HINSDALE WATER DEPARTMENT

PUBLIC WATER SYSTEM

PWS ID No. MT0000250

SOURCE WATER DELINEATION & ASSESSMENT REPORT

PREPARED BY:

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
SOURCE WATER PROTECTION PROGRAM

PREPARED FOR:

Hinsdale Water Department
Jerry Arnold
Certified Operator

PO Box 55
Hinsdale, Montana, 59241

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EXECUTIVE SUMMARY

This Source Water Delineation and Assessment Report (SWDAR) was prepared under the requirements and guidance of the Federal Safe Drinking Water Act and the US Environmental Protection Agency, as well as a detailed Source Water Assessment Plan developed by a statewide citizen's advisory committee here in Montana. The Department of Environmental Quality (DEQ) is completing these assessments for all public water systems in Montana. The purpose is to provide information so that the public water system staff/operator, consumers, and community citizens can begin developing strategies to protect your source of drinking water. The information that is provided includes the identification of the area most critical to maintaining safe drinking water, i.e., the inventory region, an inventory of potential sources of contamination within this area, and an assessment of the relative threat that these potential sources pose to the water system.

Hinsdale's drinking water is supplied by a dug well located approximately one mile east-southeast of town. In accordance with the Montana Source Water Protection Program criteria (1999), the aquifer (source water) is considered to have a high sensitivity to potential contaminant sources since the well is completed in unconfined alluvium. Sensitivity is defined as the relative ease that contaminants can migrate to source water through the natural materials.

As part of this assessment, three types of source water protection management areas were mapped for the Hinsdale public water system. They are: the control zone, the inventory region, and the recharge region. Potential sources of contamination were identified within each of these three regions and the results are as follows:

- No potential sources of contamination were identified within the control zone. However, the disused well in the pumphouse could serve as a conduit for contaminants to enter the groundwater. The goal of management in the control zone is to avoid introducing contaminants directly into the water supply's well or immediate surrounding areas. The control zone is delineated as a 100-foot radius around the wellheads. All sources of potential contaminants should be excluded from the control zones.
- Significant potential contaminant sources identified within the inventory region are limited to agricultural land and the railroad. According to the Source Water Protection Program criteria (DEQ, 1999) the agricultural land is considered to present a high hazard, to which the PWS is highly susceptible. However, the very low nitrate concentrations detected during routine water quality sampling suggest that surrounding agricultural land has not adversely affected water quality.

  The inventory region should be managed to prevent contaminants from reaching the well before natural processes (dispersion, dilution, biological natural attenuation, etc.) reduce their concentrations. The inventory region includes the area upgradient of the well that is expected to supply groundwater recharge to the well over the next three years. Without field investigations that are beyond the scope of this report, this area could not be determined accurately. Therefore, a one-mile fixed radius around the wellhead was delineated as the inventory zone, excluding the portion of this region on the north side of the Milk River.
- Potential contaminant sources identified within the recharge region are limited to minor agricultural lands. Few point sources of potential contaminants were identified in this sparsely developed region.

  The goal of management in the recharge region is to maintain and improve water quality over long periods of time or increased usage. Recharge to the aquifer is probably from a combination of stream loss from the Milk River to the alluvium, and infiltration of precipitation on the higher country south of the well.

Low risk potential sources and potential sources located outside the inventory region, but within the recharge region may still pose a threat over time, but are not discussed in detail in this assessment. This provides a quick look at the existing potential sources of contamination that could, if improperly managed or released, impact the source water for the Hinsdale. The susceptibility analysis provides the community and the public water system with information on where the greatest risk occurs and where to focus resources for protection of this valuable drinking water resource.

According to the sanitary surveys, another well is present adjacent to the dug well, but was never used. This well should be properly abandoned to eliminate a direct conduit into the groundwater beneath the control zone. The Montana DEQ may be a source of information regarding this procedure.

The costs associated with contaminated drinking water are high, and prevention is preferable to treatment. Public awareness is a powerful tool for protecting drinking water. The information in this report will help increase public awareness about the relationship between land use activities and drinking water quality.

