant source identified is described below:

Railroads – The potential hazard represented by pesticides, fertilizers, VOCs and SOCs from spills along the Burlington Northern railway pose a moderate to high hazard, depending on the proximity of the spill to the Yellowstone River and the Miles City intake. As noted previously, the railroad is in close proximity to the river at multiple locations upstream from Miles City. One barrier identified for this source is the county emergency response plan. The abandoned Chicago Milwaukee Bridge about 2.5 miles up-stream from the intake likely does not pose a threat to the public water supply as long as access to the bridge is restricted.

Highway- The potential hazard imposed by pesticides, fertilizers and other hazardous materials that could be accidentally spilled on or along the highway or secondary highways is moderate to high depending on whether a spill occurs in close proximity to the Yellowstone River. Susceptibility is rated moderate with the county emergency response plan counting as one barrier. The bridge crossing the Yellowstone River on the west side of town about a mile up-stream is abandoned and likely does not pose a threat to the public water supply as long as access to the bridge is restricted.

Petroleum Pipeline – The potential hazard represented by releases, spills, and leaks from pipelines within the watershed is high because the pipeline crosses several tributaries and runs in close proximity to the Yellowstone River in several places. Susceptibility of the public water supply to the pipeline is high with the county emergency response plan counting as one barrier.

Agricultural lands – The potential hazard from pathogens and nitrate originating from agricultural lands is moderate. Cropped agricultural lands occupy a significant part of the Yellowstone River alluvial valley within the spill response region. The susceptibility of the intake to these agricultural sources of nitrate and pathogens is also moderate because adequate dilution should be provided by the average discharge of the Yellowstone River.

UST/LUSTs- The potential hazard imposed by VOCs and petroleum hydrocarbons is low. This is because most of the underground tanks are located either a significant distance up-stream of the intake, or are located in Miles City down-stream of the intake. The susceptibility is rated very low due to the presence of several barriers including spill prevention, dilution, ongoing monitoring of ground water and monitoring for spills.

Assorted Businesses in Town- Appendix A lists various businesses in town that are considered to represent potential contaminant sources based on the criteria within the Source Water Protection Guidelines (DEQ, 1999). Based on their location with respect to the public water supply intake, these businesses are not considered to pose a threat to the water supply. However, a simple proactive step to reducing the risk of unnecessary contamination in a community is to provide educational information and resources to business owners and the public on proper waste disposal and recycling.

Mining Operations- Based on available information, the mining operations in the area are relatively small or simply represent undeveloped claims. Due to their size and distance from the public water supply intake they are not considered to pose a threat to the water supply. The susceptibility is rated as low.

Wastewater Discharges- The potential hazard from VOCs, SOCs, pathogens, and nitrate originating from wastewater discharges is moderate. The susceptibility of the PWS intake to contaminants originating from these sources is low. The primary reason for the low rating is that the discharge points are either downstream from the public water supply intake, or a significant distance up-stream.

Municipal Sewer System – The potential hazard imposed by pathogens and nitrate originating from Miles City's municipal sewer system is low. The area adjacent to the intake location is primarily undeveloped. As a result, the number of sewer lines that could be considered a potential threat is small. The susceptibility of the intakes to nitrate and pathogens originating from this source is rated as low to very low.

Class V Injection Wells – The potential hazard imposed by VOCs, SOCs, pathogens, nitrate, and other contaminants originating from the class V injection wells is considered low. The susceptibility of the intake to contaminants originating from this source is unknown due to the fact that no inventory of Class V well is complete or the current inventory is inadequate.

It should be noted that even small releases of some chemicals in close proximity to a surface water intake can have significant negative impact on water quality, and is therefore a significant threat to the public water supply. Steps can be taken to reduce the likelihood of releases in the source water for the PWS or in the vicinity of the sources. Some of these steps (considered management recommendations) are listed below.

