East Glacier Water and Sewer District

SOURCE WATER DELINEATION AND ASSESSMENT REPORT

11/99

East Glacier Water and Sewer District
Public Water System
PWSID # MT0002887

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INTRODUCTION

This Delineation and Assessment Report was prepared by Perri Phillips, Hydrogeologist, and Kristine Berg in the Source Water Protection Program of the Montana Department of Environmental Quality (DEQ). The DEQ PWS identification number, contact person, and operator names for the East Glacier Water and Sewer District PWS evaluated in this report appear on the title page of this report.

Purpose

This report is intended to meet the technical requirements for the completion of the source water delineation and assessment report for the East Glacier Water and Sewer District 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 East Glacier Water and Sewer District operator in the identification of potential contaminant sources in the vicinity of the East Glacier Water and Sewer District surface water intake at Midvale Creek, and the need for a source water protection plan to protect the East Glacier Water and Sewer District drinking water source.

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 East Glacier Water and Sewer District 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 East Glacier Water and Sewer District PWS, and not any other public or private water supply. Also, not all potential or existing sources of groundwater or surface water contamination in the area of the East Glacier Water and Sewer District PWS are identified. Only potential sources of contamination in areas that contribute water to the identified drinking water sources are considered.

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

CHAPTER 1
BACKGROUND

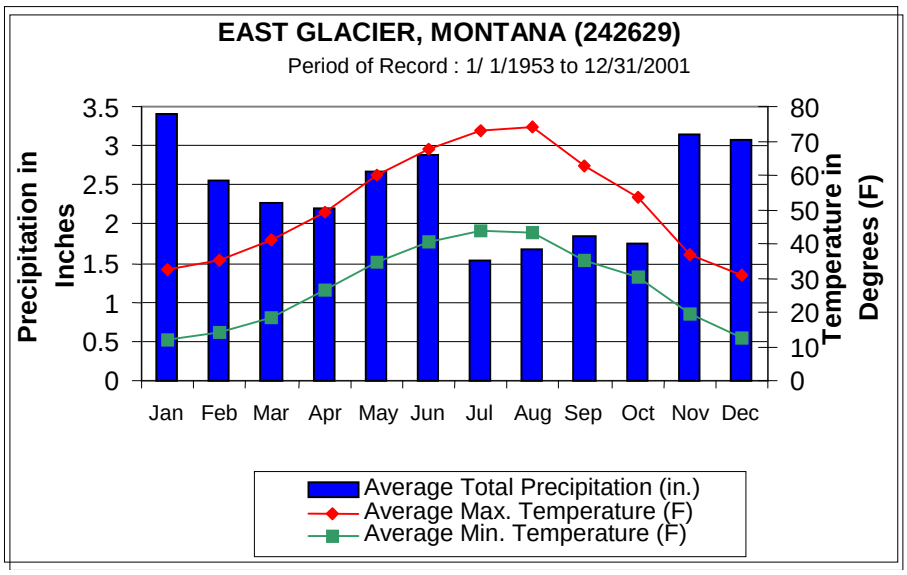
The Community

The town of East Glacier was established in 1950 and is located on the Blackfeet Indian Reservation in southern Glacier County, Montana. U.S. Highway 2 connects East Glacier with Browning thirteen miles to the east and Glacier National Park to the west. Montana Highway 49 runs north of East Glacier and connects with U.S. Highway 89. The Burlington Northern Railroad runs northeast - southwest through East Glacier (Figure 1).

According to the 2000 U.S. Census Bureau, Glacier County has a population of 13,247, of which approximately 275 reside in East Glacier. The largest revenue-generating industries in Glacier County in 2000 were services, 26.1 percent of earnings; federal civilian government, 19.5 percent; and state and local government, 19.1 percent (www.bea.doc.gov/bea/regional/bearfacts).

Currently, the water supplied to residents in East Glacier is unsuitable for drinking purposes. Residents must either boil the water before using it for drinking or cooking purposes or purchase bottled drinking water. The Public Water Supply section of this chapter discusses status of the Boiling Order effective in East Glacier. On-site septic systems treat domestic sewage. No community or municipal sewage systems are currently present in the East Glacier area. The following three PWSs are located in the East Glacier vicinity: Bison Creek Ranch, Glacier Park Inc, and Firebrand Pass Restaurant and Campground.