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1.0 INTRODUCTION

Eric Sivers, a hydrogeologist with the Montana Department of Environmental Quality (DEQ) Source Water Protection Section, completed the Hinsdale (PWS ID No. 00250) Source Water Delineation and Assessment Report (SWDAR).

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

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

2.0 BACKGROUND

Hinsdale is located in Valley County in northeast Montana (Figure 1). According to the Census Bureau, the population of Valley County in 2000 was 7,675, with 431 individuals residing within the Hinsdale ZIP code (59241).

2.1 PHYSICAL SETTING

2.1.1 Geography and Geology

Hinsdale is located in the Milk River valley, at an elevation of approximately 2,300 feet above mean sea level.

The area is characterized by relatively flat-lying sedimentary rocks, slightly incised by alluvial valleys. Bedrock exposed in the Hinsdale area is of Cretaceous age, consisting of generally fine-grained sediments deposited in the Cretaceous interior seaway. Three formations are mapped in the vicinity of Hinsdale: The Bearpaw Shale, the Claggett Formation, and the Judith River Formation. Alluvial deposits are localized in the Milk River valley and at the mouths of smaller tributary streams, such as Dodson Creek. The geology of the Dodson area is shown on Figure 2.

Hinsdale is located in the Western Glaciated Plains groundwater region of North America (Heath, 1984). The community is in the Lower Milk Watershed, in the Lower Missouri River drainage of Montana (Figure 1).

2.1.2 Climate

Climate in the Hinsdale area is semi-arid and typical of central Montana. Annual total precipitation is 12.87 inches. Rainfall occurs April through September with June and July being the wettest months. Hinsdale receives an annual average of 30.4 inches of snow, mainly November to April. Climate data is provided by the Western Regional Climate Center,

operated by the Desert Research Institute of Reno, Nevada. See Table 1 for additional climate information.

Table 1. Monthly Climate Summary: Hinsdale 1E Climate Station (244177)

Period of Record: 07/01/1948 to 05/31/1971

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Ave. Max. Temp (F)	19.3	27.6	37.5	56.5	69.6	77.6	85.8	85.0	73.0	60.1	42.2	27.8	55.2
Ave. Min. Temp. (F)	-3.7	3.9	14.5	29.8	41.1	49.6	54.5	52.6	42.2	31.8	17.9	6.4	28.4
Ave Tot. Precip. (in.)	0.73	0.45	0.48	1.04	1.80	2.61	1.89	1.42	0.95	0.66	0.35	0.49	12.87
Ave. Tot. Snowfall (in.)	8.1	6.7	5.0	3.2	0.3	0.2	0.0	0.0	0.0	0.6	1.8	4.5	30.4
Ave Snow Depth (in.)	6	9	6	0	0	0	0	0	0	0	0	2	2

2.2 THE PUBLIC WATER SUPPLY

2.2.1 Water Supply System

The Hinsdale PWS serves approximately 350 people, through approximately 130 service connections. The Hinsdale PWS is classified as a community public water system since it serves at least 25 of the same people every day. Information on the water system was obtained from correspondence in the DEQ Public Water Supply Section files including sanitary surveys completed in 1996 and 2001 (attached as Appendix A). Groundwater is provided by a dug well east of town. Two pumps, each with liquid chlorination, pump water from the well to a storage tank south of town. The tank provides a reserve of 100,000 gallons.

2.2.2 Supply Well Information

The Hinsdale well is located approximately one mile east-southeast of town, in alluvium of the Milk River. The well was dug in 1946, and is reportedly 30 feet deep and six feet wide. The well is constructed of corrugated metal pipe. According to the well log, the lithology encountered while digging the well is clay and gumbo. The Montana Bureau of Mines and Geology (MBMG) Ground Water Information Center (GWIC) designates the Hinsdale supply well as GWIC ID No. 42048. The water right ID assigned to the well is W168584. The well log is attached as Appendix A. According to the sanitary surveys, a new well was completed adjacent to the current supply, but was not suitable for use. This well is no longer used, but there is no record of proper abandonment. If not properly abandoned, this well could provide a conduit for potential contaminants to instantaneously affect groundwater quality.