Management Recommendations
Management recommendations are included in the susceptibility table for the Miles City PWS (Table 8). If these management recommendations are implemented, they may be considered additional barriers that will reduce the susceptibility of the intake to specific sources and contaminants.

Management recommendations fall into the following categories:

- Sewer maintenance and leak detection
- Municipal sewer extension
- Agricultural best management practices
- Stormwater management
- Proper disposal and monitoring of oil and gas production wastewater
- Education
- Emergency Response Planning

Sewer Maintenance and leak detection – Early warning of leaks and scheduled replacement of aging sewer lines may reduce the susceptibility of the City's PWS to contamination from municipal septic wastes, and could also benefit other public water supplies in the Miles City area.

Sewer Extension – Installation of advanced septic treatment systems such as sand filters can limit contamination from new rural residential development, however, annexation and extension of sewers is the only way to reduce contamination from existing unsewered developments.

Agricultural and silvicultural best management practices (BMPs) – BMPs that address application and mixing of fertilizer and pesticides are a viable alternative to prohibition of their use. BMPs may also be utilized to minimize surface runoff and soil erosion on cultivated fields. Erosion control, selective logging, and other silvicultural practices (essentially BMPs) should be considered on a county-wide basis. BMPs are generally voluntary but their implementation can be encouraged through education and technical assistance. County planning can help promote the implementation of BMP on lands that are outside city limits but indirectly affect the city PWS.

Education - Educational workshops provided to the general public by the city, county, or state promote safe handling and proper storage, transport, use, and disposal of hazardous materials. Ongoing training provided to designated emergency personnel will promote the efficiency and effectiveness of emergency responses to hazardous material spills. 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.

Hazardous Materials Collection Days – Several counties in the state that have vulnerable water supplies have implemented scheduled days for the collection of hazardous wastes from the public. These vary in the inclusiveness of what materials are collected, how the materials are handled, and how they are disposed of, but they all act to reduce the amount of unauthorized or improper disposal of these wastes. Used motor oil collection station could be established and available to the public on a regular basis.

Emergency Response Plan – Several counties have compiled Emergency Response Plans that were then adopted by the local communities. The usefulness and effectiveness of a response plan are maximized if it contains a clear listing of all emergency contacts, emergency numbers, and resources available within the county to respond to an emergency situation, such as a hazardous material spill. Emergency plans are not difficult to develop or distribute, but have a significant benefit to the citizens and municipalities within the county.

The City’s PWS operators, the city administration, and the Custer County administration should consider these management recommendations. Should contamination reach the town's intake, the City and County will likely need to work cooperatively to address remediation or relocation of the intake.

CHAPTER 5
Monitoring Waivers

Waiver Recommendation

The town of Miles City has a wavier for Phase 2 and 5 inorganic constituents that include Barium, Cadmium, Chromium, Mercury, Selenium, Antimony, Thallium, Beryllium, and Nickel. Note: Fluoride is not included in the waiver because Miles City adds Fluoride as part of their water treatment. As a result, the system samples and monitors for fluoride. Based on past monitoring results or the susceptibility assessment of the intake, Miles City PWS may not be eligible for additional monitoring waivers. However, to be sure that eligibility for all available waivers is considered, the PWS Operators are encouraged to carefully review the following section on Monitoring Waiver Requirements. If after reviewing this section it is determined that an additional waivers are feasible, the Miles City PWS should submit a letter with the proper documentation to DEQ requesting monitoring waivers. Table 9 shows how identified potential contaminant sources affect the eligibility for monitoring waivers.

Table 9. Susceptibility Assessment as it relates to waiver eligibility for significant potential contaminant sources in the Spill Response Region Miles City PWS surface water intakes.

