

Butte Silverbow Water Department Public Water Supply System

PWSID #MT0000170

SOURCE WATER DELINEATION AND ASSESSMENT REPORT

Report Date: 2/4/03

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INTRODUCTION

This Delineation and Assessment Report was prepared by Carolyn DeMartino, a Water Quality Specialist with the Source Water Protection Program of the Montana Department of Environmental Quality (DEQ) and Aubrey Smartt, a DEQ intern. The Butte-Silver Bow Water Department public water supply (PWS) is located in and around the Butte vicinity in the city and County of Silver-Bow, Montana. Marty Hovan, Plant Manager, as well as several certified operators assist in the operation of PWS.

Purpose

This report is intended to meet the technical requirements for the completion of the source water delineation and assessment report for the Butte-Silver Bow Water Department 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 Butte PWS operator in the identification of potential contaminant sources near the four surface water intakes and in providing information that helps Butte in the completion of a source water protection plan to protect its drinking water sources.

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 Butte public water supply, and is based on published data 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 the public water supplies, and not to any other public or private water supply. Also, not all potential or existing sources of groundwater or surface-water contamination in the area of Butte 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 constituents that do not have MCLs but are considered to be significant health threats.

CHAPTER 1 BACKGROUND

The Community

Butte is located in southwestern Montana and is the county seat of the City and County of Butte-Silver Bow ([Figure 1](#)). Butte is situated in the middle of the four surface water sources that serve the community. The U.S. Census Bureau estimates the 2000 population of Silver Bow County at 35,002 people, 33,325 of whom live in and around Butte. The main lines of the Burlington Northern Railroad, Montana Western Railroad, Rarus Railroad, and the Union Pacific Railroad all run through the town. Interstate 90 connects Butte with Warm Springs to the northwest and Whitehall to the east. Interstate 15 connects Butte with Dillon to the south and Boulder to the north.

Butte, first called Butte City, is named after a nearby sentinel-like peak known as Big Butte (Cheney, 1983). The community is well known for its mining prospects that began in the 1860s and was once known as the richest hill on earth. Butte found its fortune in copper under the leaders William Andrews Clark and Marcus Daly, also known as the “Copper Kings.”

Within Butte, residents obtain their drinking water from the Butte-Silver Bow Water Department PWS. The city limits are served by a municipal sanitary sewer system. A wastewater treatment plant is located on the western edge of town to treat the sewage. Residents in areas outlying city limits utilize private wells or surface water sources for water and on-site septic systems for waste disposal.

Climate

The climate in the vicinity of Butte is typical of higher-elevation intermountain valleys of southwestern Montana. Based on Western Regional Climatic Center data for the period of record, annual precipitation averages 12.87 inches. Monthly average precipitation ranges from 0.54 inches in February to 2.30 inches in June. Summer thunderstorms and winter snows provide a majority of the precipitation in the area. The annual mean snowfall in the Butte area is 56.8 inches. Periodic drought cycles (as defined by moving annual precipitation averages less than 10 inches) occur in the region at approximately 5 to 6 year intervals. A summary of the available climatic data for the Butte area is presented on Table 1.

Table 1. Climatic Summary

Butte Airport (241318)

Period of Record Monthly Climate Summary

Period of Record : 4/2/1894 to 12/31/2001

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	29.8	34.3	40.7	51.2	60.5	69.4	79.6	78.1	66.9	55.5	40.7	31.8	53.2
Average Min. Temperature (F)	7.3	10.9	17.6	27.2	34.9	42.0	47.0	45.3	36.9	28.6	18.4	10.0	27.2
Average Total Precipitation (in.)	0.62	0.54	0.82	1.05	1.92	2.30	1.30	1.14	1.12	0.80	0.64	0.61	12.87
Average Total Snow Fall (in.)	8.5	7.3	10.2	6.9	3.8	0.5	0.0	0.1	1.1	3.6	6.5	8.4	56.8
Average Snow Depth (in.)	4	4	2	0	0	0	0	0	0	0	1	3	1

Percent of possible observations for period of record.

Max. Temp.: 86.9% Min. Temp.: 86.7% Precipitation: 87.1% Snowfall: 87.1% Snow Depth: 54.6%%

Source: Western Regional Climate Center, wrcc@dri.edu

Geographic Setting

Butte is located in the Silver Bow Creek intermountain valley in southwestern Montana. Two of the PWS intakes are located in this valley and the other two are located a few miles south near the Big Hole Basin intermountain valley. Butte is flanked to the west by the Anaconda Range and to the south and east by the Highland Mountains. Generally, Tertiary mountain materials such as, gravel, sand, silt, clay, Boulder Batholith and some volcanic rock (latite and quartz) underlie the land in the Butte vicinity (Ross, 1955). Several different materials underlie the intakes themselves. An unconsolidated alluvium consisting of silt, sand, and gravel sediments underlies the Big Hole River. The South Fork Reservoir is underlain by a variety of sandstone and shale sediments. Both the Basin Creek Reservoir and Moulton Reservoir are underlain by the Boulder Batholith that is also found beneath Butte ([Figure 2](#)). Numerous springs and creeks flow through the area.

The Big Hole River flows east into the vicinity just south of Butte where the intake lies. Divide Creek is a tributary of this river and flows south to meet up with the Big Hole River. Yankee Doodle Creek flows into the Moulton Reservoir and then flows approximately one mile south to the Sandhouse Intake. Silver Bow Creek enters the Butte vicinity from the east, where several tributaries meet the Creek, then flows west where it converges with the Clark Fork River.

General Description of the Source Water

The Butte-Silver Bow Water Department obtains its water via four surface water intakes in the Butte vicinity ([Figure 3](#)). Intakes on the Big Hole River (Source 002) and off of the South Fork of Divide Creek Reservoir (Source 003) are located in the Big Hole watershed. The U.S. Geological Survey (U.S.G.S.) hydrologic unit code for this watershed is 10020004 and the area covered by the watershed is approximately 2,799 square miles. The remaining two intakes, the Basin Creek Reservoir (Source 004) and Moulton Reservoir (Source 005) are located in the Upper Clark Fork watershed. The U.S. Geological Survey hydrologic unit code for this watershed is 17010201 and the area covered is approximately 1,906 square miles.

The Big Hole River is a perennial stream. Stream flow data was obtained from U.S.G.S. gauging station 06024580, located on the Big Hole River near Wise River and upstream of the river intake area for Butte. Based on stream gauging data collected from 1979 to 1981, the mean monthly discharge at this station varies from 183 cubic feet per second (ft³/s) in September to 3,212 ft³/s in May (U.S.G.S.). Based on recorded data from U.S.G.S. gauging station 12323240, located on Basin Creek downstream of the Butte intake, between 1988 and 2001, the mean monthly discharge at this station varies from 8.95 ft³/s in September to 18.8 ft³/s in May. No stream flow data was available for either Divide Creek or Yankee Doodle Creek.

Geology

This section provides an overview of the geology and hydrology of the area in the vicinity of Butte. 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.

The following is primarily drawn from Kendy and Tresch (1996) and Groff (1980). The Big Hole Basin is north trending and located in southwestern Montana. This Basin contains most of the Big Hole River in the Butte vicinity. The Beaverhead Mountains bound it on the west, Anaconda Range on the north, Pioneer Mountains on the east, and the Big Hole Divide on the south. The basin was formed by east-west extension between rotating fault blocks.

Metasedimentary rocks surround the basin to the south and igneous intrusive rocks surround to the north. The Big Hole River intake lies just northeast of the basin. This area, within the northern Pioneer Mountains, is composed of Cretaceous to Tertiary granitic rocks that intrude the metasedimentary rocks of the Missoula Group. The Big Hole River itself is underlain by Quaternary alluvium, which consists of cobbles, gravel, sand, silt, and clay. These deposits tend to be coarser with depth. Stream water in the Big Hole River is typically a calcium bicarbonate or calcium sodium bicarbonate type. Due to mining in the area, the concentration of dissolved solids, including metals, increases during high flow (Kendy & Tresch, 1996).

Tertiary sediments are present at the base of the Pioneer Mountains, however they are mostly covered by glacial deposits. The South Fork of Divide Creek Reservoir intake is located along the eastern edge of the Pioneer Mountains in these sediments. These Tertiary and Cretaceous sediments include sandstone, siltstone, and mudstone with some limestone, marl, tuff, shale, and conglomerate. The flood plain of the Big Hole River contains numerous bogs and sloughs (Kendy & Tresch, 1996).