2.2.3 Source Water

The Hinsdale PWS well is completed in Milk River alluvium. This alluvium is likely to be relatively fine-grained, due to the meandering character of the Milk River, and the fact that fine-grained Cretaceous sedimentary rocks dominate much of the Milk River drainage. This is supported by the well log, which reports that the well is completed in 30 feet of clay and gumbo. Due to the proximity of the Milk River (within one-half mile), the water level in the well reportedly varies in accordance to the river level. Whether the majority of the well water is derived from the alluvial plain or from the bluffs south of the well cannot be determined without field study.

Based on the results of a groundwater under the direct influence of surface water (GWUDISW) study completed in April 2001, the source water is classified as groundwater. According to the Source Water Protection Program (DEQ, 1999) the source water aquifer is considered to have high sensitivity to potential contamination, as it is unconfined unconsolidated alluvium.

2.3 WATER QUALITY

Each PWS is required to perform regular sampling of their water supply to detect contamination. The analytical parameters include: coliform bacteria and other pathogenic organisms, nitrates, metals, petroleum hydrocarbons, and other organic chemicals. The monitoring schedule depends on factors such as the size and source water of a PWS, the number of supplies (e.g. wells), and the population served. Monitoring programs are tailored to each system, following the general protocols defined by DEQ. Monitoring schedules are available at: <http://nris.state.mt.us/wis/swap/swapquery.asp>. The Hinsdale PWS monitoring data from DEQ's database for the past five years was reviewed and is summarized in this section. Analytical results are compared to quality standards established by the US EPA. Maximum Contaminant Levels (MCLs) are enforceable standards that limit the highest level of a contaminant allowed in drinking water. National Secondary Drinking Water Standards (known as SMCLs) are non-enforceable guidelines regarding contaminants that may cause aesthetic (color, odor, taste) or cosmetic (staining, skin/tooth discoloration) issues.

2.3.1 Public Water Supply Monitoring Results

Health-based violations are issued when the amount of contaminant exceeds the MCL. Coliform bacteria have not been detected for several years, but were detected in March 2001, twice in 2000 and twice in 1999.

Nitrate + nitrite has been periodically detected at concentrations below 1 mg/L (milligram per liter, equivalent to parts per million), considerably below the MCL of 10 mg/L. No other regulated parameters have been detected above the method detection level. The water quality results are attached as Appendix B.

2.3.2 Background Water Quality Monitoring Results

Background water quality sampling typically includes general water quality parameters: major dissolved ions (calcium, magnesium, sodium, potassium, iron, manganese, silica, bicarbonate, carbonate, chloride, sulfate, nitrate, fluoride and orthophosphate), trace elements, and metals. No background water quality analyses were identified for the Hinsdale public water supply.

3.0 MANAGEMENT AREA DELINEATION

This report delineates three source water management areas. The goal of source water management is protection of the source water by 1) controlling activities in the control zone, 2) managing significant potential contaminant sources in the inventory region, and 3) ensuring that major land use activities or other significant activities in the recharge region pose minimal threat to the source water.

3.1 CONCEPTUAL MODEL

Hinsdale is located in the Lower Milk River watershed (USGS Hydrologic Unit Code 10050012), which is located within Montana's Lower Missouri River watershed. As detailed above, the recharge region probably includes both the upstream reaches of the Milk River as well as the higher county

immediately south of the well. The relative significance of these two regions cannot be accurately characterized without field investigation.

The public water supply is considered to have high sensitivity to contamination, as it is completed in unconsolidated unconfined alluvium. This determination is according to the DEQ Source Water Protection Program criteria for ranking aquifer sensitivity (DEQ 1999).

3.2 DELINEATION

Methods and criteria for delineating source water protection areas are specified in the Montana Source Water Protection Program (DEQ, 1999). These procedures are available online at: <http://www.deq.state.mt.us/wqinfo/swp/Guidance/source_water_protection_program.htm>. The delineated management zones for the wells are shown on Figure 3.

Control Zone – A 100-foot radius control zone is delineated for the wells. All sources of potential contaminants should be excluded in these regions.