Figure 2. East Glacier Average Temperatures and Precipitation



Climate

The climate in the East Glacier area is considered semi-arid. It can be characterized by short, hot, dry summers and cold, dry winters (Garvin, 1975). Based on Western Regional Climatic Center data for the January 1, 1953 to December 31, 2001 period of record at the nearby weather station, annual precipitation averages 29.05 inches. Monthly average precipitation ranges from 1.54 inches in July to 3.4 inches in January (Figure 2).

Geographic Setting

East Glacier is located in the Northern Rocky Mountain physiographic province of North America. The elevation of East Glacier is approximately 4795 feet above mean sea level. East Glacier is situated approximately three miles from an entrance to Glacier National Park on the eastern slope of the Northern Rocky Mountain front range. The Two Medicine Lakes are located north west of East Glacier. Approximately fifteen miles to the west of East Glacier is the Continental Divide where elevations reach above 9000 feet above mean sea level.

The town of East Glacier and the land that contributes water to the town is located in the northwestern reaches of the Two Medicine watershed. The U.S. Geological Survey hydrologic unit code for the Two Medicine watershed is 10030201.

The East Glacier Water PWS obtains its water from Midvale Creek, which originates in Glacier National Park west of the town of East Glacier, and flows east through town to the confluence with Two Medicine River, approximately 2 ½ miles to the southeast. A U.S.G.S. gauging station is located on Midvale Creek east of East Glacier and downstream from the PWS intake (Figure 4). The U.S. Geological Survey collected the only physical and water-quality data available for this station on August 3, 1995. The instantaneous discharge recorded on August 3, 1995 was 18 cubic feet per second (cfs).

Geology

The bedrock units exposed progressively from east to west in the watershed region of the East Glacier PWS include: Upper Cretaceous Marias River shale, Lower Cretaceous Blackleaf formation interbedded mudstone and sandstone, PreCambrian Atlyn limestone, PreCambrian Appekunny argillite, PreCambrian Ginnel argilltie, and PreCambrian Siyeh limestone. (See Figure 3) These bedrock units have withstood extensive faulting and deformation (Cannon, 1997). Bedrock units generally dip steeply to the southwest along successive northwest-trending, westward-dipping thrust faults within a structurally complex area known as the Disturbed Belt (Cannon, 1997 and Cannon, 1996).

Landforms in the area are the combined result of regional uplift and thrust faulting followed by extensive erosion, glaciation and associated deposition, and post-glacial erosion (Cannon, 1997). Uplifting and faulting occurred during the Late Cretaceous and Early Tertiary. Subsequently, erosion during the Mid- to Late Tertiary period reduced the Northern Rocky Mountains in this vicinity to near-present elevations. During the same time period, sediments eroded from the mountains were deposited in vast pediments sloping east toward the plains (Cannon, 1997).

Following erosion and pediment deposition, the watershed region underwent extensive glaciation from approximately 2 million to 10,000 years ago. A thin blanket of Wisconsin Stage Pleistocene till mantles the bedrock in the lower reaches of the watershed (Cannon, 1996). The till is associated with the Two Medicine valley glacier, and varies in thickness from 1 to 15 feet. It generaly consists of a heterogeneous mixture of clays, silts, sands, and gravels. Remnant narrow subglacial channels and meltwater channels are marked by homogeneous gravel deposits scattered throughout the till (Cannon, 1996).

The Public Water Supply

The East Glacier Water and Sewer District PWS is classified as a community system under the Federal Safe Drinking Water Act, because the system serves at least 25 year-round residents through at least 15 service connections. The PWS serves approximately 275 East Glacier permanent residents via 125 active service connections (DEQ PWS AREV Database). The system serves a large transient population during the summer months as a result of tourism.

