NORTH HARLEM COLONY
Public Water System

PWS ID # MT0001771

Source Water Delineation and Assessment Report

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Prepared by:
Bill O'Connell
of
Montana Rural Water Systems Inc.
for the
Source Water Protection Program
Montana Department of Environmental Quality

Prepared for:
Joseph K. Hofer Jr.
Certified Operator
North Harlem Colony
53 Lilac Loop
PO Box 68
Harlem, MT 59526

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EXECUTIVE SUMMARY

The drinking water for North Harlem Colony is supplied by, 1 well located on the northwest side of the colony complex. This Source Water Delineation and Assessment Report 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 conducting these assessments for all public water systems in Montana. The purpose is to provide information so that the public water system 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.

Based on the site visits, sanitary survey, well logs, and the depth of the well, it appears that sandstone unit at the bottom of the Judith River Formation of the Cretaceous Montana Group Formations is providing water to the North Harlem Colony's PWS's well. In accordance with the Montana Source Water Protection Program criteria (1999), the aquifer is considered to have a low sensitivity to potential contaminant sources since it is consolidated sandstone bedrock and a confined aquifer. Sensitivity is defined as the relative ease that contaminants can migrate to source water through the natural materials.

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

- 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 wells and all sources of potential contaminants should be excluded in this region. Potential contaminant sources identified within the control zones include: No potential sources of contamination were identified within the control zones.
- The inventory region should be managed to prevent contaminants from reaching the well before natural processes reduce their concentrations. Since the source water is confined, the inventory region for the wells consists of a 1000-foot radius circle around the wells. Significant potential contaminant sources identified within the inventory region include: shops for vehicle repair, chemical mixing and storage, livestock barns, sewer lines, cropped land and above ground fuel storage.
- 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 wells is likely from infiltration of precipitation and surface water into the sandstone units where the sandstone units outcrop upgradient northwest of the wells. Potential contaminant sources identified within the recharge region are the same as the Inventory Region.

Susceptibility is the potential for a public water supply to draw water contaminated by inventoried sources at concentrations that would pose concern. Susceptibility is determined by considering the hazard rating for each potential contaminant source and the existence of barriers that decrease the likelihood that contaminated water will flow to the public water supply wells. The North Harlem Colony public water supply hazard rating for all of the potential contaminant sources identified is low

because the North Harlem Colony source water well is confined and potential contaminant source migration pathways through the confining layer (i.e. poorly sealed wells) were not identified in the inventory region. 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 North Harlem Colony. 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.

The costs associated with contaminated drinking water are high. Developing an approach to protect that resource will reduce the risks of a contamination event occurring. In this report, we have summarized the local geology and well construction issued as they pertain to the quality of your drinking water source. We have identified the area we believe to be most critical to preserving your water quality (the Inventory Region) and have identified potential sources of contamination within that area. In addition, we provide you with recommendations, i.e., Best Management Practices, regarding the proper use and practices associated with some common potential contamination sources. We believe public awareness is a powerful tool for protecting drinking water. The information in this report will help you increase public awareness about the relationship between land use activities and drinking water quality.

INTRODUCTION

This Source Water Delineation and Assessment Report (SWDAR) was prepared for the North Harlem Colony Public Water Supply, PWS ID# MT0001771, located in Blaine County. It was completed by, Bill O'Connell with Montana Rural Water Systems, Inc. with review and assistance from the Source Water Protection Program at the Department of Environmental Quality. Joseph Hofer, the North Harlem Colony water system operator, also provided additional assistance.

PURPOSE

This report is intended to meet the technical requirements for the completion of the delineation and assessment report for the North Harlem Colony 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 (Public Law 104-182). The Montana Source Water Protection Program is intended to be a practical and cost-effective approach to protect public drinking water supplies from contamination. A major component of the Montana Source Water Protection Program is "delineation and assessment." Delineation is a process whereby areas that contribute water to aquifers or surface water bodies that are used to supply drinking water are identified on a map. These areas are called source water protection areas. Assessment involves identifying locations in the delineated areas where contaminants may be generated, stored, or transported, and then determining the relative potential for contamination of drinking water by these sources. The primary purpose of this source water delineation and assessment report is to provide information that helps North Harlem Colony protect its drinking water sources.

LIMITATIONS

This report was prepared to assess threats to North Harlem Colony's public water supply, and is based on published information and information obtained from local residents familiar with the community. The terms "drinking water supply" or "drinking water source" refer specifically to the source of the North Harlem Colony public water supply and not to any other public or private water supply. Also, not all potential or existing sources of groundwater or surface water contamination in the area of the North Harlem Colony public water supply are identified. Only potential sources of contamination in areas that contribute water to its drinking water source are considered.