Source	Contaminant	Susceptibility	Waiver Eligibility
Petroleum Pipelines	Fuels, Hydrocarbons	**High**	The number of pipelines and the volume of petroleum products transported likely precludes a waiver
Railroad	Pesticides, fertilizers, VOCs	**Moderate to High**	Chemical use likely precludes waivers for some chemicals
Highway	Pesticides, fertilizers, VOCs, other	**Moderate to High**	Chemical use likely precludes waivers for some chemicals
Cultivated Cropland	Fertilizers, pesticides, pathogens, nitrate	**Moderate**	Chemical use likely precludes waivers for some chemicals
Oil Wells and Test Holes	Total Dissolved Solids (TDS), Petroleum, Hydrocarbons	**Low**	The number of drilling activity in the watershed likely precludes a waiver
UST/LUSTs	VOCs, petroleum hydrocarbons	**Very Low**	Presence of sites with historic leaks within Miles City likely precludes waivers
Assorted Businesses in Town	VOCs, SOCs, petroleum hydrocarbons, metals, pathogens, nitrate	**Very Low**	Chemical use likely precludes waivers for some chemicals Waivers are not available for pathogens and nitrate
Mining Operations	Metals	**Low**	Extensive mining within the Yellowstone River watershed likely precludes waivers

Source	Contaminant	Susceptibility	Waiver Eligibility
Wastewater Discharges	VOCs, SOCs, pathogens, nitrate, TDS	**Low to Very Low**	Waivers are not available for pathogens and nitrate
Municipal Sewer System	Pathogens, nitrate	**Low to Very Low**	Waivers are not available for pathogens and nitrate
Class V Injection Wells	VOCs, SOCs, pathogens, nitrate	**Very Low**	Waivers are not available for pathogens and nitrate

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.

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 (GWUDISW) 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. DEQ's PWS Section and DEQ's Source Water Protection Program will conduct review of an organic chemical monitoring waiver application. 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.

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GLOSSARY*

Acute Health Effect. An adverse health effect in which symptoms develop rapidly.

Alkalinity. The capacity of water to neutralize acids.

Best Management Practices (BMPs). Methods that have been determined to be the most effective, practical means of preventing or reducing pollution from nonpoint sources.

Coliform Bacteria. Bacteria found in the intestinal tracts of animals. Their presence in water is an indicator of pollution and possible contamination by pathogens.

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 that inhibits the flow of water.

Delineation. A process of mapping source water management areas.

Effective Porosity. The percent of soil, sediment, or rock through which fluids, such as air or water, can pass. Effective porosity is always less than total porosity because fluids can not pass through all openings.

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

Hazard. A measure of the potential of a contaminant leaked from a facility to reach a public water supply source. Proximity or density of significant potential contaminant sources determines hazard.

Hydraulic Conductivity. A coefficient of proportionality describing the rate at which water can move through an aquifer.

Inventory Region. A source water management area that encompasses an area expected to contribute water to a public water supply well within a fixed distance or a specified groundwater time-of-travel distance.

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.

Nitrate. An important plant nutrient and type of inorganic fertilizer. In water the major sources of nitrates are 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.

Pathogens. A bacterial organism or virus typically found in the intestinal tracts of mammals, capable of producing disease.

Point-Source. A stationary location or fixed facility from which pollutants are discharged.

Porosity. The percent of soil, sediment, or rock filled by air, water, or other fluid.

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

SIC Code. The U.S. Standard Industrial Classification (SIC) Codes classify categories of businesses. SIC Codes cover the entire range of business categories that exist within the economy.

Source Water Protection Area. For surface water sources, the land and surface drainage network that contributes water to a stream or reservoir used by a public water supply.

Susceptibility (of a PWS). The 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. 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, non-point, and natural sources. The TMDL program was established by section 303(d) of the Clean Water Act to help states implement water quality standards.

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

Transmissivity. The ability of an aquifer to transmit water.

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

Volatile Organic Compounds (VOC). Any organic compound which evaporates readily to the atmosphere (e.g. fuels and solvents).

Recharge Region / 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.

* Definitions taken from EPA’s Glossary of Selected Terms and Abbreviations and other sources.