Inventory Region – The inventory region is the area that is expected to contribute to the water supply within no less than three years. All signification sources of potential contaminants are inventoried in this region. The inventory region was delineated as a one-mile fixed radius around the wellhead (excluding the portions of this region that lie on the far side of the Milk River). This area is believed to be sufficiently conservative to include a three-year capture zone, particularly in light of the clay lithology reported in the well log. Groundwater flowpaths in the vicinity of the well cannot be determined without field study; therefore a radial inventory region is appropriate.

Recharge Region – The recharge region probably includes both the upstream reaches of the Milk River as well as the higher county immediately south of the well. The relative significance of these two regions cannot be accurately characterized without field investigation. The inventory for the recharge region focuses on general land uses and large industrial facilities. The goal of management in the recharge region is to maintain and improve the long-term quality of groundwater in the aquifer.

4.0 INVENTORY

Significant potential contaminant sources in the source water management areas were inventoried to assess the susceptibility of Hinsdale's source water to contamination, and to provide a foundation for source water protection planning. The inventory for Hinsdale focuses on facilities or features that generate, use, store, or transport potential contaminants, as well as certain land uses in the inventory and recharge regions. It is important to remember that the sites and areas identified in this section are only potential sources of contamination to the drinking water. Contamination of drinking water sources is less likely when potential contaminants are properly used and managed.

4.1 INVENTORY METHOD

The inventory focus is slightly different in each of the delineated management areas. The inventory for the Hinsdale focuses on all activities in the control zones; certain types of facilities and land uses in the inventory region and surface water buffer; and general land uses and large facilities in the Recharge Region. Information on facilities and land uses that are potential sources of regulated contaminants was obtained from a number of databases, described below. The process for completing the inventory included several steps, which are summarized as follows:

- Step 1: Land uses were identified from the U.S. Geological Survey's (USGS) Geographic Information Retrieval and Analysis System <http://nris.state.mt.us/gis/datalist.html>. Sewered

and unsewered residential land uses were identified from boundaries of sewer coverage obtained from municipal wastewater utilities.

- Step 2: The US Environmental Protection Agency's (EPA) Envirofacts System <http://www.epa.gov/enviro/> was queried to identify EPA-regulated facilities located in the management areas. This system accesses facilities listed in the following databases: Resource Conservation and Recovery Information System (RCRIS), Biennial Reporting System (BRS), Toxic Release Inventory System (TRIS), and Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) and the Permit Compliance System (PCS - for Concentrated Animal Feeding Operations with MPDES permits). The available reports were browsed for facility information including the Handler/Facility Classification to be used in assessing whether a facility should be classified as a significant potential contaminant source.
- Step 3: Montana DEQ databases were queried to identify any of the following in the management areas:
  - Underground storage tanks (USTs) <http://www.deq.state.mt.us/UST/USTDownloads.asp>
  - Hazardous waste contaminated sites, above ground storage tanks (ASTs), landfills, and abandoned and active mines, including gravel pits <http://nris.state.mt.us/gis/bundler/>

  Any information on past releases and present compliance status was noted.
- Step 4: Major road and rail transportation routes were identified throughout the inventory region: <http://nris.state.mt.us/gis/gisdatalib/gisDataList.aspx>.

Potential contaminant sources are considered significant if they fall into one or more of the following categories:

1. Large quantity hazardous waste generators.
2. Landfills.
3. Underground storage tanks.
4. Known groundwater contamination (including open or closed hazardous waste sites, state or federal Superfund sites, and leaking UST sites).
5. Underground injection well.
6. Major roads or rail transportation routes.
7. Cultivated cropland exceeding 20% of the inventory region.
8. Animal feeding operations.
9. Wastewater treatment facilities, sludge handling sites, or land application areas.
10. Septic systems.
11. Sewer mains.
12. Storm sewer outflows.
13. Abandoned or active mines

4.2 INVENTORY RESULTS

4.2.1 Control Zone Inventory Results

The 100-foot control zones around the wellheads include the wellhead and the former well. No potential sources of contamination were identified within the control zone, but if any were to be introduced, the former well provides a conduit for contamination to impact soil and groundwater. The PWS should be vigilant to ensure that potential sources of contamination are excluded from the control zone and that positive drainage away from the wellhead is maintained. The former well should be properly abandoned. The Montana DEQ may be contacted for further information regarding this process.