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

CHAPTER 1
BACKGROUND

THE COMMUNITY

The North Harlem Hutterite Colony is located in Blaine County, in northeast Montana, as shown in Figure 1. The nearest town is Harlem, which is located approximately 5 miles south of the colony. The nearest town with commercial services is Havre (population 9621), located approximately 43 miles west of the colony. The economy of the colony relies on the production of a variety of agricultural products.

The Colony complex comprises residential buildings, a kitchen building, and several other facilities that support the agricultural activities at the colony. A map showing the layout of the colony is included with Appendix A. North Harlem Colony serves 39 people through 6 service connections (lots/hook ups). North Harlem Colony's public water system (PWS) is classified as a Community PWS because it serves more than 25 residents. Drinking water to the Colony is supplied by, 1 well, located on the north side of the compound (Figure 1). Human waste and animal processing wastes are treated in wastewater treatment lagoons located east of the colony, downgrade, away from the buildings.

GEOGRAPHIC SETTING

North Harlem Colony is located on the rolling plains near the Canadian Border in North-central Montana (see Figure 1). The Colony is on the glacial deposits that overlay the Cretaceous sandstone and shale formations of the Northern Great Plains. The Colony is 5 miles north of US 2 and the BN railroad's main line. North Harlem Colony is located in the Milk River Watershed, U.S. Geological Survey (USGS), which is located within the Lower Missouri River Watershed Management Region for Montana. The Milk River is south of the Colony and the Watershed extends north into Canada and west to the Rocky Mountains.

Figure 1. Vicinity Map and Well Locations

CLIMATE

Information on climate in the North Harlem Colony area is based on the National Oceanic and Atmospheric Administration's (NOAA) Havre climate station (Western Regional Climate Station). Average temperatures and total precipitation for the period of record are shown in Table 1.

Table 1. Period of Record Monthly Climate Summary Havre Climate Station

HAVRE WSO AP, MONTANA (243996)

Period of Record Monthly Climate Summary
Period of Record : 2/ 1/1961 to 6/30/2004

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	24.9	32.9	43.1	57.2	67.8	76.6	84.9	84.1	71.5	59.2	41.0	29.7	56.1
Average Min. Temperature (F)	3.6	10.8	19.7	30.9	41.1	49.2	53.7	52.5	41.9	31.1	18.0	7.8	30.0
Average Total Precipitation (in.)	0.47	0.33	0.58	0.92	1.65	2.07	1.58	1.16	1.05	0.57	0.38	0.46	11.22
Average Total SnowFall (in.)	8.9	5.8	7.2	5.6	1.2	0.0	0.0	0.0	0.3	1.8	5.0	7.4	43.1
Average Snow Depth (in.)	3	3	1	0	0	0	0	0	0	0	1	2	1

Percent of possible observations for period of record.
Max. Temp.: 98.9% Min. Temp.: 98.9% Precipitation: 98.9% Snowfall: 96.1% Snow Depth: 96.1%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

GENERAL DESCRIPTION OF THE SOURCE WATER

North Harlem Colony's drinking water is supplied by, 1 well, located on the northwest side of the Colony complex. The well is 810 feet deep and completed with 1/8" by 1 ft slots from 750 feet to 810 feet. The static water level measured at the time of drilling was 184 feet below surface with a pumping water level of 300 feet at 180 gpm and 240 feet at a pumping rate of 55 gpm. The drinking water aquifer is confined and the groundwater flow direction in the vicinity of the wells is towards the south. Recharge to the wells is likely from infiltration of precipitation and surface water at locations where the sandstone is exposed. Additional detail on the geology and hydrogeology of the area is provided in Chapter 2.

THE PUBLIC WATER SUPPLY

North Harlem Colony serves 39 people through 6 service connections (hook ups). The North Harlem Colony is classified as a community public water system (PWS) 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 the most recent sanitary surveys completed on 7/22/1999 included in Appendix A) and personal communication with the PWS operator.

The North Harlem Colony uses one well located on the northwest edge of the Colony complex to supply drinking water. The water is pumped into the first of 2-5000 gallon storage tanks, where chlorine is

added, the chlorinated water is then pumped through a reverse osmosis treatment unit and into the second 5000 gallon storage tank. Finally the treated water is pumped through a UV radiation treatment and into the colony's distribution system.

The well is over 810 feet deep with static water levels at 184 feet below the ground surface. A nearby pond is several hundred feet east of the well and 40 feet below the wellhead, there is no hydraulic connection between the aquifer and the pond. The water source is groundwater.