FIGURES

APPENDICES

APPENDIX A - Listing of Potential Contaminant Sources by SIC Code and Supplemental List Provided by PWS Operator

NAME	Standard Industrial Code Name 1	Standard Industrial Code Name 2
A-1 Quality Transmission	Automobile Repairing & Service	Transmissions-Automobile
Agri Industries	Irrigation Systems & Equipment (Whol)	Pumps (Wholesale)
Albertson's	Grocers-Retail	Pharmacies
Allen's Auto Body	Automobile Body-Repairing & Painting	#N/A
American Lube	Automobile Lubrication Service	#N/A
American Medical Oxygen	Oxygen (Wholesale)	Metals Service Centers & Offices
Armadillo Storage	Storage-Household & Commercial	#N/A
Auto Dismantlers	Automobile Parts-Used & Rebuilt (Whol)	Wreckers-Dealers
Auto Electric Co	Auto & Home Supply Stores	Alternators & Generators-Automotive
B & C Oil Co	Oils-Fuel (Wholesale)	Gas-Liquefied Petro-Bttld/Bulk (Whol)
B & C Spraying	Pest Control	Real Estate Inspection
Barney's Blocks & Heads	Machine Shops	Automobile Machine Shop Service
Best Western Inn	Hotels & Motels	Motels & Hotels Reservations
Bfi Waste Systems	Garbage Collection	Waste Disposal
Big Country Educational Co-Op	Schools	#N/A
Bill's Minit Market	Grocers-Retail	Convenience Stores
Bill's Truck Svc	Truck-Repairing & Service	#N/A
Bluegrass Upholstery	Upholsterers	Automotive Glass Replacement Shops
Bob's Pickup & Delivery	Trucking-Motor Freight	#N/A
Body & Sole	Embroidery	#N/A
Brush Truck Repair & Towing	Truck-Repairing & Service	Wrecker Service
Bud Curran-Grain Hauling	Trucking-Heavy Hauling	#N/A
Bullis-Graves Memorial Chapel	Funeral Directors	Monuments
Bumper To Bumper Auto Parts	Automobile Parts & Supplies-Retail-New	Batteries-Storage-Wholesale
Calley & Sandy's Creative Cor	Florists-Retail	Balloons-Novelty & Toy
Carlson Machine & Rebuild Inc	Machine Shops	Indstrl/Coml Machinery/Equip Nec (Mfrs)
Carolyn's Embroidery	Embroidery	Monograms
Carquest Auto Parts	Automobile Parts & Supplies-Retail-New	#N/A
Cat Coulee Enterprises	Hunting Supplies	#N/A
Cellular One	Refuse Systems	Telephone Equipment & Supplies
Cenex General Store	Truck Stops & Plazas	#N/A
Cenex Harvest States	Fertilizers (Wholesale)	Feed-Dealers (Wholesale)
Cenex Harvest States	Gas-Liquefied Petro-Bttld/Bulk (Whol)	Asphalt Paving Mixtures & Blocks
Cenex Harvest States Co-Op	Seed & Grain Cleaning	Mobile Home Dealers
Cenex Supply Station	Automobile Repairing & Service	Service Stations-Gasoline & Oil