4.2.2 Inventory Region

The inventory results for Hinsdale's source water are summarized in Table 2, and are shown on Figure 3.

The inventory region includes the railroad and Highway 2. Several UST and LUST sites were identified within Hinsdale, but not within the inventory region. The database report of UST facilities in the Hinsdale area is attached as Appendix C for the operator's review and general reference. The wastewater treatment plant is outside the inventory region.

The primary land use within the inventory region is small grain crop/fallow agriculture. Smaller amounts of grassland and shrubland are located on the higher ground south of the well. The percentage of cropped agricultural land is greater than 50% of the inventory region, and therefore is considered to present a high hazard to the public water supply. Septic system density within the inventory region is low and is not considered a hazard to the PWS drinking water. Septic system density within Hinsdale is high, but this is outside of the inventory region.

4.2.3 Recharge Region Inventory Results

According to the 1992 National Land Cover dataset, the primary land cover in the recharge region is grassland, with agricultural (crop-fallow small grain) land use along the Milk River. Septic system density within the watershed/recharge region is generally low. The septic system density is not considered a hazard to the PWS drinking water.

4.3 INVENTORY UPDATE

To make this SWDAR a useful document for the years to come, the certified water system operator should review the inventory every year. Changes in land uses or potential contaminant sources should be noted and additions made as appropriate. The complete inventory should be submitted to DEQ every five years to ensure the source water delineation and assessment remains current.

5.0 SUSCEPTIBILITY ASSESSMENT

5.1 INTRODUCTION TO SUSCEPTIBILITY

Susceptibility is the degree of likelihood for a public water supply to be impacted by inventoried contaminant sources, at concentrations that would pose a concern. Susceptibility is assessed to prioritize potential pollutant sources for local management, in this case the Hinsdale PWS managers and operators.

5.2 DETERMINATION OF SUSCEPTIBILITY

According to the DEQ Source Water Protection Program (DEQ, 1999) Susceptibility is determined by considering the *hazard* rating for each potential contaminant source relative to any contaminant *barriers*. Proximity or density of significant potential contaminant sources and nature of contaminants determines hazard.

Barriers to contamination are anything that decreases the likelihood of contaminants reaching a spring or well. Barriers may be engineered structures, management actions, or natural conditions. Examples of engineered barriers include spill catchment structures and leak detection for underground storage tanks. Emergency planning and best management practices (BMPs) are

considered management barriers. Thick clay-rich soils, a deep water table or a thick unsaturated zone above the well intake are examples of natural barriers. Where credited, barriers are noted in Table 2.

5.3 RESULTS OF SUSCEPTIBILITY ASSESSMENT

A summary of the susceptibility assessment for the Hinsdale wells is provided in Table 2. This table only includes the potential contaminant sources (identified in the inventory) that were determined to present a significant potential risk to the drinking water supply. Therefore, this list is not exhaustive, and it is highly recommended that the PWS operator and community members familiar with the nature of businesses and land use in the area enhance the inventory through further research and local input.

Table 2. Susceptibility Assessment of Significant Potential Contaminant Sources

Potential Contaminant Source	Potential Contaminants	Hazard	Hazard	Barriers	Susceptibility	Management Recommendations
Inventory Region						
Septic Systems	Pathogens, nitrate (NO_3)	System failure could result in discharge of untreated effluent	Low	No septic systems in vicinity of wells or gallery	Low	Encourage septic system owners to periodically inspect their septic systems.
Agricultural Land: Cropland and grazing lands	NO_3 and SOCs from fertilizer, pesticides and herbicides. Pathogens from pastures.	Contaminants leaching into groundwater	High	None	Very High	Encourage BMPs.
Transportation Routes: Roads and Railroads	Pesticides, fertilizers, VOCs, SOCs, other	Spills, routine spraying, storm water runoff, infiltration into groundwater	Low	Emergency spill response	Low	Encourage and support emergency planning, training of local emergency response personnel, and cooperation with MDOT to reduce herbicide use.
Class V Injection Wells	VOCs, SOCs, metals	Infiltration into groundwater	Unknown at this time	None	Unknown at this time	Work with EPA to identify locations and appropriate response.
Recharge Region						
Agricultural Crop Land	NO_3 and SOCs from fertilizer, pesticides and herbicides. Pathogens (if grazing occurs)	Contaminants leaching into groundwater	Not assessed	None	Not assessed outside inventory region	Encourage use of BMPs in the recharge region.