WATER QUALITY

Every PWS is required to perform monitoring for contamination to their water supply. The monitoring constituents include coliform and other signs of pathogenic organisms, nitrates, metals and multiple organic chemicals. The monitoring schedule depends on many factors such as the size and source water for a PWS, the number of sources (e.g. wells), and the population served. Each PWS has a specific monitoring program tailored to their system that follows the general protocols for operation of a PWS defined by DEQ. PWS monitoring schedules and water quality data are available at http://deq.mt.gov/wqinfo/pws/reports.asp. The North Harlem Colony PWS monitoring data from DEQ's PWS database for the past five years was reviewed and is summarized in this section.

The aquifer is high in sodium and total dissolved solids (TDS) water system has had health-based violations (for coliform). Health based violations are issued when the amount of contaminant exceeds the safety standard (maximum contaminant level, MCL) or water was not treated properly. The health based MCL violation occurred in February, 2001 when water samples confirmed the presence of total coliform bacteria in the water supply. A Public Health Advisory was posted for the system following the detections. The Health Advisories were subsequently lifted based on the satisfactory bacteriological test results of five additional samples and proof of public notification.

CHAPTER 2
DELINEATION

The source water protection area, the land area that contributes water to the North Harlem Colony's PWS is identified in this chapter. Three management areas are identified for a PWS's source water protection area. These three regions, the control zone, inventory region, and recharge region, are delineated for the wells. The control zone, also known as the exclusion zone, is an area at least 100-foot radius around each well. The inventory region represents the zone of contribution of the wells, which typically approximates a three-year groundwater time-of-travel. Because of the depth and confined conditions in the aquifer a 1000-foot radius was delineated for this region. The recharge region represents the area where the source aquifer supplying the North Harlem Colony's water system well is replenished.

GENERAL GEOLOGIC AND HYDROGEOLOGIC SETTING

This section provides an overview of the geology and hydrology of the North Harlem Colony area and is based on a primarily on a geologic map of the area by Bergantino, Patten and Sholes (2003) and the well logs for the North Harlem Colony PWS wells and regional well logs available from the Montana Bureau of Mines and Geology (MBMG) Ground-Water Information Center (GWIC). A regional geologic map is provided in Figure 2. The geology of the area can be used to determine the locations, boundaries, and hydraulic properties of local aquifers. An understanding of hydrogeologic conditions also provides an explanation for the sensitivity of local aquifers to potential contaminant sources.

The stratigraphy in the North Harlem Colony area generally consists of a repeating sequence of sandstone, clay, some coal and shale layers. The shale and clay layers are excellent confining layers.

Figure 2*. *Geology of the Area

PWS WELL INFORMATION

North Harlem Colony's drinking water is supplied by one well located on the north side of the housing and shop complex for the colony. The well is reported to be completed at a relatively deep depth of over 400 feet deep and draw water from a sequence of sandstone layers. The static water levels measured at the time of drilling ranged from 200 feet below surface with a pumping water level of 254 feet at 65 gpm. The drinking water source material is interpreted to be sandstone units of the Judith River Formation. The aquifer is confined and the groundwater flow direction in the vicinity of the wells is towards the southeast. Recharge to the wells is likely from infiltration of precipitation and surface water where the sandstone outcrops.

Copies of the well logs showing stratigraphic and well construction information are included in Appendix B and are summarized in Table 2.

PWS Name Well Number	**Well #2**
DEQ Well Name/ Source Code	Well #2
GWIC ID	44877
DNRC Water Right	C070948-00
Well Location	48 35.176N -108 45.444W
Well Elevation	2594 ft
Date Completed	10/24/1988
Total Depth (bgs)	810 feet
Well Completion: Casing	8 inch casing, 1/8" slots from 750 to 810 feet
Well Completion: Screen	No screen
Well Completion: Annular Seal	10 inch from 0 ft to 80 ft bentonite and cement.
Static Water Level (at time of drilling)	184 feet
Well Pump Test Data	Pumping water level of 240 feet after 2 hours of pumping at 55 gpm

CONCEPTUAL MODEL AND ASSUMPTIONS

North Harlem Colony's production well is located in the Milk River watershed, which is located within the Lower Missouri River Watershed Management Region for Montana. North Harlem Colony's drinking water source is interpreted to be sandstone units in the Judith River Formation. The groundwater flow direction is controlled by deep geologic structures and is from the north-northeast towards the south-southwest. The aquifer is confined and recharge to the wells is primarily from infiltration of precipitation where the formations are exposed.