Center Ag Supply	Feed-Dealers (Wholesale)	#N/A
Charles Moore Trucking	Livestock Hauling	Trucking-Heavy Hauling
Circle T Inc	Welding	#N/A
Clark Clevenger Street Svc	Transmissions-Automobile	#N/A
Cluster County High School	Schools	#N/A
Commnet Paging Inc	Cellular Telephones-Equipment & Supls	Radio Paging/Signaling Eqpt Systs (Whol)
Community Home Oxygen Inc	Oxygen (Wholesale)	Metals Service Centers & Offices
Conklin Products	Bicycles-Dealers	#N/A
Conoco Quick Stop	Service Stations-Gasoline & Oil	Laundries-Self Service
Culligan Water Conditioning	Water Softening Equipment Svc & Supls	Water Treatment Equip Svc & Supls
Custer County Art Ctr	Art Gallery	Gift Shops
Custer County Clerk	Legislative Bodies	#N/A
Custer County Clerk Of Dist Ct	Legislative Bodies	#N/A
Custer County High School	Schools	#N/A
Custer County High School	Schools	#N/A
Custer County School Supt	Schools	#N/A
Custer Motors	Automobile Repairing & Service	#N/A
De Luxe Motors Inc	Auto & Home Supply Stores	#N/A
Detail Center	Automobile Detail & Clean-Up Service	#N/A
Dollar Bills Car & Truck Wash	Car Washing & Polishing	Truck-Washing & Cleaning
Donnelly Repair	Automobile Repairing & Service	Engines-Rebuilding & Repairing
E H Oftedal & Sons Inc	General Contractors	Hydraulic Equipment & Supplies (Whol)
Eastern Montana Cremation Svc	Crematories	#N/A
Eastern Montana Industries	Books-Publishing & Printing	Recycling Centers (Wholesale) - Wood Produc
Eastern Montana Transport	Trucking-Contract Hauling	Automobile & Truck Brokers
Eastern Montanna Ag Repair	Farm Equipment (Wholesale)	Tractor-Repairing & Service
Evergreen Landscaping	Lawn & Grounds Maintenance	Landscape Contractors
F & F Trucking & Supply	Trucking-Heavy Hauling	#N/A
Faber Taxidermy	Taxidermists	#N/A
Falcon Aviation Inc	Aircraft Servicing & Maintenance	#N/A
Fire Prevention & Invstgtn Bur	State Government-Fire Protection	#N/A
Fireman's Co	Fire Extinguishers (Wholesale)	Fire Protection Equipment & Supls (Whol)
First Class Building Inspctn	Real Estate Inspection	Inspection Service
Flo-Rite Radiator	Automobile Radiator Repairing	Truck-Repairing & Service
Flying J	Convenience Stores	Service Stations-Gasoline & Oil
Frame Gallery	Picture Frames-Dealers	#N/A
Frank's Body Shop	Automobile Body-Repairing & Painting	Wrecker Service
Frare Trucking	Trucking-Heavy Hauling	#N/A