According to the most recent Sanitary Survey, the East Glacier PWS receives water from Midvale Dam, located approximately one mile west of town on Midvale Creek. The water is first screened and then disinfected via chlorination. Treated water from the chlorination building is fed directly into the water system distribution mains. The elevation head from the dam to the town provides pressure. The distribution system prior to the town consists of iron, PVC, and about 100 feet of wood pipe. The distribution line in the town of East Glacier consists of 6-inch, 8-inch, and 10-inch PVC. There is a storage tank on the south side of East Glacier that has not been used since East Glacier abandoned its well source. See Appendix A for a copy of the Sanitary Survey, and Appendix B for a copy of the facility configuration.

East Glacier is presently under an Administrative Order (AO) from the EPA (May 15, 1997) and the State of Montana (August 8, 1997) for failing to provide filtration and disinfection for their surface water source. The order requires the East Glacier PWS to post monthly public notices (including a boil order), submit bi-weekly turbidity reporting and quarterly status reports, and construct a surface water treatment plant. The system is required to monitor for turbidity exceedances until a water filtration/treatment plant is completed to resolve the problem with turbidity. Construction is pending for treatment and storage facilities, and the dam at Midvale Creek is scheduled to be rebuilt. See Appendix C for a copy of the boil order.

Because East Glacier Water obtains its drinking water from Midvale Creek, a surface water supply, the source water sensitivity is classified as highly sensitive to contamination, in accordance with Montana Source Water Protection Program aquifer sensitivity criteria (DEQ, 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 and non-community, non-transient PWSs in accordance with schedules specified in the Administrative Rules of Montana. Transient, non-community PWSs are required to conduct routine monitoring for pathogens (including coliform bacteria), nitrate, and nitrite. All contaminant concentrations detected in required samples must comply with numeric maximum contaminant levels (MCLs) specified in the Federal Safe Drinking Water Act.

Water contributing to East Glacier's PWS flows through Glacier National Park and approximately ½ mile through the Blackfeet Indian Reservation until it reaches the PWS intake. All National Park waters, including Midvale Creek, have been classified as A-1 waters by DEQ. Waters classified A-1 are suitable for drinking, culinary and food processing purposes, after conventional treatment for removal of naturally present impurities; water quality must be suitable for bathing, swimming and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, water fowl and furbearers; and agricultural and industrial water supply.

Section 303(d) of the federal Clean Water Act (and related regulations) requires states to assess the condition of their waters to determine where water quality is impaired (does not fully meet standards) or threatened (is likely to violate standards in the near future). The DEQ Envirofacts database was queried to determine if any waterbodies in the Two Medicine watershed upstream from the East Glacier PWS intake are listed as water-quality impaired. DEQ assessed Midvale Creek in 2000 using readily available water quality data and geographic information in 2000. The Department determined that Midvale Creek fully supports all designated benefical uses due to the absence of land-use activities in the drainage that would impair or degrade water quality, such as logging, mining, grazing, or other perturbations. As a result,

Midvale Creek can be considered fully supporting the following beneficial uses: aquatic life, cold and warm water fishery, industrial, drinking, and recreation.

Background Midvale Creek Water Quality

The National Park Service has collected no data for Midvale Creek and U.S.G.S. data is limited to one sample obtained on August 3, 1995. The collection site is located west of East Glacier before the park boundary and down stream from the PWS intake at Midvale Dam (Figure 4). The U.S.G.S. site number is 482700113143001. Data displayed in Table 1 represents water quality in Midvale Creek.

Table 1. Dissolved constituent concentrations in Midvale Creek approximately 1/3 mile downstream from the East Glacier surface water intake were obtained from the U.S.G.S. gauging station, station number 482700113143001 (U.S. Geological Survey, NWIS, 2002).

Constituent	Range of Dissolved Concentrations (mg/L)	MCL (mg/L)	MCLG (mg/L)
Fluoride (F)	≤0.1	4.0	4.0
Barium (Ba)	.130	2	2
Beryllium (Be)	≤0.0005	0.004	0.004
Cadmium (Cd)	≤0.001	0.005	0.005
Chromium (Cr)	≤0.005	0.1	0.1
Copper (Cu)	≤0.01	N/A	1.3

East Glacier Water and Sewer PWS Water Quality

The East Glacier Water and Sewer District water is routinely monitored for compliance with drinking water standards. Within the past five years, fecal coliform has been detected in routine water quality samples. On March 21, 2002 the system was issued an Acute MCL violation for total coliform. Additionally, the system has received multiple violations for turbidity MCLs. Due to the absence of a water treatment facility, the East Glacier PWS is unable to eliminate turbidity in their source water using filtration or other conventional treatment methods. Higher turbidity levels are often associated with higher levels of disease-causing microorganisms. The completion of a treatment plant in compliance with the order would resolve the turbidity problem. No MCL exceedances were noted for any other constituents monitored over the past five years. (DEQ PWS Database, AREV and SDWIS).