Basin Creek Reservoir and Moulton Creek Reservoir are both located in the Silver Bow Basin in southwestern Montana. The basin contains both reservoirs, the adjoining creeks, and the city of Butte. This basin is composed largely of Boulder batholith, a large igneous intrusion composed of the Butte Quartz Monzonite (granite). The batholith has been intruded by many small quartz and feldspar dikes as well as by the many metallic sediments that are the basis for the Butte Mining District. The batholith is overlain by volcanic rocks in the northwestern part and the south-central part is a broad valley filled with detritus derived from weathering of igneous rock. Other deposits of valley fill stand above modern flood plains as terraces that slope steeply down to the younger unconsolidated alluvium associated with modern streams. The bedrock has been cut by numerous faults and the valley is bounded on the east by the Continental Fault zone (Groff, MBMG).

A geologic map for the area is presented in [Figure 2](#).

The Public Water Supply

The Butte-Silver Bow Water Department 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 City of Butte receives water from three entry points: the Big Hole Treatment Plant, the Moulton Treatment Plant, and Basin Creek (DEQ, 1999). Treated water is then taken from these sources and distributed equally throughout Butte. Water use in Butte averages about 7 million gallons per day, with an average peak day use of 18 million gallons per day. Most of the peak demand is a result of unmetered irrigation practices.

The Big Hole Treatment Plant receives water from the Big Hole River and the South Fork Reservoir of Divide Creek and was put online December 28, 1994. Water from the river is pumped 10 miles through a 36-inch steel transmission main and water from the reservoir is gravity fed 3 miles through 24-inch steel transmission main to the treatment plant. Treated water is then pumped approximately 11 miles to storage and distribution through 36-inch steel transmission main. Peak production from the Big Hole Water Treatment Plant is 15 million gallons per day.

The Moulton Treatment Plant receives water only from the Moulton Reservoir and was put online in March of 1995. Water is gravity fed from the reservoir to the treatment plant located on the northern edge of the distribution system outside of Walkerville. The transmission main from the reservoir consists of approximately 1 mile of 12 inch PVC transmission main to the Sand House and another 4.5 miles of 16-inch steel transmission main from the Sand House to the treatment plant. Peak production for the Moulton Treatment Plant is 2 million gallons per day.

The Basin Creek Reservoir provides unfiltered surface water that is chlorinated and gravity fed through 7 miles of 24-inch steel transmission main to the south side of the distribution system. Peak withdrawal from the Basin Creek Reservoir is 7 million gallons per day.

The distribution system ranges over 1000 feet of elevation change, and involves seven pressure zones within the system. Service connection pressures range from 35 pounds per square inch (psi) to 160 psi. The pressure zones are isolated by valves, and the system is designed to maximize gravity flow from the Moulton and Basin Creek sources while limiting pumping requirements from the treated Big Hole and South Fork sources (DEQ 1999). The distribution system contains about 1.2 million feet of distribution mains, most of which were originally installed over 100 years ago. The Butte-Silver Bow Water Department has implemented a progressive main replacement project since 1992, which has reduced the number of leaks in the system significantly.

There are three main storage reservoirs within the distribution system including Colorado Hill, West Side, and High Service. The Colorado Hill reservoir was constructed in 1993 and has a 9 million-gallon (mg) capacity. West Side reservoir, constructed in 1990, has a 5mg capacity. The High Service reservoir, 2.24mg capacity, was constructed during the 1950's and has since been periodically cleaned and regularly inspected. The old Butchertown reservoir, constructed in 1995, was transformed into a clear well for the Moulton Water Treatment Plant.

Table 2 gives a detailed description of the treatment components and process. See Appendix A for a diagram of the Big Hole and Moulton treatment plants.

Table 2. List of Sources & Facilities for the Butte-Silver Bow Water Department PWS

Table 2A. Big Hole Water Treatment Plant

Facility	PWS Facility ID	Location	Description	Notes
Intake from Source 002	IN002	Big Hole River	Surface Water Intake (Active)	Pumped 44,000ft to treatment plant through 36" pipe
Intake from Source 003	IN003	South Fork Reservoir	Surface Water Intake (Active)	Gravity fed 13,000ft to treatment plant through 24" pipe
Raw Water Storage Pool		Just north of the Big Hole River Intake	Water from river dammed into pool	Fed to pumping station
Pumping Station	PF001	At Big Hole River Intake	Pumps water 10 miles to treatment plant	(5) 500HP vertical turbine pumps
Water Treatment Plant	TP001	11 miles south of storage and distribution system	16 MGD plant for IN002 and IN003	-----
Surge Basin	-----	Treatment plant TP001	300,000 gallon	Used for adequate mixing of coagulant chemicals/water and for flow balancing
Contact Adsorption Clarifiers (CAC's) (4)	-----	Treatment plant TP001	Equipped with 33 inches of plastic media	Water gravity fed from surge basin
Multimedia Filters (4)	-----	Treatment plant TP001	44-inch deep filters	Consists of anthracite, sand, garnet sand, garnet, and gravel
Clear Well	CW001	Treatment plant TP001	775,000 gallon	Chlorine added then water flows 11 miles to either the storage tank or distribution system
Colorado Hill Storage Tank	ST007	Butte	9,000,000 gallon capacity	Storage from Big Hole WTP
Distribution System	DS001	Throughout Butte	Distribution of water for consumption	-----

Table 2B. Moulton Water Treatment Plant

Facility	PWS Facility ID	Location	Description	Notes
Intake from Source 005	IN005	Moulton Reservoir	Surface Water Intake (Active)	Gravity fed 4 miles to treatment plant
Water Treatment Plant	TP005	Northeastern border of distribution system	2.5 MGD conventional plant for IN005	-----
Water Trains (2)	-----	Treatment Plant TP005	Addition of Nalco 8155 for coagulation	Transports water to floc tank
Circular Floc Tanks (4)	-----	Treatment Plant TP005	Two tanks per water train	Used for flocculation
Multimedia Filters (4)	-----	Treatment Plant TP005	4 filters contained in a circular basin	Filter flocculated water
Clearwell	CW002	Treatment Plant TP005	300,000 gallon	Water sent to distribution
Distribution System	DS001	Throughout Butte	Distribution of water for consumption	-----

Butte obtains its drinking water from four surface water supplies. As a result, the source water is classified as highly sensitive to contamination, in accordance with Montana Source Water Protection Program aquifer/source water sensitivity criteria (1999). These criteria are discussed in the next chapter.

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 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.

Background Butte Water Quality

Water quality data was collected to characterize background conditions of the Big Hole River and Basin Creek by the USGS Gauging station 06025500 located near Melrose. This data was used to provide background downstream water quality data for Big Hole River and South Fork Reservoir. Gauging station 12323240, located about 2.5 miles downstream of the Basin Creek intake was used for water quality data. No U.S.G.S. data was available for Moulton Reservoir. The data provided by USGS is found in Table 3. Routine sampling data taken by Butte can be found in Appendix B.

**Table 3. Water Quality Data
Big Hole River near Melrose (06025500) and Basin Creek (12323240)**

USGS Station ID	Date	Time	Water Temperature (Deg C) (00010)	Air Temperature (Deg C) (00020)	Instant Discharge (cfs) (00061)	Gage Height (feet) (00065)	Specific Conductance (us/cm) (00095)
06025500	08/20/2001	15:20	19.5	26.0	180	1.01	239
06025500	07/12/2001	16:34	20.0	26.0	415	1.58	195
06025500	05/31/2001	8:30	11.5	24.0	1450	2.71	119
06025500	04/17/2001	12:00	7.5	14.5	543	1.63	148
06025500	02/26/2001	11:00	0	0	263	1.46	195
06025500	01/18/2001	14:40	0	-1.0	332	1.59	201
06025500	12/04/2000	19:45	0	-4.0	295	1.34	199
06025500	10/03/2000	13:25	9.0	12.0	287	1.21	210
06025500	07/24/2000	14:10	19.0	27.0	267	1.20	210
06025500	60/13/2000	15:10	14.0	16.0		2.66	128
12323240	09/14/2001	12:20	13.0	26.0	8.7	0.94	416
12323240	08/28/2001	14:50	17.0	33.0	5.5	0.92	390
12323240	08/20/2001	10:45	12.5	21.5	5.1	1.01	387
12323240	08/07/2001	10:45	14.0	25.5	6.4	1.70	354
12323240	07/25/2001	16:40	19.5	30.5	7.0	1.65	365
12323240	07/16/2001	12:45	14.0	27.5	8.4	1.46	401
12323240	07/09/2001	12:35	14.5	26.5	6.6	1.29	395
12323240	06/26/2001	13:40	13.5	21.5	7.7	1.07	375
12323240	06/04/2001	12:40	10.5	14.0	17.0	1.23	335
12323240	04/25/2001	11:30	11.0	21.0	17.0	1.17	245

Further data is available for the Big Hole River gauging station, though it is somewhat old, and can be found in an extension of Table 3 on the following page.