Table 3. Source Water (Aquifer) Sensitivity Criteria
Based on DEQ Source Water Protection Program Criteria (DEQ, 1999)

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

Using DEQ Source Water Protection Program criteria for ranking aquifer sensitivity (Table 3), the PWS North Harlem Colony's source water is considered as having **low Source Water Sensitivity** to contamination because the aquifer is a confined consolidated sandstone bedrock. Sensitivity is defined as the relative ease that contaminants can migrate to source water.

DELINEATION

Methods and criteria for delineating source water protection areas are specified in the Montana Source Water Protection Program (DEQ, 1999). Source water protection areas delineated for the North Harlem Colony PWS include a control zone, an inventory region and a recharge region. The delineated management zones for the wells are shown on Figure 3.

Control Zone – A 100-foot radius control zone is delineated for North Harlem Colony's well. All sources of potential contaminants should be excluded in this region.

Inventory Region - For the North Harlem Colony well, the DEQ's Source Water Protection Program criteria for a confined aquifer system was followed. The inventory zone was delineated using a 1000-foot radius centered on each well. The 1000-foot radius is the default delineation and was chosen because of the isolated nature of the Colony and the depth of the well. All sources of potential contaminants are inventoried in this region.

Recharge Region –The recharge region for the North Harlem Colony well includes agriculture land 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.

LIMITING FACTORS

Delineation of the source water protection areas for the North Harlem Colony PWS well is based on published reports and lithology indicated on the well logs. The delineation was completed using conservative assumptions to help ensure that the inventory zone reflects the actual area where contamination to the system may occur.

Figure 3. Drinking Water Protection Areas and Potential Sources of Contamination

CHAPTER 3
INVENTORY

INVENTORY METHOD

An inventory of significant potential contaminant sources was conducted to assess the susceptibility of North Harlem Colony's well to contamination and to provide a foundation for source water protection planning. The inventory for North Harlem Colony focuses on facilities that generate, use, or store potential contaminants and certain land uses in the inventory region delineated in the previous section. Sources of all primary drinking water contaminants and pathogens are identified, although only potential sources of contaminants that are the greatest threat to human health were selected for detailed inventory.

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 the drinking water is not likely to occur when potential contaminants are properly used and managed. Not all of these inventoried activities pose actual high risks to your public water supply. The day-to-day operating practices and contamination awareness varies considerably from one facility or land use activity to another.

The inventory for the North Harlem Colony PWS focuses on all activities in the control zone for the well; certain types of municipal and private facilities or land uses in the inventory region; and general land uses and large facilities in the Recharge Region. Databases were searched to identify businesses and land uses that are potential sources of regulated contaminants. The process for completing the inventory included several steps, which are summarized as follows:

Step 1: Urban and agricultural land uses were identified from the U.S. Geological Survey's 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: EPA's Envirofacts System (http://www.epa.gov/enviro/) was queried to identify EPA regulated facilities located in the inventory region. This system accesses facilities listed in the following databases: Resource Conservation and Recovery Information System (RCRIS), Biennial Reporting System (BRS), Toxic Release Inventory (TRI), 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: Databases were queried to identify the following in the inventory region:

- Underground Storage Tanks (UST) (http://www.deq.state.mt.us/UST/USTDownloads.asp)
- Hazardous waste contaminated sites (DEQ hazardous waste site cleanup bureau),
- Landfills (http://nris.state.mt.us/gis/datalist.html), and
- Abandoned and active mines including gravel pits (http://nris.state.mt.us/gis/datalist.html)

Any information on past releases and present compliance status was noted.

Step 4: A business phone directory was queried to identify businesses that generate, use, or store chemicals in the inventory region. Equipment manufacturing and/or repair facilities, printing or

photographic shops, dry cleaners, farm chemical suppliers, and wholesale fuel suppliers were targeted by Standard Industrial Classification (SIC) code.
Step 5: Major road and rail transportation routes were identified throughout the inventory region (http://nris.state.mt.us/gis/datalist.html).

Step 6: Public water system officials, or someone they designated as knowledgeable of the area, were interviewed to identify potential sources that are not listed in databases or on maps elsewhere (such as animal feeding operations that are not required to obtain a permit) and to assist in locating potential sources listed in the state and federal databases.

Step 7. Significant potential contaminant sources were identified in the control zone and inventory region and land uses and facilities that generate, store, or use large quantities of hazardous materials were identified within the recharge region

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

1. Large quantity hazardous waste generators.
2. Landfills.
3. Underground storage tanks.
4. Known groundwater contamination (including open or closed hazardous waste sites, state or federal superfund sites, and UST leak sites).
5. Underground injection well.
6. Major roads or rail transportation routes.
7. Cultivated cropland greater than 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

CONTROL ZONE INVENTORY RESULTS

The control zone includes for the New Well is located on the west side of the Colony complex. The control zone does not have any potential contaminant sources. The PWS should be vigilant to ensure that potential sources of contamination are excluded from the control zone and that positive drainage away from each well casing is maintained.