CHAPTER 2
DELINEATION

The source water protection area, the land area that contributes water to the East Glacier Water and Sewer District public water supply, is identified in this chapter. This delineated area is subdivided into spill response and watershed regions, each with separate management goals. Potential contaminant sources are identified in Chapter 3. Relative susceptibility to significant potential contaminant sources is evaluated and management solutions are recommended in Chapter 4.

Hydrologic Conditions

The general hydrogeologic setting in the vicinity of the East Glacier PWS consists of fine-grained, low-permeability bedrock aquifers overlain by unconsolidated glacial till with geerally poor to moderate permeability (Cannon, 1996). More permeable gravel beds within the till provide conduits for ground water, but these deposits are limited in thickness and extent. Slow melting of thick snowpacks in the upper reaches of the watershed recharges the unconsolidated glacial till. Recharge to bedrock aquifer is comparatively smaller due to the limited permeability of the predominantly fine-grained bedrock (Cannon, 1996). Ground water in unconsolidated tills is to springs commonly found along till and underlying bedrock contacts, streams, lakes, and underlying bedrock aquifers (Cannon, 1996). Discharge from bedrock aquifers is to springs and regional ground-water flow systems (Cannon, 1996). Bedrock aquifer discharge to major streams is likely small and difficult to measure. Streamflow measurements of Two Medicine River indicated no discernable discharge from bedrock aquifers (Cannon, 1996).

The headwaters of Midvale Creek are located in Glacier National Park approximately 8 miles west of East Glacier. Midvale Creek flows as a result of snowmelt, direct precipitation, surface runoff and lateral inflow from alluvial and bedrock aquifers. From the headwaters to the PWS intake at Midvale Dam, the creek is approximately 5.25 miles long.

Using DEQ Source Water Protection Program criteria for ranking aquifer sensitivity (Table 2), the East Glacier Water source water is considered highly sensitive to contamination because it is derived from surface water. Sensitivity is defined as the relative ease with which contaminants can migrate to source water.

Table 2. Source water sensitivity criteria (DEQ, 1999).

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

Conceptual Model and Assumptions

Contaminants, if spilled directly into water bodies upstream or in the immediate vicinity of the East Glacier Water PWS surface water intake, could potentially reach the intake before water operators could close it. Over a longer time frame, contaminants that accumulate throughout the watershed could be flushed into Midvale Creek. During periods of spring run-off, contaminants in groundwater can also enter the source water in areas where it is hydraulically connected to shallow aquifers.

Methods and Criteria

DEQ's Source Water Protection Program specifies the methods and criteria used to delineate subregions of the source water protection area for the East Glacier PWS intake. Because this is considered a surface water system, a spill response region and a watershed region have been delineated in accordance with SWPP delineation criteria (DEQ, 1999).

Delineation Results

Spill Response Region

The spill response region for the East Glacier PWS extends upstream 5.25 miles to the headwaters and ½ mile downstream from the intake, and includes a ½-mile wide buffer adjacent to all shorelines. The location of the intake is 48.4492°N latitude and –113.2493°W longitude (Figure 4).

Watershed Region

The watershed region for the East Glacier PWS extends upstream from the surface water intake to the watershed boundaries and represents all the land within the topographic boundaries of the Lower-Missouri-Two Medicine-Midvale Creek watershed or drainage. Hydrogeologic mapping was utilized to encompass areas of surface water contribution to Midvale Creek and the East Glacier PWS surface water intake. (Figure 5).