Table 3
 Department
Water Quality Data
Big Hole River, near Melrose

SWDAR

USGS Station ID	Date	Time	Stream Flow (ft ³ /s) (00060)	Specific Conductance (us/cm) (00095)	Field pH (Standard units) (00400)	ANC Unfiltered Water (mg/L as HCO ₃) (00440)	Total Hardness (MG/L as CaCO ₃) (00900)	Diss. Calcium (mg/L as Ca) (00915)	Diss. Magnesium (mg/L as Mg) (00925)	Diss. Sodium (mg/L as Na) (00930)	Sodium Adsorption Ratio (00931)	Diss. Potassium (mg/L as K) (00935)
06025500	09/01/64	00:00	489	225	7.8	120	96	28	6.4	8.2	0.4	2.7
06025500	08/01/64	00:00	565	220	8.1	120	94	28	5.9	8.0	0.4	2.5
06025500	07/16/64	00:00	1210	164	7.2	88	69	20	4.6	5.8	0.3	1.9
06025500	07/01/64	00:00	2880	131	7.0	69	54	15	2.8	4.9	0.3	1.7
06025500	06/18/64	00:00	6820	106	7.2	56	44	13	2.8	4.8	0.3	1.7
06025500	06/01/64	00:00	6850	98	6.9	48	37	12	1.7	4.8	0.3	1.7
06025500	05/16/64	00:00	4340	80	6.8	36	28	8.1	1.9	3.8	0.3	1.5
06025500	05/01/64	00:00	1880	117	7.0	54	39	11	2.8	6.2	0.4	2.2
06025500	04/16/64	00:00	1460	147	7.1	72	51	15	3.3	8.0	0.5	3.2
06025500	04/01/64	00:00	582	150	7.0	72	52	16	2.9	7.0	0.4	3.8
06025500	03/18/64	00:00	366	200	7.7	100	81	22	6.3	8.1	0.4	2.5
06025500	03/04/64	00:00	341	198	7.0	100	81	22	6.3	7.9	0.4	2.1

USGS Station ID	Date	Time	Diss. Chloride (mg/L as Cl) (00940)	Diss. Sulfate (MG/L as SO ₄) (00945)	Diss. Fluoride (mg/L as F) (00950)	Diss. Silica (mg/L as SiO ₂) (00955)	Diss. Boron (ug/L as B) (01020)	Diss. Solids Residue (mg/L) (70300)	Diss. Solids, (Tons per day) (70302)	Diss. Nitrogen, Nitrate (mg/L as NO ₃) (71851)	Diss. Bromide (mg/L as Br) (71870)	Iron (Ug/L as Fe) (71885)
06025500	09/01/64	00:00	2.4	13.0	0.2	15	20	142	187	0.2	0.15	20
06025500	08/01/64	00:00	2.3	13.0	0.2	16	20	136	207	0.2	0.15	20
06025500	07/16/64	00:00	1.4	9.5	0.2	15	10	105	344	0.1	0.15	0
06025500	07/01/64	00:00	1.4	7.5	0.1	16	20	92	715	0.4	0.17	20
06025500	06/18/64	00:00	1.4	7.0	0.1	15	30	80	1470	0.3	0.18	60
06025500	06/01/64	00:00	1.4	8.0	0.1	14	30	83	1530	0.4	0.21	30
06025500	05/16/64	00:00	1.7	7.5	0.1	14	10	78	913	0.3	0.22	40
06025500	05/01/64	00:00	2.2	9.8	0.1	17	30	95	482	0.0	0.24	60
06025500	04/16/64	00:00	2.7	11.0	0.1	18	20	109	429	0.3	0.24	50
06025500	04/01/64	00:00	2.7	9.8	0.1	17	20	111	174	0.4	0.21	50
06025500	03/18/64	00:00	2.2	13.0	0.2	20	30	133	131	0.1	0.17	10
06025500	03/04/64	00:00	2.2	14.0	0.2	19	30	128	118	0.3	0.17	10

*Note: USGS Station 06025500 is located downgradient of the intake but still provides some helpful water quality information.

The State of Montana classifies the Big Hole River as A-1 surface water. A-1 surface waters are to be maintained suitable for drinking, culinary, and food processing purposes after conventional treatment for removal of naturally present impurities. Water quality must be maintained suitable for bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.

The State of Montana classifies the South Fork of Divide Creek as B-1 surface water. B-1 surface waters are to be maintained as suitable for drinking, culinary, and food processing purposes after conventional treatment. These waters must also be maintained as suitable for bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply.

The State of Montana classifies Basin Creek and Yankee Doodle Creek (with Moulton Reservoir) as A-Closed surface waters. A-Closed surface waters are to be maintained suitable for drinking, culinary, and food processing purposes after simple disinfection. Water quality is to be maintained suitable for swimming, recreation, growth, and propagation of fishes and associated aquatic life. This and the above surface water classifications are pursuant to the Administrative Rules of Montana 17.30.600-.625.

The entire segment of the Big Hole River between Divide Creek and Pintlar Creek appears on the Montana 2000 303(d) list as fully supporting agriculture and industry but only partially supporting recreation, as well as not supporting drinking water supply, aquatic life support, or cold water fishery (trout). The probable causes include copper, dewatering, fish habitat degradation, flow alteration, lead, metals, thermal modifications, riparian degradation, and other habitat alterations. The probable sources include agriculture, resource extraction (mining), grazing (pasture and range), and construction (roads and bridges).

Butte-Silver Bow Water Department PWS Water Quality

According to the DEQ PWS Database, there have been no detections of coliform or fecal coliform bacteria in the drinking water within the past five years. Within the past five years, the level of nitrate plus nitrite has not been detected at the Big Hole Treatment Plant, ranged from 0 mg/L to 0.07 mg/L at the Basin Creek treatment facility, and ranged from 0 mg/L to 0.16 mg/L at the Moulton Treatment Plant, all concentration being well below the MCL of 10 mg/L (SDWIS). See Appendix B for a detailed description of this data.

CHAPTER 2 DELINEATION

The source water protection area, the land area that contributes water to the Butte-Silver Bow Water Department public water supply surface water intakes, is delineated in this chapter. The purpose of delineation is to map the source of Butte's drinking water and to define areas within which to prioritize source water protection efforts.

Source water protection areas for surface water sources are subdivided into Spill Response and Watershed Regions, each with separate management goals. The Spill Response Region encompasses an area upstream of the Butte-Silver Bow Water Department intakes in which contaminants can be drawn into the intake with little lag time. The Watershed Region encompasses the entire area of the watershed upstream of the Butte intakes.

Hydrogeologic Conditions

The Big Hole River begins in the mountains south of the Big Hole Basin, and gains water from numerous tributaries during its northward flow (Kendy & Tresch, 1996). The watersheds surrounding the Big Hole River and the South Fork Reservoir eventually drain into the Missouri River. The watersheds surrounding Basin Creek and Moulton Reservoir eventually drain into Silverbow Creek which later drains into the Clark Fork River. Snowmelt, direct precipitation, surface runoff, and lateral inflow from alluvial and bedrock aquifers contribute to flow in these surface water sources.

Using DEQ Source Water Protection Program criteria for ranking aquifer/source water sensitivity (Table 4 below), the Butte-Silver Bow Water Department PWS source water is considered highly sensitive to contamination. The sensitivity ranking is a result of the surface water sources for the Butte-Silver Bow PWS.

Table 4. Source water sensitivity criteria (DEQ, 1999).