6.0 LIMITATIONS

This Source Water Delineation and Assessment Report is intended to meet the technical requirements for delineation and assessment of the Hinsdale Public Water System (PWS) as required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 (P.L. 104-182). The following limitations should be noted:

- This report was prepared to assess the susceptibility of the Hinsdale PWS to significant potential contaminant sources, and is based on published information and correspondence within DEQ files. The terms "drinking water supply" or "drinking water source" refer specifically to the source of the Hinsdale public water supply and not any other public or private water supply. Also, not every potential or existing source of groundwater or surface water contamination in the Hinsdale area has been identified. Only potential sources of contamination in areas that contribute water to its drinking water source are considered
- Delineation of the source water protection areas for the Hinsdale wells is based on map and aerial photograph interpretation, augmented by correspondence in DEQ files. In the absence of field investigations to accurately characterize aquifer characteristics, the assumptions are necessarily conservative. The use of such conservative assumptions was to ensure that the inventory zone reflects the actual area where contamination to the system may occur. As the groundwater flowpaths in the vicinity of the well could not be determined within the scope of this investigation, a radial capture zone is appropriate. Based on available information, a radius of one mile was deemed to be sufficiently conservative to include a three-year time of travel.
- The potential contaminant sources described in the inventory are identified from readily available information. Consequently, unregulated activities or unreported contaminant releases may have been overlooked. The use of multiple sources of information increases the likelihood that the major threats to the source water for Hinsdale's public water supply have been identified. <u>The inventory is not exhaustive</u>. If a type of potential contaminant source is not identified in the inventory or susceptibility assessment of this report, it does not necessarily follow that the potential for contamination does not exist, or there is not a threat. It is highly recommended that the PWS and community enhance or refine the identification of potential contamination sources through further research and local input.

7.0 CONCLUSIONS

This Source Water Delineation and Assessment Report (SWDAR) was prepared under the requirements and guidance of the Federal Safe Drinking Water Act and the US Environmental Protection Agency, as well as a detailed Source Water Assessment Plan developed by a statewide citizen's advisory committee here in Montana. The Department of Environmental Quality (DEQ) is completing these assessments for all public water systems in Montana. The purpose is to provide information so that the public water system staff/operator, consumers, and community citizens can begin developing strategies to protect your source of drinking water. The information that is provided includes the identification of the area most critical to maintaining safe drinking water, i.e., the inventory region, an inventory of potential sources of contamination within this area, and an assessment of the relative threat that these potential sources pose to the water system.

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8.0 REFERENCES

Heath, Ralph C., 1984. Ground-water Regions of the United States, U.S. Geological Survey, Water Supply Paper 2242, Washington D.C., 78p.

Montana Bureau of Mines and Geology, 2004. Groundwater Information Center, lithologic well logs. http://mbmggwic.mtech.edu/

Montana Department of Environmental Quality Public Water Supply Section, 2004. Safe Drinking Water Information System (SDWIS).

Montana Department of Environmental Quality (DEQ), 1999. Montana Source Water Protection Program. http://www.deq.state.mt.us/ppa/p2/swp/index.asp

Montana Department of Environmental Quality Underground Storage Tank Program web site. http://www.deq.state.mt.us/Rem/tsb/iss/USTDownloads.asp

Montana Natural Resources Information Interactive Map website. 2004. http://nris.state.mt.us/interactive.html

Raines, G.L., and Johnson, B.R., 1995, Digital representation of the Montana state geologic map in ARC/INFO export format.: U.S. Geological Survey Open-File Report 95-0691.