Limiting Factors

The delineation method involves fixed-distance and watershed mapping. The spill response region represents an approximation of an area within which minimal dilution of introduced contaminant concentration may occur within Midvale Creek and tributary streams before reaching the PWS intake. Numerous assumptions are associated with these SWPP criteria for spill response region delineations. Contaminant transport rates and concentrations will vary depending on stream flow conditions, ground water flux into the stream, 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 region may be more conducive to contaminant transport than others, and should be designated as higher priority areas for source water protection efforts. No effort has been made to characterize groundwater flow to the river or intake structure. As will be described later in this report, the area around the intake and the intake structure itself are probably the most vulnerable elements of this public water supply

CHAPTER 3
INVENTORY

An inventory of potential sources of contamination was conducted to assess the susceptibility of the East Glacier Water and Sewer District PWS to contamination and to identify priorities for source water protection planning. These inventories were conducted within the spill response and watershed regions assigned to the PWS. The inventory for the East Glacier PWS focuses on facilities that generate, use, store, transport, or dispose potential contaminants, and on land types on which potential contaminants are generated, used, stored, transported, or disposed. Additionally, the inventory identifies potential sources of all primary drinking water contaminants and Cryptosporidium. Only significant potential contaminant sources were selected for detailed inventory. The significant contaminants posing potential threats to the East Glacier PWS include metals, nitrate, pathogens, solvents, herbicides, pesticides, VOCs, SOCs, and petroleum hydrocarbons. The inventory for the East Glacier PWS also focuses on all activities in certain sites or land use activities in the spill response region, and general land uses and large potential contaminant sources in the watershed region.

Inventory Method

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

Step 1: Land cover is identified from the National Land Cover Dataset compiled by the U.S. Geological Survey and U.S. Environmental Protection Agency (U.S.G.S., 2000). Land cover types in this dataset were mapped from satellite imagery at 30-meter resolution using a variety of supporting information.

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

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

Step 4: A business phone directory was consulted to identify businesses that generate, use, or store chemicals in the spill response 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, land uses, and facilities that generate, store, transport, or dispose large quantities of hazardous materials were identified in the spill response and watershed regions.

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

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

Inventory Results/Spill Response Region

The East Glacier PWS surface water intake is located in forested area on the Blackfeet Indian Reservation. Approximately the lower 1/6 of the spill response region lies within the Blackfeet Indian Reservation. The upper 5/6 of the region lies within Glacier National Park. Land cover within the East Glacier PWS spill response region consists of 62 percent forestland and 20 percent bare rock (Figure 4). No agricultural land (row crops, small grains, and pasture/hay production) is located in the East Glacier PWS spill response region (Figure 4).

No significant potential contaminants were identified in the East Glacier PWS spill response region. The town of East Glacier is located downstream from the PWS intake; therefore, septic systems in the town of East Glacier do not pose a threat to the PWS intake. Low septic densities occupy 100 percent of the spill response region (Figure 4).

Inventory Results/Watershed Region

Land cover within the East Glacier PWS watershed region consists of 53 percent forestland, 18 percent bare rock, and 17 percent shrubland (Figure 5). No agricultural land is located in the East Glacier watershed region.

The Burlington Northern Sante Fe railroad, Montana Highway 49, and U.S. Highway 2 are located in the watershed region. Spills of fertilizers, pesticides, volatile organic compounds (VOCs) and synthetic organic compounds (SOCs) could occur along the railroad tracks or the highways. However, contamination generated along these transportation routes would be transported to areas downgradient (in shallow ground water), or downstream (in overland runoff or surface water) from the East Glacier intake (Figure 5). Therefore, these potential contaminant sources are not considered significant. Symbols on the map legend and numbers on the map (Figure 5) identify the location of these identified potential contaminant sources in the watershed region.

Turbidity has been a recurring problem in Midvale Creek source water. Sediments can be concern since they can interfere with treatment processes. The watershed is predominantly evergreen forest at lower to mid-elevations, and exposed bedrock in the upper reaches. The fine grains comprising the mudstone, argillite, and shale bedrock and clay matrix of overlying glacial till deposits outcropping within the drainage provide a ready source for suspended sediments carried into Midvale Creek during spring runoff and storm events, resulting in naturally elevated turbidity levels. No land use activities were identified in the drainage that would elevate turbidities over naturally occurring levels unless certain extraordinary activities or occurrences promote the mobilization of sediments by erosion. These activities would be extensive logging or catastrophic forest fires that would allow the erosion and transport of sediments directly into the river or tributaries and would reach the intake structure. The upper watershed is managed as a national park where some “let it burn” fire management may occur.