Source Water Sensitivity
High Source Water Sensitivity <u>Surface water</u> 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

If spilled or discharged directly into one of the four surface water bodies used by the Butte-Silver Bow Water Department PWS or into one of their immediate surrounding tributaries upstream of the Butte-Silver Bow PWS source intakes, contaminants may reach that surface water intake before plant operators can close/isolate them. Contaminants derived from sources farther removed from the river throughout the watershed may be flushed into tributaries and the main stream channels during spring snowmelt or storm events, or may infiltrate aquifers which discharge to the surface waters via hydraulic connections. Contaminants in groundwater can also enter the surface water sources in areas where it is hydraulically connected to sub-surface sediments.

Delineation Results

Spill Response Regions

The Spill Response Region for the Big Hole River extends ½ mile downstream and approximately 10 miles upstream of the intake (Based on DEQ SWPP Criteria, 1999). The junction point of the Big Hole River and the Wise River is included in the spill response region due to its close proximity to the intake and potential for contamination. The width of the region extends ½ mile surrounding either side of the Big Hole River ([Figure 4](#)).

The Spill Response Region for the South Fork Reservoir is combined with the Watershed Region and includes all tributaries upstream of the intake and extends ½ mile downstream ([Figure 5](#)). The two regions were combined due to the small size of the area and the limited number of tributaries.

The Spill Response Region for the Basin Creek Reservoir extends ½ mile downstream and the entire remaining segment upstream of the intake ([Figure 6](#)). The width of the region extends ½ mile surrounding either side of the Creek.

The Spill Response Region for the Moulton Reservoir was also combined with the Watershed Region due to a lack of tributaries and the very small size of the overall area. The region extends ½ mile downstream of the reservoir and the entire segment upstream of the reservoir ([Figure 7](#)).

Watershed Regions

The Watershed Region for the Big Hole River intake encompasses a major portion of the Big Hole watershed upstream of the intake ([Figure 8](#)). The region extends several miles west of the intake area and includes the Wise River, Pattengail Creek, Seymour Creek, West Fork Fishtrap Creek, and Pintler Creek along with the smaller tributaries that feed into these rivers and creeks.

The Watershed Region for the Basin Creek Reservoir intake encompasses the entire portion of the Upper Clark Fork watershed upstream of the intake ([Figure 9](#)). The region extends only a few miles south of the intake and includes all of the smaller tributaries that feed into the Basin Creek and reservoir.

A map of all Watershed and Spill Response Regions relative to each other is found on [Figure 10](#).

Limiting Factors

The delineations for the Butte-Silver Bow PWS Spill Response Regions and Watershed Regions 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 little lag time. Numerous assumptions are associated with these Source Water Protection Program (SWPP) criteria for Spill Response Region delineations. Contaminant transport rates and concentrations will vary depending on stream/river flow conditions, ground water 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, adsorption, precipitation, oxidation, complexation, and volatilization. As a result, some areas within the Spill Response Regions 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 Butte-Silver Bow Water Department 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 and land types where potential contaminants are generated, used, stored, transported, or disposed. Additionally, the inventory identifies potential sources of all primary drinking water contaminants and pathogens. Only significant potential contaminant sources were selected for detailed inventory. The most significant contaminants posing potential threats to the Butte PWS include nitrate, pathogens, herbicides, pesticides, fuels, and metals. The inventory for the Butte PWS also focuses on all activities in the Spill Response Regions, as well as general land uses and large potential contaminant sources in the Watershed Regions.

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

Inventory Results/Spill Response Regions

Table 5 presents the list of potential contaminant sources within the Spill Response Region. [Figure 11](#) identifies the locations of potential contaminant sources (point sources) in the Big Hole River Spill Response Region. Figures [12](#), [13](#), and [14](#) identify the locations of potential contaminant sources in South Fork Reservoir, Basin Creek Reservoir, and Moulton Reservoir Spill Response and Watershed Regions respectively. Spills of fertilizers, pesticides, volatile organic compounds (VOCs), and synthetic organic compounds (SOCs) could occur along the highway within some of the Spill Response Regions. Nearby mines may contribute contaminants to the intake areas. USTs are located within the Big Hole River Spill Response Region. Grazing and logging also take place in the area, and there may be occasional human trespassing. The city of Butte is not located in any of the Watershed or Spill Response Regions and as such the facilities in Butte are not considered significant potential contaminant sources.

The principal overall land cover in the four Spill Response Regions is forest (63%), but there is also a significant amount of grassland (17%) and shrubland (11%), along with some agricultural land (6%) and open water (2%). The percentages for each of the four individual regions vary and can be found in Figures [15](#), [16](#), [17](#), and [18](#) in greater detail. Activities on agricultural land pose a low potential threat to the Butte-Silver Bow PWS because cultivated hay and cropland occupies only approximately six percent of the Spill Response Regions.

Low densities of private septic systems occur over all four Spill Response Regions. However, there are areas of both high and medium septic density in the Big Hole River and Basin Creek Reservoir Spill Response Regions. The Big Hole River is in an area of 0.008% high, 1.911% moderate, and 98.080% low density ([Figure 19](#)). The Basin Creek Reservoir is in an area of 0.043% high and 99.957% low density ([Figure 20](#)). Although the area is for the most part low density, there are several private septic systems in the area used to treat and dispose of sanitary waste. Both the South Fork Reservoir and Moulton Reservoir Spill Response Regions are located in a region of 100% low septic density. The entire portion of the Butte municipal sewer system is located outside of the Spill Response Region and is not a significant potential contaminant source. No concentrated animal feeding operations are located in the Spill Response Region,

however there is some grazing activity along the banks of the Big Hole River and grazing areas along Basin Creek.

Table 5. Significant Potential Contaminant Sources in the Butte-Silver Bow Water Department PWS Spill Response Regions

Potential Contaminant Source	Figure/Map ID#	Potential Contaminants	Hazard
Cultivated Cropland	Figure 15	Fertilizers, pesticides, pathogens, nitrates	Spills, over application, surface runoff
Transportation Routes: State Highway 43	Figure 11 8	Pesticides, fertilizers, VOCs, nitrates, pathogens	Spills, storm water runoff, infiltration into ground water
USTs/LUSTs: Wise River Club (inactive - leak) Wise River Store (active – no leak)	Figure 11 7 6	VOCs, petroleum hydrocarbons	Spills, leaks impacting groundwater and reaching surface water
Animal Grazing		Nitrates, pathogens	Animal feces entering the surface water
Area Septic Systems	Figure 19 & 20	Nitrates, 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
Landfill: Wise River Dump (closed 3/21/94)	Figure 11 5	VOCs, SOCs, metals, nitrates, pathogens	Contaminants discharging into surface water via groundwater
Quarries/Mines: Churchill Dewey Harrison Abandoned Fleecer Mountain Area Fish Creek Highlands Bonanza Lode Superfund Site	Figure 11 3 2 4 1 Figure 12 1 Figure 13 2 1 Figure 14 1	Metals: Lead, gold, silver, zinc stone gold, silver, bismuth, tellurium metals phosphate, uranium, fluorine silver, copper gold copper, silver, gold, zinc metals	Erosion and mobilization of metals in sediment and/or leached into surface water and groundwater
Assorted Businesses in Wise River	Appendix D	VOCs, SOCs, petroleum hydrocarbons, metals, pathogens, nitrates	Releases or spills, mishandling of chemicals, improper disposal of chemicals anywhere near the Jefferson River

There is also a federal superfund site located in the Moulton Reservoir Spill Response/Watershed Region ([Figure 14](#)). This site is a portion of the larger Silver Bow Creek superfund site and federal funds have been used to clean up the creek for over 20 years. Contamination is a result of over 100 years of mining and processing operations in the area. The primary contaminants of concern in this area include arsenic, cadmium, copper, lead, and zinc. However, water quality data from Moulton Reservoir indicates that concentrations of these contaminants are well below the Environmental Protection Agency mandated maximum contaminant level (Appendix B).

Inventory Results/Watershed Region

The Watershed Region for the Big Hole River intake includes only the area upstream of the river and the intake area (Figure 8). Potential contaminant point sources are located throughout the region (Figure 21). Spills of fertilizers, pesticides, volatile organic compounds (VOCs), and synthetic organic compounds (SOCs) could occur along the highways and roads within the Watershed Region. As in the Spill Response Region, there are a large number of mines in the area. In addition to the mines, the town of Wise River contains a number of potential contaminant sources; a full listing of the business in and around this town was compiled based on SIC codes and is present in Appendix C. The Watershed Region for the Basin Creek Reservoir extends only a few miles further east and west than the Spill Response Region (Figure 13). In addition to those potential contaminants present in the Spill Response Region, there are several additional mines in the Watershed Region as well as a Comprehensive Environmental Cleanup and Responsibility Act (CECRA) site.