NAME	Standard Industrial Code Name 1	Standard Industrial Code Name 2
Howe Appraisal Svc	Real Estate Appraisers	Appraisers
J Lee's	Gift Shops	Balloons-Novelty & Toy
Jack's Body Shop	Automobile Body-Repairing & Painting	Glass-Auto Plate & Window & Etc
Jefferson Elementary School	Schools	#N/A
Jerke Livestock	Trucking	#N/A
K M Repair	Automobile Repairing & Service	Motorcycles & Motor Scooters-Rpr & Svc
Kelly's Auto Repair	Automobile Repairing & Service	#N/A
Kircher Elementary School	Schools	#N/A
L P Anderson Supply Co	Culverts	Truck Equipment & Parts-Wholesale
Larry's Auto Sales & More	Auto & Home Supply Stores	#N/A
Larry's Auto Sales & More	Auto & Home Supply Stores	#N/A
Larrys Auto Works	Automobile Repairing & Service	#N/A
Lazy Letters Office Machine	Office Furniture & Equip-Dealers (Whol)	Metals Service Centers & Offices
Lee's Transmission Shop	Transmissions-Automobile	Automobile Repairing & Service
Lincare	Metals Service Centers & Offices	Oxygen (Wholesale)
Lincoln Elementary School	Schools	#N/A
Lube Center	Automobile Lubrication Service	Automobile Repairing & Service
Luther Appraisal Svc	Real Estate Appraisers	Appraisers
M & H Gas Station	Service Stations-Gasoline & Oil	#N/A
Mac's Frontierland Inc	Auto & Home Supply Stores	Auto & Home Supply Stores
Mangen's Electric Inc	Electric Contractors	Generators-Electric (Wholesale)
Mary Kay Cosmetics	Cosmetics & Perfumes-Retail	#N/A
Miles City City Airport	Airports	City Government-Transportation Programs
Miles City City Clerk	Legislative Bodies	#N/A
Miles City Club	Labor Unions & Similar Organizations	Clubs
Miles City County Market	Grocers-Retail	Florists-Retail
Miles City Fire Dept	Public Order & Safety Nec	#N/A
Miles City Laundry & Cleaners	Cleaners	Coin-Operated Laundries & Cleaning
Miles City Livestock Cmmssn	Livestock Sales Yard	#N/A
Miles City Mayors Office	Legislative Bodies	#N/A
Miles City Moving & Storage	Movers	Storage-Household & Commercial
Miles City Parks Shop	Parks	#N/A
Miles Community College	Junior Colleges & Technical Institutes	Schools-Universities & Colleges Academic
Montana-Dakota Utilities Co	Utility Company	
Moon Creek School	Schools	#N/A
Muggli Brothers Inc	Feed-Dealers (Wholesale)	#N/A
Napa Auto Parts	Automobile Parts & Supplies-Retail-New	#N/A
Nolley's Welding & Machine Inc	Welding	Indstrl/Coml Machinery/Equip Nec (Mfrs)
Notbohm Motors	Auto & Home Supply Stores	Automobile Renting & Leasing
Ochsner Equipment Sales	Irrigation Systems & Equipment (Whol)	#N/A
Olive Hotel	Hotels & Motels	Motels & Hotels Reservations
Pacific Steel & Recycling	Steel-Distributors & Warehouses	Prefabricated Metal Buildings
Park Place	Convention & Meeting Facilities & Svc	#N/A
Peavey Co	Grain Elevators	#N/A
Pedal Power Sports	Bicycles-Dealers	Sporting Goods-Retail
Philip Services Corp Ind Svc	Tank Cleaning	#N/A
Photos By Kristy	Photographers-Portrait	#N/A
Pioneer Carpet Cleaners	Carpet & Rug Cleaners	Fire Damage Restoration
Quad-K Supply	Janitors Supplies (Wholesale)	#N/A
R Z Welding	Welding	#N/A
Ray Jerrel Trucking Inc	Livestock Hauling	Fabricated Plate Work-Manufacturers
Recreation Lanes	Membership Sports & Recreation Clubs	Bowling Apparel & Accessories
Red Rock Sporting Goods	Sporting Goods-Retail	Guns & Gunsmiths
Regal Sign Co	Signs (Manufacturers)	Screen Printing
Reynold's Warehouse Grocery	Grocers-Retail	#N/A
Riverside Marine & Cycle Shop	Boat Dealers	Motorcycles & Motor Scooters-Dealers
Riverview School	Schools	#N/A
Rolling Rubber	Tire-Dealers-Retail	Automotive Glass Replacement Shops
S H School	Schools	#N/A
S Y School	Schools	#N/A
Sacred Heart School	Schools	#N/A
Sandhills Sewing & Vacuum Ctr	Sewing Machines-Household	Vacuum Cleaners-Household-Dealers
Sayre Fire Equipment Co	Fire Extinguishers (Wholesale)	Fire Protection Equipment & Supls (Whol)
Scott's Automotive Svc	Automobile Repairing & Service	#N/A
Security Storage	Storage-Household & Commercial	#N/A
Selle Livestock	Livestock Buyers	#N/A
Settle Aviation	Aircraft Servicing & Maintenance	#N/A
Sherwin-Williams Co	Paint-Retail	Wallpapers & Wallcoverings-Retail
Short Stop	Convenience Stores	#N/A
Silva Service Ctr	Automobile Repairing & Service	#N/A
Smith Livestock Inc	Livestock Buyers	#N/A
Smitty's Lock & Key	Security Control Equip & Systems-Whol	#N/A
Steadman's Hardware Inc	Hardware-Retail	Television & Radio-Dealers