Table 3 below lists the potential contaminant sources identified within the Watershed Region.

Table 3. Potential contaminant sources in the Inventory and Watershed Region

Potential Source	Potential Contaminants	Map ID Number	Hazard	Significance of this Potential Source
Human tampering and/or vandalism, intentional spills	Assorted contaminants (chemical and biological)	N/A	Intentional or unintentional damage to the intake, or the intentional introduction of contaminants to the water source.	Moderate. This is due to the effect this will have on the system's one source of water but limited by the remote nature of the intake.
Loss of the evergreen forest	Turbidity, TDS, nitrate, nitrite	N/A	Erosion after logging activities or forest fires.	Not significant. This is due to the infrequency of these events. Additionally the watershed is managed to protect the water supply.
BNSF Railway	Pesticides, fertilizers, VOCs, SOCs	1	Spills, storm water runoff, infiltration into ground water	Not significant; contamination would be transported downgradient and/or downstream of the PWS intake
U.S. Highway 2	Pesticides, fertilizers, SOCs, VOCs	2	Spills, storm water runoff, infiltration into ground water	Not significant; contamination would be transported downgradient and/or downstream of the PWS intake
Montana Highway 49	Pesticides, fertilizers, SOCs, VOCs	3	Spills, storm water runoff, infiltration into ground water	Not significant; contamination would be transported downgradient and/or downstream of the PWS intake

Inventory Update

The certified operators of the East Glacier PWS should update the inventory every year. Changes in land uses or potential contaminant sources should be noted and additions made as needed. The complete inventory should be submitted to DEQ every five years to ensure re-certification of the source water delineation and assessment report.

Inventory Limitations

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

CHAPTER 4
SUSCEPTIBILITY ASSESSMENT

Susceptibility of East Glacier's source water is determined by two factors: the potential of a contaminant reaching the intake and the resulting health hazard. Susceptibility is assessed in order to prioritize potential pollutant sources in the spill response region and large potential pollutant sources in the watershed region. The susceptibility results will guide management actions undertaken by local entities, in this case the East Glacier Water and Sewer District, Blackfeet Indian Reservation, and Glacier County.

The goal of source water management is the protection of source water through 1) managing significant potential contaminant sources in the spill response region, 2.) large potential contaminant sources in the watershed region, and 3) ensuring that land use activities in the watershed region pose minimal threats to the source water. Alternative management approaches that could be pursued by the East Glacier PWS owners and operators to reduce susceptibility are also included in this section of the report. Because no significant potential sources were identified in the spill response region, susceptibility assessment will focus on large potential contaminant sources in the watershed region.

Susceptibility is determined by considering the hazard rating for each potential contaminant source and the existence of barriers that decrease the likelihood that contaminated water will reach the PWS intake (Table 4). The hazard presented by point sources of contaminants in the East Glacier spill response and watershed regions depends on whether contaminants can discharge directly to Midvale Creek. Point source hazard is also dependent on the health affects associated with potential contaminants (Table 5). Hazard ratings for nonpoint sources are assigned based on criteria listed in Table 5 for septic systems, sanitary sewers, and cropped agricultural land. Barriers can be anything that decreases the likelihood that contaminated water will reach East Glacier PWSs surface water intake. Examples of barriers include a vegetated riparian area, protective forest management practices, and dilution.

Table 4. Hazard of potential contaminant sources for the East Glacier Water and Sewer public water system intake.

	High Hazard	**Moderate Hazard**	**Low Hazard**
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

Table 5. Susceptibility to potential contaminant sources based on hazard and the presence of barriers.