Predominant land covers in the Big Hole and Basin Creek Watershed Regions include forest (67%), grassland (19%), shrubland (9%), and agricultural land (2%), as well as some wetlands, transitional land, bare rock, and open water. Land cover percentages for each of the two Watershed Regions vary and can be found in Figures 22 & 23.

Low septic densities occur over both Watershed Regions. However, there are small areas of both high (0.008%) and moderate (2.198 %) septic density in the Big Hole Watershed and an area of high (0.029%) septic density in the Basin Creek Watershed. There are no municipal sewer systems located inside of either of these Watershed Regions. No concentrated animal feeding operations are located in these Watershed Region but, as mentioned before, some grazing takes place along the banks of the river and creek.

Figure 24 is a detailed tabular and graphical summary of all land use within the Spill Response Regions and within the Watershed Regions. Table 6 below summarizes septic density in the Spill Response Regions and within the Watershed Regions.

Table 6. Septic Density Analysis for Inventoried Areas of Butte PWS

<u>Big Hole Spill Response Region</u>		
Hazard Ranking	Square Meters	% Total in Region
High	2,580.650	0.008%
Moderate	606,452.835	1.912%
Low	31,112,320.779	98.080%
Totals	31,721,354.264	100.00%

Table 6. Septic Density Analysis for Inventoried Areas of Butte PWS

<u>South Fork Reservoir Spill Response Region & Watershed Region</u>		
Hazard Ranking	Square Meters	% Total in Region
Low	19,122,270.536	100.000%
Totals	19,122,270.536	100.000%
<u>Basin Creek Spill Response Region</u>		
Hazard Ranking	Square Meters	% Total in Region
High	11,561.314	0.043%
Low	26,660,849.614	99.957%
Totals	26,672,410.928	100.000%
<u>Moulton Reservoir Spill Response Region & Watershed Region</u>		
Hazard Ranking	Square Meters	% Total in Region
Low	13,297,988	100.000%
Totals	13,297,988	100.000%
<u>Big Hole Watershed Region</u>		
Hazard Ranking	Square Meters	% Total in Region
High	2,580.650	0.002%
Moderate	683,872.346	0.353%
Low	192,813,291.880	99.645%
Totals	193,499,744.876	100.00%
<u>Basin Creek Watershed Region</u>		
Hazard Ranking	Square Meters	% Total in Region
High	11,561.314	0.029%
Low	39,878,274.718	99.971%
Totals	39,889,836.020	100.000%

Potential contaminant sources in the Watershed Region are very similar to those found in the Spill Response Region with some additions. Table 7 summarizes these contaminants.

**Table 7. Significant Potential contaminant sources in the Watershed Region
Butte-Silver Bow Water Department PWS**

Potential Source	Potential Contaminants	Hazard
Cultivated Cropland	Fertilizers, pesticides, pathogens, nitrate	Spills, over application, surface runoff
Highways and Roads	Pesticides, fertilizers, VOCs, other	Spills, storm water runoff, infiltration into ground water
USTs/LUSTs	VOCs, petroleum hydrocarbons	Spills, leaks impacting groundwater and or reaching surface water
Animal Grazing	Nitrates, pathogens	Animal feces entering the surface water
Area Septic Systems	Nitrates, pathogens	Leaks in septic tank, leaks in collection lines, system failure, infiltration of untreated effluent into shallow ground water, which may in turn reach surface water
Mines	Metals	Erosion and mobilization of metals in sediment and/or leached into surface water and groundwater
Landfills	VOCs, nitrates, pathogens, metals	Contaminated groundwater discharging to surface water
Assorted businesses in Wise River	VOCs, SOCs, metals, pathogens, nitrate	Releases or spills, mishandling of chemicals, improper disposal of chemicals anywhere near the lake

The CECRA State Superfund site located in the southern portion of the Moulton Reservoir intake watershed is between 21 and 50 acres in area and found in the Beaverhead National Forest around the Elkhorn Mine. The mine and mill in the area have since been abandoned and the area has been remediated.

Inventory Update

To make this SWDAR a useful document for the Butte-Silver Bow Water Department in the years to come, the owners, manager, or the certified water system operator(s) for the public water supply 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 updated 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 this 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 Butte-Silver Bow Water Department 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 Regions in order to guide management actions undertaken by local entities, in this case Butte-Silver Bow Water Department and Silver Bow County.

The goal of source water management is to protect the source water, manage significant potential contaminant sources in the Spill Response Regions, and ensure that land use activities in the Watershed Regions pose minimal threats to the source water. Management priorities in the Spill Response Regions 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 Butte-Silver Bow PWS owner and operators 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 intakes. Barriers can be anything that decrease the likelihood that contaminated water will reach Butte 's surface water intakes. 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 a well intake can be natural barriers.

Table 8. 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

The hazard presented by point source contaminants in the Butte-Silver Bow Spill Response Regions depends on whether contaminants can discharge directly to the Big Hole River, South Creek Reservoir, Basin Creek Reservoir, or Moulton Reservoir. Point source hazard is also dependent on the health affects associated with potential contaminants (Table 9).

Table 9. Hazard of Potential Contaminant Sources, Determination 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
Cropped Agricultural Land (percent land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region

Susceptibility ratings are presented individually for each significant potential contaminant source and each associated contaminant (Table 10).

Table 10. Susceptibility Assessment Results
Significant Potential Contaminant Sources in the Spill Response and Watershed Regions
Butte-Silver Bow Water Department PWS surface water intakes

Source	Contaminant	Hazard	Hazard Rating	Barriers	Susceptibility	Management Recommendations
State Highway 43	Pesticides, fertilizers, VOCs	Spills, storm water runoff, infiltration directly to surface water	High	None	Very High	Maintain preparedness of local emergency personnel through active training, storm water diversion
Mines	Metals	Contaminants spreading to surface water	High	None	Very High	Monitor to ensure proper site management
Animal Grazing	Nitrates, pathogens	Contaminants discharging directly to surface water	High		Very High	Ensure continued maintenance of the fence line; monitor site
Landfill	Pathogens, nitrates, VOCs, metals	Contaminants discharging to surface water directly or via groundwater	High	Landfill properly closed, groundwater and soils monitored	Moderate	Ensure proper maintenance and operation of systems; monitor site
USTs/LUSTs	VOCs, petroleum hydrocarbons	leaks, spills discharging directly to river or via groundwater	Low	None	Moderate	Spill response planning, tank and groundwater monitoring, spill containment, active and ongoing remediation of spill sites
Area Septic Systems	Pathogens, nitrate	Leaks in septic tank, leaks in collection line, system failure, infiltration of untreated sewage into groundwater	Low	None	Moderate	Educate public on proper maintenance and replacement of on-site systems; promote advanced treatment systems; annex into City sewer district
Cropped Agricultural Land	Nitrates and pathogens	Contaminants to surface water via runoff or irrigation return flows	Low	None	Moderate	Use best management practices
Assorted businesses in Wise River	Pathogens, nitrates, VOCs, SOCs, metals	Releases or spills, mishandling of chemicals, improper disposal of chemicals anywhere near the Big Hole River	Low	Distance from intake	Low	Develop and implement emergency spill response plan

Table 10, above, displays the susceptibility assessment results for the Butte-Silver Bow Water Department PWS surface water intakes. The PWS's four intakes are susceptible to a number of different contaminants, including pathogens, nitrates, fertilizers, pesticides, VOCs, petroleum hydrocarbons, and total dissolved solids. The above assessment addresses both the Spill Response Regions and the Watershed Regions for the Butte PWS.

It should be noted that the United States Forest Service or Butte-Silverbow County owns over 90% of the forested land and as such timber harvesting is very limited. It was also noted that most of the timber in the forest is unsuitable for harvesting.

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

Highway 43 and other roads near the river and reservoirs – The potential hazard imposed by pesticides, fertilizers, VOCs, and SOCs originating from releases along these roads is high. This is because there is potential for a spill originating on or near the roadways to discharge directly into the Jefferson River near or upstream from the Big Hole River surface water intake. The susceptibility of the Butte PWS to contaminants originating from this source is considered to be very high as there appear to be no barriers to contamination.