INVENTORY REGION RESULTS

The inventory results for the North Harlem Colony well is summarized in Table 4 and shown on Figure 3. The inventory region includes the farm complex and nearby cropland. The farm complex includes Colony housing and school, hog and chicken barns, a dairy stockyard with runoff retention pond, a slaughterhouse, equipment repair and maintenance shops, and various other shops and storage buildings (See Appendix A for PWS Site Plans).

Above ground storage tanks, one for unleaded gas and one for diesel, and one above ground storage tank for farm diesel are located next to the shop buildings.

Herbicides for application on cropland are mixed in the shop area.
Human waste is piped through sewer mains from the houses to the lagoon.

Additional point sources of potential pollutants (such as businesses or facilities listed on regulatory databases) were not identified in the inventory region.

Potential contaminants at the Colony include human and animal wastes, solvents and fuels, waste chemicals, and herbicides. The primary hazards are chemical or fuel spills, excess application of herbicides, spills at the chemical mixing station, runoff from the stockyard and slaughterhouse, and leakage from sewer mains (Table 4).

Land uses within the inventory region include primarily pasture, crops and some low intensity residential property at the Colony complex. Other potential sources of contamination noted include a sewage treatment lagoon. Septic system density within the inventory region is low and is not considered a risk to the PWS drinking water. Additional point sources of potential pollutants (such as businesses or facilities listed on regulatory databases) were not identified in the inventory region).

Table 4. Summary of Potential Contaminant Sources in the Inventory Region

Source Type	*Potential Contaminants*	*Description/Concern*
Land Use Cover (Step 1)		
Agricultural Crop Land	Pathogens, nitrates, pesticides and herbicides	Over-application or improper handling of pesticides or fertilizers may impact drinking water. Excessive irrigation may cause transport of contaminants or sediments to groundwater
Residential Development with Sewer Lines – colony only	Pathogens and nitrates	If not properly designed, installed, and maintained, sewer lines can be a point source of residential and commercial effluent in groundwater.
EPA Envirofacts Sites (Step 2)		
None Identified		
DEQ Databases (Step 3)		
None Identified		
Business – SIC Code Sites (Step 4)		
None Identified		
Miscellaneous Others, including Step 5 and 6		
Garden/Cropped Agricultural Land	Pathogens and nitrates, various herbicides	Land application of animal waste; spills and excess application of fertilizers and herbicides
Animal Waste Management Areas (Barns, Stockyard, Corral Areas)	Pathogens and nitrates, small volumes of chemicals	Leaching from animal wastes, leakage from sewer lines or spills of stored chemicals
Slaughterhouse/Butcher Shop	Pathogens and nitrates	Leaching from animal wastes
Sewer Lines/Sewage Lagoon(s)	Pathogens and nitrates	Leaking and infiltration to ground water
Vehicle/Equipment Maintenance Areas/Shops	VOCs, SOCs	Spills of chemicals used
County and Colony Access Roads	Nitrates, pesticides and herbicides, various others	Spills of transported chemical, routine spraying, infiltration into groundwater
Chemical/Waste Storage, Handling, Mixing, and Cleaning Areas	Various chemicals	Spills and runoff
Colony Wide	Various chemicals	Waste chemical spills
Fuel Storage Tanks	Petroleum hydrocarbons	Spills or leaks

Notes: Individual sites identified are evaluated in Chapter 4.

RECHARGE REGION INVENTORY RESULTS

Land use in the recharge region is reported in the 1992 National Land Cover dataset (Figure 4) to be primarily grasslands and agricultural land. The percentage of agricultural land is considered a moderate risk to the drinking water supply. Grasslands are not considered potential sources of contamination unless there are significant grazing operations in the area.

Septic system density within the watershed/recharge region is low and is not considered a risk to the PWS drinking water.

Additional point sources of potential pollutions (such as businesses or facilities listed on regulatory databases) were not identified in the recharge region.

INVENTORY UPDATE

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

INVENTORY LIMITATIONS

The potential contaminant sources described above are identified from readily available information. Consequently, unregulated activities or unreported contaminant releases may have been overlooked. The use of multiple sources of information, however, should ensure that the major threats to the source water for North Harlem Colony's public water supply have been identified. The lack of identification of a potential contaminant source in the inventory or susceptibility assessment of this report does not mean 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 the potential contamination sources through further research and local input.