APPENDIX B - DEQ PWS's Database Output

Inorganic Water Quality Sampling Results – Miles City PWS

NUMBER0	TINWSYS.NAME	WATER_TYPE_CODE	TINWSF.NAME	IDENTIFICATION_CD	TSAANLYT.NAME
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	1,1,1-TRICHLOROETHANE
MT0000291	MILES CITY CITY OF	GW	WELL 1 SODA	EP503	1,1,1-TRICHLOROETHANE
MT0000291	MILES CITY CITY OF	GW	WELL 1 SODA	EP503	1,1,1-TRICHLOROETHANE
MT0000291	MILES CITY CITY OF	GW	WELL 1 SODA	EP503	1,1,1-TRICHLOROETHANE
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	1,1,1-TRICHLOROETHANE
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	1,1,1-TRICHLOROETHANE
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	1,1,1-TRICHLOROETHANE
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	1,1,1-TRICHLOROETHANE
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	1,1,1-TRICHLOROETHANE
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	1,1,1-TRICHLOROETHANE
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	1,1,1-TRICHLOROETHANE
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	1,1,1-TRICHLOROETHANE
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	1,1,1-TRICHLOROETHANE
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	1,1,1-TRICHLOROETHANE
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	1,1,1-TRICHLOROETHANE
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	ANTIMONY
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	ANTIMONY
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	ANTIMONY
MT0000291	MILES CITY CITY OF	GW	WELL 1 SODA	EP503	ANTIMONY
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	ANTIMONY
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	ANTIMONY
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	ARSENIC
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	ARSENIC
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	ARSENIC
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	ARSENIC
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	ARSENIC
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	ARSENIC
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	ARSENIC
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	ARSENIC
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	ARSENIC
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	ARSENIC
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	ARSENIC
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	ARSENIC
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	ARSENIC
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	ARSENIC
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	ARSENIC
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	ARSENIC
MT0000291	MILES CITY CITY OF	GW	WELL 1 SODA	EP503	ARSENIC
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	ARSENIC
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	ARSENIC
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	ARSENIC
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	ARSENIC
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	ARSENIC
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	ARSENIC
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	ARSENIC
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	BARIUM
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	BARIUM
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	BARIUM
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	BARIUM
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	BARIUM
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	BARIUM
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	BARIUM
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	BARIUM
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	BARIUM
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	BARIUM
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	BARIUM
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	BARIUM
MT0000291	MILES CITY CITY OF	SW	DISTRIBUTION SYSTEM	SP001	BARIUM
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	BARIUM
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	BARIUM
MT0000291	MILES CITY CITY OF	SW	TREATMENT PLANT FOR YELLOWSTONE RIVER	EP502	BARIUM
MT0000291	MILES CITY CITY OF	GW	WELL 1 SODA	EP503	BARIUM