Quarries/Mines – The potential hazard imposed by metals originating from the area mines is high. There are many mines in the area surrounding all four intakes, which have the potential of leaking directly into the surface water. There are no barriers so the susceptibility to the PWS is very high.

Underground Storage Tanks (USTs) – The potential hazard imposed by petroleum leaks from these sites is high due to the close proximity of the tanks and their ability to discharge contaminants via contaminated ground water into the Big Hole River surface water. The susceptibility of the Big Hole River intake to these tanks is moderate, as there are no barriers.

Landfill – The potential hazard imposed by pathogens, nitrates, VOCs, and metals is high due to the very close proximity to the Big Hole River and the ability for direct discharge. The susceptibility of the PWS to this landfill is moderate with the presence of one barrier.

Animal Grazing – The potential hazard imposed by nitrates and pathogens from the area cattle is high due to the ability for direct discharge into the surface water. The susceptibility of the Big Hole River intake to this grazing is very high, as there are no distinct barriers.

The Butte-Silver Bow Water Department PWS has a low susceptibility to the remaining significant sources listed in Table 10 above. The hazard they pose is thought to be low and there appear to be some barriers that reduce the susceptibility. 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 on the following pages.

Management Recommendations

Management recommendations are included in the susceptibility table for the Butte PWS (Table 10). If these management recommendations are implemented, they may be considered additional barriers that will reduce the susceptibility of Butte's intake to specific sources and contaminants.

Management recommendations fall into the following categories:

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

Advanced Septic Treatment Systems – Installation of these systems such as sand filters can limit contamination from new rural residential development.

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.

Stormwater management – Stormwater planning should address source and drainage control. Source control can be accomplished through educational programs focussing 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 that could potentially reach the lake.

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.

These management recommendations should be considered by the Butte-Silver Bow Water Department PWS operator, the city administration, and the Silver Bow County administration. Should contamination reach the town's intake, the City and County will likely need to work cooperatively to address remediation or relocation of the Butte PWS source.

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.

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 miles 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 miles 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. 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, also 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 a 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.

Susceptibility Waiver for Surface Water

Many surface water bodies are locally recharged by local precipitation. In general, residence time in local surface water bodies such as streams and narrow lakes is considered small, as the water moves through the new system rather quickly. Water contained in large lakes and reservoirs may have variable residence times based on seasonal turnover, temperature inversions, stagnant depths or isolated reaches of the lake water, and throughput of water in the water body. Similar water chemistry often exists between shallow unconfined groundwater and surface water, and physical parameters and dissolved constituents can be indicators 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. Alternately, surface water bodies directly or indirectly receives a considerable percentage of their water from groundwater. Therefore, surface water can be susceptible to contamination by organic chemicals migrating from groundwater into the surface water.

The objective of the susceptibility waiver application is to assess the potential of organic chemical migration of contaminants into surface water that is used as a source. The general procedures make use of a combination of site-specific information pertaining to the location and construction of the water source development, monitoring history of the source, geologic/hydrologic characteristics of the source water, and chemical characteristics of the organic chemicals pertaining to their mobility and persistence in the environment. The area of contribution to the surface water body at the PWS intake must be defined and plotted. This should describe the water flow directions, stream discharge and velocity, and residence time of water in the stream, lake, or reservoir (if the information is available). All surface bodies within 1,000 feet of the PWS intake(s) must be plotted. The Montana DEQ Source Water Protection Program typically will delineate and assess a larger (more conservative) area called a Spill

Response Region or a Watershed Region that extends at least 0.5 miles downstream and approximately 10 miles upstream of the PWS surface water intake. It encloses the shoreline of any lakes along the length of the region. The width of the region extends ½ mile surrounding any lakes and on either side of the primary stream tributaries. Analytical monitoring history of the PWS intake should also be provided as part of the susceptibility waiver application.

Waiver Recommendation

Currently, Butte-Silver Bow Water Department has phase 2 and 5 inorganic waivers for: 1) the treatment plant for the Big Hole River and South Fork, 2) the treatment plant for Basin Creek, and 3) the treatment plant for Moulton Reservoir. Based on past monitoring results and the susceptibility assessment of the Butte PWS intake, the Butte-Silver Bow Water Department may be eligible for additional monitoring waivers. For monitoring waiver consideration, the Butte-Silver Bow Water Department PWS should submit a letter to DEQ requesting monitoring waivers. The PWS also needs to provide additional information to DEQ regarding chemical use within the Spill Response Regions.

REFERENCES

- Board of Water Well Contractors, Administrative Rules of Montana, 01/30/2001. 36.21.656-.660
- Cheney, Roberta Carkeek, 1983. Names on the Face of Montana – The Story of Montana’s Place Names. Mountain Press Publishing Company.
- Department of Environmental Quality, 1999. Montana Source Water Protection Program, Approved by EPA in November 1999, inclusive of personal communications with Joe Meek & others.
- Environet Watershed Information, 2000 TMDL List, 2000. <http://nris.state.mt.us/wis/environet/>
- Groff, S. L., Ph.D. 1980 State Geologists Comment on Geology for Planning in the Butte-Silver Bow Planning Area. MBMG Open file report 58, Montana Bureau of Mines and Geology.
- Heath, Ralph C., 1984. Ground-water Regions of the United States, U.S. Geological Survey, Water Supply Paper 2242, Washington D.C., 78p.
- Kendy, Eloise and Tresch, Ruth E., 1996. Geographic, Geologic, and Hydrologic Summaries of Intermontane Basins of the Northern Rocky Mountains, Montana. U.S. Department of the Interior, U.S. Geological Survey.
- Montana Bureau of Mines and Geology tabular well information, 2000: <http://mbmgsun.mtech.edu/> & <http://mbmgwic.mtech.edu/>
- Montana Department of Environmental Quality, Permitting & Compliance Division and the Drinking Water Assistance Program - Montana Water Center: Ground Water Manual for Small Water Systems, January 1999.
- Montana State Library - Natural Resource Information Service, 2000. Graphical and tabular information: <http://nris.state.mt.us/mapper/>
- Montana State Library - Natural Resources Information System (NRIS) 2000 map base of the USGS Topographical coverage at 1:24,000 scale in MrSID format.
- Permitting & Compliance Division of the Department of Environmental Quality, 12/13/1999. Sanitary Survey for Butte-Silver Bow Water Department PWS – PWS # 02916
- Ross, Clyde; Andrews, David; and Witkind, Irving. 1955. Geologic Map of Montana, Montana Bureau of Mines and Geology Groundwater.
- U. S. Environmental Protection Agency (US EPA) Federal Superfund Site Description, 2002: <http://www.epa.gov/superfund/sites/>
- U. S. Environmental Protection Agency (US EPA), 1991. Manual of Small Public Water Supply Systems, US EPA Office of Water (WH-550), EPA 570/9-91-003.
- U.S. Geological Survey, 2000. National Landcover Dataset, Montana. 30-meter electronic digital landcover / land use data set interpreted from satellite imagery.

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.

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).

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.

