Hillside Colony
Public Water System

PWS ID # MT0001782

Source Water Delineation and Assessment Report

Date of Report: July 21, 2005

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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 conducting 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.

The drinking water for Hillside Colony is supplied by one well located approximately three miles northwest of the Colony. Based on the sanitary survey, well log, and the depth of the well, it appears that the Two Medicine Formation is providing water to the PWS's well. In accordance with the Montana Source Water Protection Program criteria (1999), the aquifer (source water) is considered to have a moderate sensitivity to potential contaminant sources. 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 Hillside Colony 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:

- Potential contaminant sources identified within the control zone include: agricultural practices. 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 well and all sources of potential contaminants should be excluded in this region.
- Significant potential contaminant sources identified within the inventory region include: agricultural activities and two petroleum wells. The inventory region should be managed to prevent contaminants from reaching the well before natural processes reduce their concentrations. The inventory region includes the area of land overlying the aquifer upgradient southwest of the well that is expected to supply groundwater recharge to the well over the next three years.
- Potential contaminant sources identified within the recharge region include: agriculture, oil field pipelines, and oil/gas production. 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 Two Medicine Formation where this formation outcrops upgradient south/southwest of the well.

The Hillside Colony public water supply has a moderate susceptibility to the following potential contaminant sources: agricultural practices and stockyards. The hazard rating for all of the other potential contaminant sources identified is low because the distance of the sources in relation to the well intake. 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 Hillside 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, 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.

INTRODUCTION

This Source Water Delineation and Assessment Report (SWDAR) was prepared for the Hillside Colony Public Water Supply (PWS), PWS ID No. MT0001782, located in Toole County. Pete Norbeck with the Montana Bureau of Mines and Geology originally completed it. It has been updated and reformatted to meet the federal Safe Drinking Water Act source water assessment requirements by Joe Meek of the Source Water Protection Program at the Department of Environmental Quality (DEQ) with assistance from intern Bethany Haines.

PURPOSE

The primary purpose of this source water delineation and assessment report is to provide information that helps the Hillside Colony protect its drinking water sources. A major component of the Montana Source Water Protection Program is '*delineation and assessment*'. Delineation is the process of identifying areas that contribute water to aquifers or surface water bodies used as drinking water supplies. The delineated areas are referred to as source water protection areas. Assessment involves identifying and inventorying potential sources of contamination within the source water protection areas, and then determining the potential for contamination of drinking water by these sources. This report is intended to meet the technical requirements for the completion of a source water delineation and assessment report for the Hillside Colony public water system, 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.

LIMITATIONS

This report was prepared to assess threats to Hillside 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 Hillside 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 vicinity of the Hillside Colony public water supply are identified. Potential sources of contamination are considered only in areas that contribute water to the source of the public water supply.

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 Hillside Colony is located in Toole County, in north-central Montana, as shown in Figure 1. The nearest town is Sweetgrass, approximately 5.5 miles east of the colony. The nearest town with significant commercial services is Cut Bank (population 1,802), located approximately 35 miles southwest of the colony. The economy of the colony relies on the production of a variety of agricultural products including grain, beef and dairy cattle, hogs, chickens and geese.

The Colony complex is compromised of living quarters, a school, kitchen, barns and slaughterhouse. The Colony serves around 130 people through 25 service connections (hook ups). Hillside Colony's public water system (PWS) is classified as a Community PWS because it serves more than 25 residents. Drinking water to the Colony's potable water is supplied by one well located northwest of the colony (Figure 1). Domestic waste from the Colony is treated by a two-cell facultative lagoon system located east of the Colony.

GEOGRAPHIC SETTING

Hillside Colony is located between the central part of the Rocky Mountain Front Range and the Sweet Grass Hills (Figure 1) in the glaciated central groundwater region of Montana (Heath, 1984). The Colony's elevation is approximately 3,600 feet above sea level. There are several lakes in the vicinity that are seasonally dry. The well is located in the Upper Milk Watershed, USGS HUC Number 10050002, which is located within the Lower Missouri River Watershed Management Region for Montana. The Upper Milk hydrologic unit is the catchment basin for 140 square miles in northern Toole and Glacier Counties. The Upper Milk hydrologic unit includes numerous coulee drainages and seasonal lakes between (but not including) the Big Rock Coulee and the Sweet Grass Hills

GEOLOGIC AND HYDROGEOLOGIC SETTING

This section provides an overview of the geology and hydrology of the Hillside Colony area and is based on a primarily on a geologic map of the area by Berg, (2002) and the well log for the Hillside Colony PWS well 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.