United States Census Bureau, 2000. http://factfinder.census.gov/home/saff/main.html?_lang=en

United States Environmental Protection Agency "Envirofacts Data Warehouse and Applications". http://www.epa.gov/enviro/

United States Geological Survey. 1992. National Landcover Dataset, Montana. 30-meter electronic digital landcover dataset interpreted from satellite imagery.

http://nris.state.mt.us/nsdi/nris/nlcd/nlcdvector.html

Various Authors, 1999-2004. Correspondence in DEQ's PWS files regarding the Hinsdale Water Supply.

Western Regional Climate Center Montana Climate Summaries. wrcc@dri.edu

9.0 GLOSSARY

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

Alkalinity. The capaTown 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, including drywells, storm drains and floor drains. 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.

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 groundwater 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. Hardness is often expressed in units of milligrams per liter (mg/L) or parts per million (ppm) of $CaCO_3$ (calcium carbonate). Waters with a total hardness in

the range of 0 to 60 mg/L are termed soft; from 60 to 120 mg/L moderately hard; from 120 to 180 mg/L hard; and above 180 mg/L very hard.

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 toxiTown 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 groundwater flow systems.

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

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

Large CapaTown Septic System. Defined by Underground Injection Control regulations as an on-site septic system serving 20 or more persons.

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 – Groundwater 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 Town streets. Nonpoint sources of pollution, such as the use of herbicides, can concentrate low levels of these chemicals into surface and/or groundwaters 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 groundwater. 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. An area in which water is absorbed that eventually reaches the zone of saturation in one or more aquifers. As a source water management region, the term generally describes 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 to regulate hazardous materials 'from the cradle to the grave.' 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). A database that provides information about specific RCRA 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.

Sensitivity. The relative ease with which contaminants can migrate to source water through the natural materials

Source Water. Any surface water, spring, or groundwater 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 groundwater 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.

Syncline. A geologic structure consisting of a down-arched fold with an axial plan dividing it in half.

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.

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

ToxiTown Characteristic Leachate Procedure (TCLP). A test designed to determine whether a waste is hazardous or requires treatment to become less hazardous.

Toxic Release Inventory System (TRIS). 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. The ability of an aquifer to transmit water. The transmissivity is determined by multiplying the hydraulic conductivity by the aquifer thickness.

Turbidity. The cloudy appearance of water caused by the presence of suspended matter. Turbidity is measured in nephlometric turbidity units (NTUs).

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 that evaporate readily to the atmosphere.

Watershed. The region drained by, or contributing water to, a stream, lake, or other water body of water.

FIGURES

APPENDIX A

PWS SANITARY SURVEYS AND WELL LOG

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
HINSDALE WATER DEPARTMENT - WELL 1

Plot this site on a topographic map

Location Information

GWIC Id:	42048	Source of Data:	LOG
Location (TRS):	30N 36E 04 BCBC	Latitude (dd):	48.3894
County (MT):	VALLEY	Longitude (dd):	-107.0620
DNRC Water Right:	W168584-00	Geomethod:	MAP
PWS Id:	00250002	Datum:	NAD27
Block:		Altitude (feet):	
Lot:		Certificate of Survey:	
Addition:		Type of Site:	WELL

Well Construction and Performance Data

Total Depth (ft):	30.00	How Drilled:	
Static Water Level (ft):	30.00	Driller's Name:	
Pumping Water Level (ft):		Driller License:	
Yield (gpm):	500.00	Completion Date (m/d/y):	2/1/1952
Test Type:		Special Conditions:	
Test Duration:		Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	110ALVM
Recovery Time (hrs):		Well/Water Use:	PUBLIC WATER SUPPLY
Well Notes:			

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

From	To	Dia	Wall Thickness	Pressure Rating	Joint	Type
0.0	30.0	72.0				

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

No Completion Records currently in GWIC.