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>

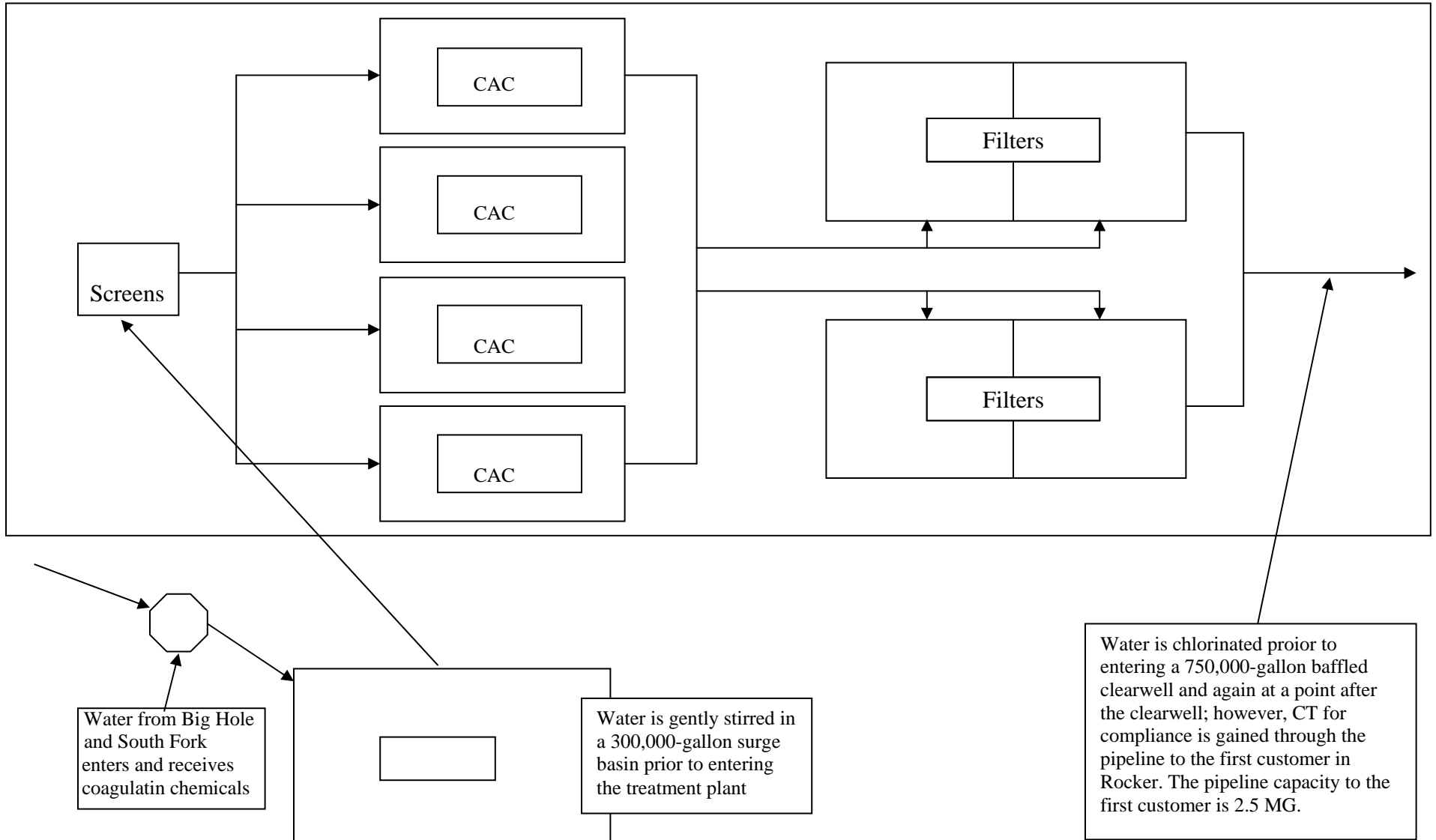
The definition for Standard Industrial Classification Code was adapted from:

[EPA/Office of Enforcement and Compliance Assurance: Guide to Environmental Issues: Glossary of Terms & Acronyms *Term Detail*](#))

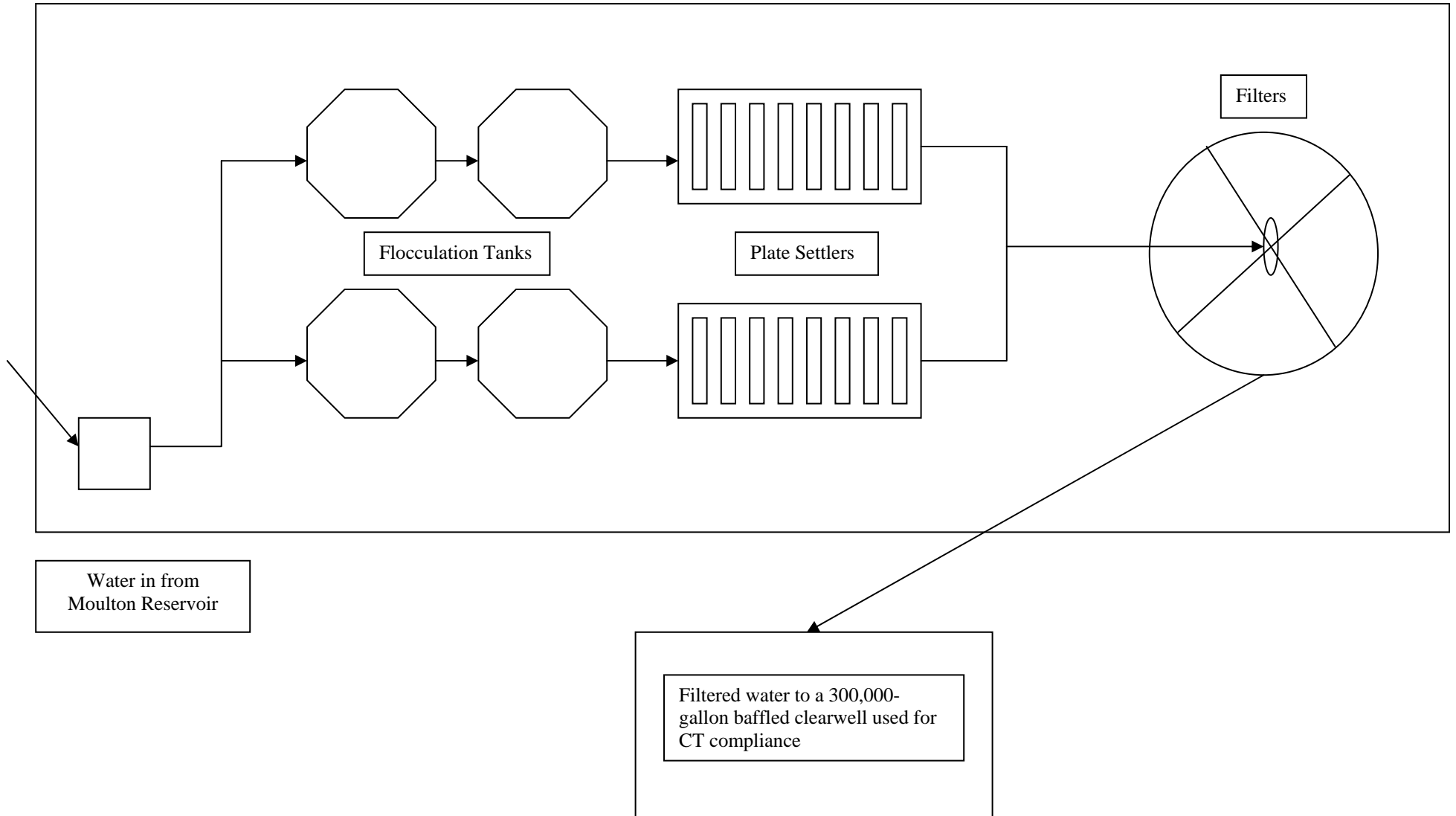
APPENDICES

APPENDIX A

Big Hole Water Treatment Plant (No Scale)



Moulton Water Treatment Plant (No Scale)



APPENDIX B

DEQ PWS's Database Output

Chemical	2001	2000	1999	1998	1997
Trichloroethane	07/31/01	03/19/01	09/16/99	05/07/98	05/13/97
Big Hole TP	0 mg/L	0 mg/L	0 mg/L	0 mg/L	0 mg/L
Basin Creek TP	0 mg/L	0 mg/L	0 mg/L	0 mg/L	0 mg/L
Moulton TP	0 mg/L	0 mg/L	0 mg/L	0 mg/L	0 mg/L
Antimony				05/07/98	03/10/97
Big Hole TP	-----	-----	-----	0 mg/L	0 mg/L
Basin Creek TP				0 mg/L	0 mg/L
Moulton TP				0 mg/L	0 mg/L
Arsenic	02/27/01	06/01/00	09/16/99	08/20/98	03/10/97
Big Hole TP	0 mg/L	0 mg/L	0 mg/L	0 mg/L	0 mg/L
Basin Creek TP	0 mg/L	0 mg/L	0 mg/L	0 mg/L	0 mg/L
Moulton TP	0 mg/L	0 mg/L	0 mg/L	0 mg/L	0 mg/L
Barium				05/07/98	03/10/97
Big Hole TP	-----	-----	-----	0 mg/L	0 mg/L
Basin Creek TP				0 mg/L	0 mg/L
Moulton TP				0 mg/L	0 mg/L
Beryllium				05/07/98	03/10/97
Big Hole TP	-----	-----	-----	0 mg/L	0 mg/L
Basin Creek TP				0 mg/L	0 mg/L
Moulton TP				0 mg/L	0 mg/L
Cadmium				05/07/98	03/10/97
Big Hole TP	-----	-----	-----	0 mg/L	0 mg/L
Basin Creek TP				0 mg/L	0 mg/L
Moulton TP				0 mg/L	0 mg/L
Chromium				05/07/98	03/10/97
Big Hole TP	-----	-----	-----	0 mg/L	0 mg/L
Basin Creek TP				0 mg/L	0 mg/L
Moulton TP				0 mg/L	0 mg/L
Dinoseb		09/12/00	06/01/00	05/07/98	03/10/97
Big Hole TP	-----	0 mg/L	0 mg/L	0 mg/L	0 mg/L
Basin Creek TP		0 mg/L	0 mg/L	0 mg/L	0 mg/L
Moulton TP		0 mg/L	0 mg/L	0 mg/L	0 mg/L
Fluoride				05/07/98	03/10/97
Big Hole TP	-----	-----	-----	0 mg/L	0.11 mg/L
Basin Creek TP				0 mg/L	0.11 mg/L
Moulton TP				0 mg/L	0 mg/L
Mercury				05/07/98	03/10/97
Big Hole TP	-----	-----	-----	0 mg/L	0 mg/L
Basin Creek TP				0 mg/L	0 mg/L
Moulton TP				0 mg/L	0 mg/L
Nickel				05/07/98	03/10/97
Big Hole TP	-----	-----	-----	0 mg/L	0 mg/L
Basin Creek TP				0 mg/L	0 mg/L
Moulton TP				0 mg/L	0 mg/L