Hillside Colony's potable water well is competed in a sandstone layer within the Two Medicine Formation. The Colony is located on or near the outcrop of this geologic unit that dips westward toward the mountain front under the Bearpaw Shale and Horsethief Sandstone (Norbeck, 1997) The surface soils in the Hillside Colony area are underlain by the Two Medicine Formation, a unit of mudstone and siltsone interbedded with lenticular, massive, commonly calcareous, fine to very course grained sandstone. Typically, low water yields (less that 10 gallons per minute) are obtained from the Two Medicine formation. The Two Medicine Formation in this area includes equivalents of the upper part of the Eagle Sandstone (Zimmerman, 1967).

***Figure 1*. Vicinity Map and Well Locations**

***Figure 2*. Geology of the Area**

CLIMATE

Information on climate in the Hillside Colony area is based on the National Oceanic and Atmospheric Administration's (NOAA) Sweetgrass climate station located at an elevation of 3,470 feet above mean sea level (Western Regional Climate Station). Average temperatures and total precipitation for the period of record are shown in Table 1.

Table 1. Monthly Climate Summary Sweetgrass, Montana Climate Station

Station 248093 Period of Record: 5/25/1951 to 8/31/2003

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	29.4	35.3	42.3	55.4	66.0	73.7	81.4	80.9	70.3	59.1	41.8	32.3	55.7
Average Min. Temperature (F)	6.9	12.8	19.5	30.4	39.9	47.7	51.7	50.9	41.7	32.9	20.6	11.6	30.5
Average Total Precipitation (in.)	0.32	0.23	0.44	1.03	2.28	3.45	1.58	1.74	1.34	0.58	0.41	0.34	13.73
Average Total SnowFall (in.)	3.0	1.9	1.5	1.5	0.1	0.0	0.0	0.0	0.2	0.5	2.9	2.3	13.9
Average Snow Depth (in.)	1	1	0	0	0	0	0	0	0	0	0	1	0

Percent of possible observations for period of record.
Max. Temp.: 84.8% Min. Temp.: 85.1% Precipitation: 90.2% Snowfall: 69.2% Snow Depth: 61.7%

GENERAL DESCRIPTION OF THE SOURCE WATER

The source aquifer is unconfined and the interpreted groundwater flow direction in the vicinity of the wells is to the northeast. Recharge to the wells is likely from infiltration of precipitation and surface water where the formation is exposed.

THE PUBLIC WATER SUPPLY

Hillside Colony serves 130 people through 25 service connections (hook ups). The Hillside Colony is classified as a community public water system (PWS) since it serves at least 25 of the same residents 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 December 3, 2003 (attached as Appendix A).

The Colony has two separate water systems; one system provides drinking water, and the other system provides water for the agricultural use (each system has its own well). However, the two systems are connected in the distribution system with a pipe that is equipped with a valve that is normally closed; therefore, the agricultural water system could be used to supply the Colony drinking water system during an emergency. Only Well 1 is active and well 2 will not be considered further in this report.

Well 1, near Red River, is the potable source of water. This 12-inch diameter well is located approximately three miles northwest of the Colony. Very little information is provided on the Ground Water Information Center (GWIC) well log. The log shows the well was drilled and cased with PVC casing to a depth of 42 feet. The log also shows a pumping water level of 10.5 feet. This well operates off of a timer and pumps water to the 60,000-gallon Storage Facility 1. The well is equipped with a 5-HP submersible pump capable of delivering 80 gallons per minute (gpm). The vent for this well terminates at 90-degree angle from the casing, rather than being U-shaped and terminating in a downward position. The 60,000-gallon storage tank is located on the northwest side of the Colony. This tank is allowed to overflow to an adjacent pond that is used for irrigation.