CHAPTER 4
SUSCEPTIBILITY ASSESSMENT

GENERAL DISCUSSION

Susceptibility is the potential for a public water supply to draw water contaminated by inventoried sources at concentrations that would pose a concern. Susceptibility is assessed in order to prioritize potential pollutant sources for management actions by local entities, in this case the North Harlem Colony PWS managers and operators. The goal of Source Water Management is to protect the source water by 1) controlling activities in the control zone, 2) managing significant potential contaminant sources in the inventory region, and 3) ensuring that major land use activities or other significant activities in the recharge region pose minimal threat to the source water. Management priorities in the inventory region are determined by ranking the significant potential contaminant sources identified in the previous chapter according to susceptibility. Alternative management approaches that could be pursued by the PWS managers and operators to reduce susceptibility are recommended in this chapter.

HAZARD DETERMINATION

The proximity of a potential contaminant source to a spring or well intake, potential contaminant migration pathways, or the density of potential non-point contaminant sources determines the threat of contamination, referred to here as hazard (Table 5). Hazard and the existence of barriers to contamination determine susceptibility, which is described in Table 6. Table 5 below describes the criteria to determine hazard within the inventory region as it was delineated in this SWDAR. Note that this table is specific to PWSs that draw their water from confined aquifers. The determination of hazard is somewhat different for other types of water sources.

Table 5. Hazard of Potential Contaminant Sources for Well Drawing Water from Confined Aquifers

Type of Potential Contaminant Source	High Hazard	Moderate Hazard	Low Hazard
Septic System Density (# per square mile)	More than 300 septic systems per sq. mile	Between 50 and 300 septic systems per sq. mile	Less than 50 septic systems per sq. mile
Municipal or Community Sanitary Sewer (% land use)	More than 50 percent of the inventory region	Between 20 and 50 percent of the inventory region	Less than 20 percent of the inventory region
Agricultural (% land use)	More than 50% of region	20 to 50 percent of region	Less than 20 percent of the inventory region
Point sources of all contaminants	PWS well is not sealed through confining layer	Well(s) in the inventory region other than the PWS are not sealed through the confining layer	All wells in the inventory region are sealed through the confining layer

Note: Highlighted areas are those relevant to the PWS Name inventory region
TOT – Time of travel

Editor's note: the MBMG GWIC database identified three additional wells (2 stockwater and 1 domestic) at North Harlem Colony. I suspect that a 'domestic' well is likely to be within the inventory region, and no information on the well's annular seal was available. Therefore, I revised the hazard posed by point sources to 'Moderate".

DISCUSSION OF SUSCEPTIBILITY

Susceptibility is determined by considering the hazard rating for each potential contaminant source and the existence of barriers that decrease the likelihood that contaminated water will flow to the North Harlem Colony PWS well (Table 6).

Table 6. Susceptibility Based on Hazard and Barriers

Presence Of Barriers	Hazard		
	High	**Moderate**	**Low**
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

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

The well logs indicate that significant layers of clay and shale are present overlying the aquifer. Clay and shale layers were also identified in other well logs in the area indicating that the layer is likely laterally extensive in the North Harlem Colony area. The clay serves as a natural barrier to the downward migration of potential contaminants from the surface.

A summary of the susceptibility assessment for North Harlem Colony PWS production well is located in Table 7. Because a contaminant source has not been identified in the inventory or susceptibility assessment of this report, it doesn't mean that the potential for contamination does not exist or is not a threat. Table 7 only includes the potential contaminant sources identified in Chapter 3 that were determined to present a significant potential risk to the drinking water supply. 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.

MANAGEMENT RECOMMENDATIONS

It should be noted that even small releases of some chemicals in close proximity to a public water supply well can have significant negative impact on water quality, and therefore are a significant threat to the public water supply. Steps can be taken to reduce the likelihood of releases in the source water for the PWS or in the vicinity of the sources. Management recommendations for protecting the North Harlem Colony drinking water supply are detailed in the susceptibility table (Table 7). If these, and other, management recommendations are implemented; they may be considered additional barriers that will reduce the susceptibility of the intake to specific sources and contaminants.