Bacteriological Sampling Data - Miles City PWS

LECTION_EN	PE_CO	NCE_IND	TSAANLYT.NAME
10/8/2002	RT	A	COLIFORM, TOTAL (TCR)
10/8/2002	RT	A	COLIFORM, TOTAL (TCR)
10/8/2002	RT	A	COLIFORM, TOTAL (TCR)
10/8/2002	RT	A	COLIFORM, TOTAL (TCR)
10/8/2002	RT	A	COLIFORM, TOTAL (TCR)
9/17/2002	RT	A	COLIFORM, TOTAL (TCR)
9/17/2002	RT	A	COLIFORM, TOTAL (TCR)
9/17/2002	RT	A	COLIFORM, TOTAL (TCR)
9/17/2002	RT	A	COLIFORM, TOTAL (TCR)
9/17/2002	RT	A	COLIFORM, TOTAL (TCR)
9/3/2002	RT	A	COLIFORM, TOTAL (TCR)
9/3/2002	RT	A	COLIFORM, TOTAL (TCR)
9/3/2002	RT	A	COLIFORM, TOTAL (TCR)
9/3/2002	RT	A	COLIFORM, TOTAL (TCR)
9/3/2002	RT	A	COLIFORM, TOTAL (TCR)
8/20/2002	RT	A	COLIFORM, TOTAL (TCR)
8/20/2002	RT	A	COLIFORM, TOTAL (TCR)
8/20/2002	RT	A	COLIFORM, TOTAL (TCR)
8/20/2002	RT	A	COLIFORM, TOTAL (TCR)
8/20/2002	RT	A	COLIFORM, TOTAL (TCR)
8/8/2002	RT	A	COLIFORM, TOTAL (TCR)
8/8/2002	RT	A	COLIFORM, TOTAL (TCR)
8/8/2002	RT	A	COLIFORM, TOTAL (TCR)
8/8/2002	RT	A	COLIFORM, TOTAL (TCR)
8/8/2002	RT	A	COLIFORM, TOTAL (TCR)
7/23/2002	RT	A	COLIFORM, TOTAL (TCR)
7/23/2002	RT	A	COLIFORM, TOTAL (TCR)
7/23/2002	RT	A	COLIFORM, TOTAL (TCR)
7/23/2002	RT	A	COLIFORM, TOTAL (TCR)
7/23/2002	RT	A	COLIFORM, TOTAL (TCR)
7/9/2002	RT	A	COLIFORM, TOTAL (TCR)
7/9/2002	RT	A	COLIFORM, TOTAL (TCR)
7/9/2002	RT	A	COLIFORM, TOTAL (TCR)
7/9/2002	RT	A	COLIFORM, TOTAL (TCR)
7/9/2002	RT	A	COLIFORM, TOTAL (TCR)
6/18/2002	RT	A	COLIFORM, TOTAL (TCR)
6/18/2002	RT	A	COLIFORM, TOTAL (TCR)
6/18/2002	RT	A	COLIFORM, TOTAL (TCR)
6/18/2002	RT	A	COLIFORM, TOTAL (TCR)
6/18/2002	RT	A	COLIFORM, TOTAL (TCR)
6/11/2002	RT	A	COLIFORM, TOTAL (TCR)
6/11/2002	RT	A	COLIFORM, TOTAL (TCR)
6/11/2002	RT	A	COLIFORM, TOTAL (TCR)
6/11/2002	RT	A	COLIFORM, TOTAL (TCR)
6/11/2002	RT	A	COLIFORM, TOTAL (TCR)
5/21/2002	RT	A	COLIFORM, TOTAL (TCR)
5/21/2002	RT	A	COLIFORM, TOTAL (TCR)
5/21/2002	RT	A	COLIFORM, TOTAL (TCR)
5/21/2002	RT	A	COLIFORM, TOTAL (TCR)
5/21/2002	RT	A	COLIFORM, TOTAL (TCR)
5/7/2002	RT	A	COLIFORM, TOTAL (TCR)
5/7/2002	RT	A	COLIFORM, TOTAL (TCR)
5/7/2002	RT	A	COLIFORM, TOTAL (TCR)
5/7/2002	RT	A	COLIFORM, TOTAL (TCR)
5/7/2002	RT	A	COLIFORM, TOTAL (TCR)
4/23/2002	RT	A	COLIFORM, TOTAL (TCR)
4/23/2002	RT	A	COLIFORM, TOTAL (TCR)
4/23/2002	RT	A	COLIFORM, TOTAL (TCR)
4/23/2002	RT	A	COLIFORM, TOTAL (TCR)
4/23/2002	RT	A	COLIFORM, TOTAL (TCR)
4/9/2002	RT	A	COLIFORM, TOTAL (TCR)
4/9/2002	RT	A	COLIFORM, TOTAL (TCR)

APPENDIX C - Sanitary Survey

APPENDIX D - Concurrence Letter & Other Correspondence