Chemical	2001	2000	1999	1998	1997
Nitrate + Nitrite					
Big Hole TP	02/27/01 0 mg/L	09/12/00	09/16/99 0 mg/L	05/07/98 0 mg/L	03/10/97 0 mg/L
Basin Creek TP	0.07 mg/L		0 mg/L	0 mg/L	0 mg/L
Moulton TP	0.13 mg/L	0 mg/L	0 mg/L	0.07 mg/L	0.16 mg/L
Oxamyl					
Big Hole TP	-----	09/12/00 0 mg/L	06/06/00 0 mg/L	05/07/98 0 mg/L	03/10/97 0 mg/L
Basin Creek TP		0 mg/L	0 mg/L	0 mg/L	0 mg/L
Moulton TP		0 mg/L	0 mg/L	0 mg/L	0 mg/L
PCB					
Big Hole TP	-----	-----	-----	06/18/98 0 mg/L	05/28/97 0 mg/L
Basin Creek TP				0 mg/L	0 mg/L
Moulton TP				0 mg/L	0 mg/L
Selenium					
Big Hole TP	-----	-----	-----	05/07/98 0 mg/L	03/10/97 0 mg/L
Basin Creek TP				0 mg/L	0 mg/L
Moulton TP				0 mg/L	0 mg/L
Simazine					
Big Hole TP	05/09/01 0 mg/L	06/01/00 0 mg/L	09/16/99 0 mg/L	05/07/98 0 mg/L	05/28/97 0 mg/L
Basin Creek TP	0 mg/L	0 mg/L	0 mg/L	0 mg/L	0 mg/L
Moulton TP	0 mg/L	0 mg/L	0 mg/L	0 mg/L	0 mg/L
Thallium					
Big Hole TP	-----	-----	-----	05/07/98 0 mg/L	03/10/97 0 mg/L
Basin Creek TP				0 mg/L	0 mg/L
Moulton TP				0 mg/L	0 mg/L

* Note: There was no detection of coliform or fecal coliform in the last five years.

* ----- indicates that no sample was taken

APPENDIX C

Listing of Potential Contaminant Sources by SIC Code & Other Sources

Name	Address	City	State	Zip	Phone	SIC 1	SIC 2	SIC 3	SIC 4	Latitude	Longitude
Anderson Auction Svc	515 Fish Trap Rd	Wise River	MT	59762	689-3618	738901				45.786480	-113.09208
Complete Fly Fisher	Highway 43	Wise River	MT	59762	832-3175	799934	594131	097101		45.786480	-113.09208
Deno Creek Trading	4600 Wise River Rd	Wise River	MT	59762	832-3238	594129				45.743700	-113.00892
High Timber Log Homes		Wise River	MT	59762	832-3411	152112				45.786480	-113.09208
Pioneer Outfitter	400 Alder Creek Rd	Wise River	MT	59762	832-3128	799934				45.797640	-113.07240
Stockton Outfitters	4000 Lamarche Creek Rd	Wise River	MT	59762	832-3138	799992				45.786480	-113.09208
Troutfitters	62311 Mt Highway 43	Wise River	MT	59762	832-3212	799934				45.793680	-113.08146
Wise River Mercantile	65221 Mountain Hwy	Wise River	MT	59762	832-3271	541105				45.786480	-113.09208
Wise River Municipal Airport	64542 Hwy 43	Wise River	MT	59762	832-3219	458106				45.760860	-112.80450
Wise River School	School Rd	Wise River	MT	59762	832-3279	821103				45.786480	-113.09208

SIC	#	Description
02**	4	Agricultural production- livestock
07**	41	Agricultural services
1521		General contractors - single family houses
1541		Industrial buildings & warehouses
1611		Highway and street construction (not elevated)
1711		Plumbing, heating and air conditioning
1794		Excavation work
2011	0	Meat Packing Plants
2015	0	Poultry Slaughtering and Processing
2491	0	Wood Preserving
27**	26	Printing and publishing
3089		Plastics products, NEC
3295	0	Minerals and Earths, Ground or Otherwise Treated
33**	0	Primary metal industries
3599		Industrial and commercial machinery & equipment, NEC
3732	0	Boat Building and Repairing
3861	0	Photographic Film, Paper, Plates and Chemicals
3911	1	Jewelry, Precious Metal
3914	1	Silverware, Plated Ware, and Stainless Steel Ware
4011	3	Railroads, Line-haul Operating
4142		Bus charter service, except local
4212		Local trucking without storage
4213	19	Trucking, Except Local
4214	2	Local Trucking with Storage
4221	0	Farm Product Warehousing and Storage
4225	16	General Warehousing and Storage
4226	0	Special Warehousing and Storage, NEC
4231	0	Terminal and Joint Terminal Maintenance Facilities for Motor Freight Transportation
4581	3	Airports, Flying Fields, and Airport Terminal Services
4789	1	Transportation Services, NEC
49**	3	Electric, gas, and sanitary services
5012		Automobiles and other motor vehicles
5013		Motor vehicle supplies and new parts
5015		Motor vehicle parts, used
5043	0	Photographic Equipment and Supplies
5052	0	Coal and Other Minerals and Ores
5063		Electrical apparatus and equipment, wiring supplies & construction materials
5082		Construction and mining (except petroleum) machinery and equipment
5083		Farm & garden machinery and equipment
5084		Industrial machinery and equipment
5085		Industrial supplies
5087		Service establishment equipment
5093	3	Scrap and Waste Materials

SIC	#	Description
5154	1	Livestock
5169		Chemicals and allied products, NEC
5171	0	Petroleum Bulk Stations and Terminals
5172	6	Petroleum and Petroleum Products Wholesalers, Except Bulk Stations and Terminals
5191	4	Farm Supplies
5198	0	Paint, Varnishes, and Supplies
5261	9	Retail Nurseries, Lawn and Garden Supply Stores
5411		Grocery stores
5511		Motor vehicle dealers (new and used)
5521		Motor vehicle dealers (used only)
5531		Auto and home supply stores
5541	9	Gasoline Service Stations
5551		Boat dealers
5941		Sporting goods and bicycle shops
5983	0	Fuel Oil Dealers
5989	0	Fuel Dealers, NEC
5999		Miscellaneous retail stores, NEC
7216	0	Drycleaning Plants, Except Rug Cleaning
7221	6	Photographic Studios, Portrait
7261	3	Funeral Services and Crematories
7335	3	Commercial Photography
7342	1	Disinfecting and Pest Control Services
7384	4	Photofinishing Laboratories
7389		Business services, NEC
75**	31	General Automotive Repair Shops
7692	5	Welding Repair
7694		Armature rewinding shops
7699	20	Repair Shops and Related Services, NEC
7992	2	Public Golf Courses
7999		Amusement and recreation, NEC
8062	2	General Medical and Surgical Hospitals
8071	3	Medical Laboratories
8072	2	Dental Laboratories
8211		Elementary and secondary schools
8734	2	Testing Laboratories
9111		Executive offices
9224		Fire protection

APPENDIX D

Sanitary Survey

APPENDIX E

Concurrence Letter