Table 7. Susceptibility Assessment of Significant Potential Contaminant Sources

Potential Contaminant Source	Potential Contaminants	Hazard	Hazard Rating	Barriers	Susceptibility	Management Recommendations
Inventory Region						
Garden/Cropped Agricultural Area(s)	Nitrate and SOCs from fertilizer, pesticides and herbicides.	Contaminants leaching into groundwater	Low	-Aquifer depth >100 feet below ground surface (bgs) - Thick clay layers overlie the aquifer - Distance from the PWS well(s)	Very Low	Prohibit land application within inventory region. Use agricultural best management practices (BMPs) and apply all chemicals according to label instructions.
Animal Waste Management Areas (Barns, Dairy, Stockyard, Corral Areas)	Pathogens, nitrates, stored chemicals	Leaching from animal wastes, spills of chemicals used	Moderate	- Concrete floor, no cracks - Distance from well -- -Good housekeeping	Low	Use agricultural best management practices (BMPs) to ensure wastes do not impact groundwater. Monitor integrity of animal waste storage units/areas. Dispose of wastes outside of inventory region. Recycle/dispose of waste chemicals properly. Ensure good housekeeping in chemical use areas.
Slaughterhouse/Butcher Shop	Pathogens and nitrates	Spills, runoff, contaminants leaching into groundwater	Moderate	- Concrete floor, no cracks - Good housekeeping	Low	Use best management practices (BMPs) to ensure wastes do not impact groundwater. Monitor integrity of animal waste storage areas. Dispose of wastes outside of inventory region. Ensure good housekeeping.
Heavily Grazed Areas	Pathogens and nitrates	Contaminants directly entering the well casing or leaching into groundwater	Low		Very Low	Maintain fencing around the wells to prevent cattle access. Encourage use of agricultural best management practices (BMPs) in the watershed to keep cattle away from the wells and stream especially directly upstream of the well locations. Work with upstream landowners to ensure livestock waste products are kept away from the stream.

Sewer Lines/ Sewage Lagoon(s)	Pathogens, nitrates	Ongoing or catastrophic leakage of sewage into groundwater	Moderate	- System is relatively new and well designed	Low	Ensure ongoing inspection and maintenance with rehabilitation or replacement of existing sewer mains if necessary. Use sewer main liners. Develop rapid response plan for leaks or ruptures.
Vehicle/Equipment Maintenance Areas/Shops	Petroleum products, maintenance products, VOCs, SOCs and others	Spills or leaks of chemicals used	Moderate	- Concrete floor, no cracks - Good housekeeping	Low	Protect area from fuel or other chemical spills. Maintain sealed concrete floors. Ensure proper chemical and waste use, storage, and disposal/recycling. Ensure good housekeeping.
County and Colony Access Roads	Pesticides, fertilizers, VOCs, SOCs, other	Spills, routine spraying, storm water runoff, infiltration into groundwater	Low	- County Emergency Response Plan, training and preparation of local response personnel	Very Low	Notify road owners of well and protection area locations. Develop Emergency Response Plan for Colony roads. For County roads, encourage and support (1) emergency planning, (2) training of local emergency response personnel, and (3) use of levees or engineered storm drainage to carry any spills away and prevent infiltration into ground. Encourage reduced herbicide use.
Chemical/Waste Storage, Handling, Mixing, and Cleaning Areas	Various Chemicals	Spills, leaks, runoff, infiltration into groundwater	Moderate	- Concrete floor, no cracks - Good housekeeping	Low	Limit volumes stored. Provide containment for large volumes. Ensure prompt and complete cleanup of spills. Maintain sealed concrete floors. Ensure proper chemical and waste use, storage, and disposal/recycling. Follow label instructions. Ensure good housekeeping.
Fuel Storage Tanks	Petroleum products and VOCs	Spills or leaks	Moderate	- Compliance with 1998 upgrades - Spill prevention - Groundwater monitoring	Low	Ensure proper operation and maintenance. Verify existing contamination, if any, is being properly removed or remediated. Properly abandon and remove USTs if out-of-service. Test soil to evaluate potential impact from historic spills or leaks.
Recharge Region						
Agricultural Crop Land	Nitrate and SOCs from fertilizer, pesticides and herbicides. Pathogens (if grazing occurs)	Contaminants leaching into groundwater	Not assessed in recharge region	- Clay layers overly the aquifer	Not assessed in recharge region	Encourage use of agricultural best management practices (BMPs) in the recharge region

CHAPTER 5
MONITORING WAIVERS

WAIVER RECOMMENDATION

The colony has a partial waiver for Organic Chemicals issued 12/1/1998 (ed.: Phase 2 organics waiver). The waiver allows the PWS to collect one sample round for these constituents every 9-year cycle (the standard is one sample round per 3-year cycle). In addition, the PWS was grandfathered under the radionuclide rule and is only required to sample once every 9-years. Based on past monitoring results and the susceptibility assessment, the North Harlem Colony PWS may be eligible for other waivers as well including Phase 5 inorganics and volatile organic compounds. Information on susceptibility and use waivers is provided in this section to give the PWS operators an opportunity to consider if waivers may be feasible.