	High Hazard	Moderate Hazard	Low Hazard
Point Sources of Nitrate or Microbes	Potential for direct discharge to source water	Potential for discharge to groundwater hydraulically connected to source water	Potential contaminant sources in the watershed region
Point Sources of VOCs, SOCs, or Metals	Potential for direct discharge of large quantities from roads, rails, or pipelines	Potential for direct discharge of small quantities to source water	Potential for discharge to groundwater hydraulically connected to source water
Septic Systems	More than 300 per sq. mi.	50 – 300 per sq. mi.	Less than 50 per sq. mi.
Municipal Sanitary Sewer (% land use)	More than 50 % of region	20 to 50 % of region	Less than 20 % of region
Cropped Agricultural Land (% land use)	More than 50 % of region	20 to 50 % of region	Less than 20 % of region

Susceptibility Assessment Results

The East Glacier PWS has no identified significant potential contaminant sources within the spill response region and therefore, the source water has low susceptibility to all sources of regulated contaminants.

Management Recommendations

Management recommendations are included for the East Glacier PWS and may be considered additional barriers to ensure low susceptibility of the intake to regulated contaminants. If the surface water intake for the PWS is impacted, an alternate source can supply needed water until the primary source is remediated.

Management recommendations are as follows:

- Construction of Treatment Plant
- Limited Access
- Alternate Water Source Development
- Emergency Response Plan
- Education

Construction of Treatment Plant – East Glacier is required under an EPA Administrative Order to complete a treatment plant to provide filtration and disinfection of the source water. Treatment via filtration and/or other conventional methods would substantially reduce or eliminate turbidity in distributed finish water, thereby ensuring compliance with the turbidity MCL.

Limited Access - Limit access to the area of the surface water intake to authorized personnel. This limiting of access can be accomplished by erecting locked gates at access points and the erection of fencing and placement of signs.

Alternate Water Source Development - Develop an alternate source of water. In the event that the current surface water intake becomes unavailable (turbidity, bacteriological contamination, chemical contamination, drought, or other) an alternate source of water can at least supply water until the surface water system is back on line.

Emergency Response Plan – Glacier County should compile and Emergency Response Plan that incorporates the East Glacier PWSs source water protection goals. The effectiveness of this response plan will be maximized if it is updated on an annual basis to reflect changes in emergency contacts, emergency numbers, and resources available within the counties to respond to an emergency situation, such as a hazardous material spill.

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.

These management recommendations should be considered by the East Glacier PWS operator, the Town of East Glacier, and Glacier County and Blackfeet Indian Reservation administration. Should contamination reach the East Glacier intake, the Town, Reservation, and County will likely need to work cooperatively to address remediation or relocation of the PWS source. Editorial contributions from the East Glacier PWS operator have been solicited and incorporated into this report.

Monitoring Waivers

Waiver Recommendation

Based on past monitoring results and the susceptibility assessment of the East Glacier Water and Sewer District PWS intake, the PWS appears to be eligible for additional monitoring waivers. Currently, East Glacier Water and Sewer District has a monitoring waiver for Phase II and V inorganic chemicals (barium, cadmium, chromium, fluoride, mercury, and selenium; antimony, thallium, beryllium, and nickel. The East Glacier Water and Sewer District PWS may be eligible for a semivolatile organics waiver. For further monitoring waiver consideration, the East Glacier Water and Sewer PWS should submit a letter to DEQ requesting additional monitoring waivers. The PWS also needs to provide additional information to DEQ regarding chemical use within the spill response region. The following sections in this chapter describe Montana's monitoring waiver procedures in more detail.

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 will 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 Surface Water

Shallow unconfined aquifers and surface water bodies are the most common source of usable groundwater in Montana. Unconfined aquifers and many surface water bodies are usually locally recharged by precipitation. In general, shallow 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. Residence time in surface water bodies such as streams and narrow lakes is considered small, as the water moves through the system rather quickly. Water contained in large lakes and reservoirs may have variable residence times based on seasonal turnover, inversions, stagnant depths or 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 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. Alternately, surface water bodies directly or indirectly receive 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, residence time of water in the lake or reservoir (if the information is available). All surface bodies within a 1,000 feet of the PWS well(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 that extends 1/2 mile

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 1/2 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.

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APPENDICES

APPENDIX A

SANITARY SURVEY

APPENDIX B

TA EVALUATION & FACILITY CONFIGURATION

APPENDIX C

BOIL WATER ORDER