Lithology Information

From	To	Description
0.0	30.0	CLAY AND GUMBO

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

APPENDIX B

WATER QUALITY ANALYTICAL REPORT

APPENDIX C

UNDERGROUND STORAGE TANK (UST) DATABASE REPORT

APPENDIX D

SOURCE WATER MONITORING WAIVERS

MONITORING WAIVERS

Waiver Recommendation

The Hinsdale PWS has a waiver for Phase 2 inorganics. Under the waiver, the PWS samples for these parameters every nine years rather than every three years. The PWS was grandfathered under the radionuclide rule and is only required to sample once every nine years for these parameters.

Before a susceptibility or use wavier is requested, the PWS Operators are encouraged to carefully review the Monitoring Waiver Requirements, described below. If after reviewing this section it is determined that an additional waivers are feasible, the PWS should submit a letter to DEQ requesting the specific monitoring waivers. The PWS must be in compliance with monitoring requirements to be considered. If requested by DEQ, the PWS may also need to provide additional information regarding chemical use in the area within the Inventory Region. The table below shows how identified potential contaminant sources affect the eligibility for monitoring waivers.

Susceptibility Assessment as it relates to Waiver Eligibility

Source	Contaminant	Susceptibility	Waiver Eligibility
Transportation Corridors	VOCs, SOCs, petroleum products and other chemicals		Chemical use in right-of-way may preclude waivers for some chemicals. PWS should confirm chemical use history along the right-of-way. Waivers might be rescinded if a spill occurred.
Sewer System/ Wastewater Treatment	Nitrates, pathogens		Waivers are not available for pathogens and nitrate.
Agricultural Cropped Areas	Nitrates and SOCs		Chemical use may preclude waivers for some chemicals. The PWS should confirm chemical use/storage history by land parcel.

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 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 (PCBs) 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. 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. 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 one mile as an area of investigation for the use of organic chemicals. Vulnerability assessment of spring water sources should use a minimum fixed radius of one mile as an area of investigation for the use of organic chemicals. Surface water and shallow groundwater sources under the direct influence of surface water (GWUDISW) should assess the watershed area above the source, or a minimum fixed radius of one and one-half miles upgradient.

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, water quality monitoring data from surrounding public water systems, delineation of zones of influence and contribution to a well; time-of-travel or attenuation studies; vulnerability mapping; and the use of computerized groundwater flow and transport models. DEQ's PWS Section and DEQ's Source Water Protection Program will conduct review of an organic chemical monitoring waiver application. Other state agencies may be asked for assistance.

Susceptibility Waiver for Unconfined Aquifers

Unconfined aquifers are the most common source of usable groundwater. Unconfined aquifers are not contained within impervious geologic strata. As a result, the upper groundwater surface, or water table, in an unconfined aquifer is not under the 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 generally shorter than for water in confined aquifers. Similar water chemistry often exists between unconfined groundwater and area surface water, and physical parameters and dissolved constituents can be an indicator of the hydraulic connection between groundwater and surface water. Consequently, unconfined aquifers can be susceptible to contamination by organic chemicals migrating from the ground surface to groundwater.

Properly assessing a susceptibility waiver application for an unconfined source aquifer requires: 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 water bodies within 1,000 feet of the PWS well(s) must be plotted. Analytical monitoring history of the PWS well and those nearby should be provided as well.

Susceptibility Waiver for Confined Aquifers

Confined groundwater is isolated from overlying material by relatively impermeable geologic units. A confined aquifer is generally subject to pressures greater than atmospheric pressure. A well that is screened in a confined aquifer will have a static water level that determined by the pressure (hydrostatic head) at the top of the 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. Important hydrogeologic controls include 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.

A confined aquifer may eventually be affected by contaminated groundwater from elsewhere in the recharge area. Improper well construction or abandonment can act as a hydraulic connection to the confined aquifer. The extent of confinement of an aquifer is critical to limiting susceptibility to organic chemical contamination. The extent of confinement must be demonstrated by the PWS in order to be considered for a confined aquifer susceptibility waiver. Typical information includes: pump test data (storage coefficient), geologic mapping, well logs, water quality history, and available information related to any other wells, active or abandoned, in the recharge region.

APPENDIX E

CONCURRENCE LETTER