Before a susceptibility or use wavier is requested, the PWS Operators are encouraged to carefully review the following section on Monitoring Waiver Requirements. If after reviewing this section it is determined that an additional waivers are feasible, the 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. Table 8 shows how identified potential contaminant sources affect the eligibility for monitoring waivers.

Table 8. Susceptibility Assessment as it relates to VOC Waiver Eligibility for Significant Potential Contaminant Sources in the Inventory Region

Source	Contaminant	Susceptibility	Waiver Eligibility
Transportation Corridors	VOCs, SOCs, petroleum products and other chemicals	**Very low**	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.
Agricultural Cropped Areas	Nitrates and SOCs	**Low**	Chemical use may preclude waivers for some chemicals. The PWS should confirm chemical use/storage history by land parcel.
Shops, Maintenance Areas, Fuel Storage	VOCs, SOCs	**Low**	Chemical use may preclude waivers for some chemicals, although the majority of the shop complex is outside the inventory region. A site inspection would likely be a prerequisite for waiver consideration.

MONITORING WAIVER REQUIREMENTS

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

Use Waivers

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

Susceptibility Waivers

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

Given the wide range of landforms, land uses, and the diversity of groundwater and surface water sources across the state, additional information is often required during the review of a waiver application. Additional information may include 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. DEQ's PWS Section and DEQ's Source Water Protection Program will conduct review of an organic chemical monitoring waiver application. Other state agencies may be asked for assistance.

Susceptibility Waiver for Confined Aquifers

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

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

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

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

CHAPTER 6
MANAGEMENT & EMERGENCEY RESPONSE

Procedures for responding to emergencies are described and an emergency coordinator is designated in this chapter. The equipment and materials needed to respond to an emergency and the source of a temporary water supply are also described.

Possible Disruption Threats
The main threat to the PWS has been identified as casing failure or line breaks. A failure of the casing could allow contaminated surface water or poorer quality water from a different aquifer to enter the wells and aquifer.

Emergency Coordinator
The emergency coordinator for North Harlem Colony is Joe Hofer.

Equipment and Material Resources
A catastrophic loss of water will require the services of an engineer and a well driller. Minor disruptions to the public water system will be handled by the colony.

Procedures to Shut Down the Wells
The well can be isolated from the water distribution system by using the valves at the well and/or pump-house. The keys are located with the operator.

SECURITY

In the wake of the September 11th attacks a new emphasis has been placed on site security. North Harlem Colony's water facilities are located within the community complex. The pump house door is locked. The well caps should be locked to prevent tampering.

The most successful security measure is to continue to be aware of activities on the colony. When residents of the colonies question visitors about their business at the colony, they help keep the PWS secure.

Important emergency contacts and phone

CONTACT NAME	TITLE	PHONE	RESPONSIBILITY
Joe Hofer	*Plumber*	*353-4617*	*PWS Facilities*
MT Rural Water Systems- MRWS		*454-1151*	*PWS*
Ed Gierke *Sheri Medow Smith*	*District 2 rep* *Homeland Security*	*450-1998* *841-3969*	*Disaster and Emergency Services* *Homeland Security Manager*
Montana Spill Hotline		*444-6911*	
DEQ Enforcement Division *DEQ Source Water Protection*	*Section Head*	*444-0379* *444-4806*	*Water Quality*

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

GLOSSARY*

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

Alkalinity. The capacity of water to neutralize acids.

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

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

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

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

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

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

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

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.

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

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

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

Hydrogeology. The study of geologic formations and how they effect 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 Capacity 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 well drilled in Montana, including stratigraphic data and well construction data, when available.

Montana Pollutant Discharge Elimination System (MPDES). A permitting system that utilizes a database to track entities that discharge wastewater of any type into waters of the State of Montana.

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

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

Nonpoint-Source Pollution. Pollution sources that are diffuse and do not have a single point of origin or are not introduced into a receiving stream from a specific outlet. Examples of nonpoint- source pollution include agriculture, forestry, and run-off from city streets. Nonpoint sources of pollution, such as the use of herbicides, can concentrate low levels of these chemicals into surface and/or 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. RCRA's primary goals are to protect human health and the environment from the potential hazards of waste disposal, to conserve energy and natural resources, to reduce the amount of waste generated, and to ensure that wastes are managed in an environmentally sound manner.

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

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

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

Source Water. Any surface water, spring, or 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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Appendix A
PWS Sanitary Survey

Appendix B
PWS Well Logs

Appendix C
Water Quality Analytical Results

Appendix D
Concurrence Letter