An assessment of groundwater sources under the direct influence of surface water (GWUDISW)

originally indicated that the groundwater might be influenced by surface water. Additional sampling (microparticulate analysis, MPA) conducted in 1999 for the aquifer indicates that the well field water is groundwater.

PWS WELL INFORMATION

Hillside Colony's drinking water is supplied by one well located northwest of the colony. The well was completed to a relatively shallow depth of about 42 feet. Copies of the Colony's two well logs showing encountered stratigraphy and well construction are attached as Appendix B and are summarized in Table 2.

Table 2. Summary of PWS Well Information

Well ID	Well No. 1 Potable Water	Well No. 2 Stock water
DEQ Well Name/ Source Code	Well #1 WL002	Well #2 WL003
GWIC ID	149823	160564
DNRC Water Right	PO46927-00	No records currently in GWIC.
Well Location	NW¼, NE¼, NW¼, Sec.3, T37N, R04W	SE¼, NE¼, SE¼, Sec.12, T37N, R04W
Well Elevation	Approx. 3,600 feet	Approx. 3,600 feet
Date Completed	No records currently in GWIC.	2/1/1997
Total Depth (bgs)	42 feet	130 feet
Well Completion: Casing	12" casing from 0 to 42 feet below surface	6" casing from 0 to 128 feet below surface
Well Completion: Screen	No l records currently in GWIC.	Casing perforated from 114-127 feet in "sandstone and shale"
Well Completion: Annular Seal	No seal records currently in GWIC.	0-40 feet of Bentonite
Static Water Level (at time of drilling)	No seal records currently in GWIC.	27 feet
Well Pump Test Data	Pumping water level of 10.5 feet	Pumping water level of 62 feet after 12 hours of pumping at 25 gpm

WATER QUALITY

Every PWS is required to perform regular sampling of their water supply to detect any 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. Each PWS has a specific monitoring program tailored to their system that follows the general protocols defined by DEQ for operation of a PWS. PWS monitoring schedules are available at: <http://nris.state.mt.us/wis/swap/swapquery.asp>. The Hillside Colony PWS monitoring data from DEQ's database for the past five years was reviewed and is summarized in this section.

No health-based violations have been reported in the last five years. Health based violations are issued when the amount of contaminant in the treated drinking water exceeds the safety standard (maximum contaminant level or MCL), or water was not treated properly. The water system has had one monitoring violation in the previous five years (for missing monthly coliform sampling).

Other compounds detected during Hillside Colony's water sampling over the past five years include nitrite

+ nitrate (3.11 to 3.54 mg/L (milligrams per liter,)), fluoride (0.39 to 0.5 mg/L), and selenium (0.007 mg/L). The compounds detected are all below established EPA primary maximum contaminant levels (MCLs).

Background Water Quality Monitoring Results

MONTANA BUREAU OF MINES AND GEOLOGY
BUTTE, MONTANA 59701 (406)496-4101

WATER QUALITY ANALYSIS
LAB NO.: 96Q0107

State:	MT	County:	TOOLE
Latitude-Longitude:	D ' 'N D ' 'W	Site Location:	37N 04W 03 BACCDB 01
Topographic Map:	HILLSIDE COLONY 7 1/2'	MBMG Site:	M:149823
Geologic Source:		Project Id:	GLACCO
Drainage Basin:	FB	Station Id:	
Agency + Sampler:	MBMG*RMT	Sample Source:	WELL
Bottle number:	370403B	Land Surface Altitude:	3580.0 FT.
Date Sampled:	15 JUL 1995	Sustained Yield:	
Time Sampled:	14:15	Yield Meas Method:	
Lab + Analyst:	MBMG*TSH	Total Depth of Well:	42.0 FT. rept.
Date Complete:	21 SEP 1995	SWL above(-) or below GS:	
Sample Handling:	3120	Casing Diameter:	12.0 In.
Method Sampled:	PUMPED	Casing Type:	PVC -
Procedure Type:	DISSOLVED	Completion Type:	
Water Use:		Perforation Interval:	

Sampling Site: HILLSIDE COLONY
Drainage Basin: MILK RIVER BTWN FRESNO DAM AND RED RIVER OF THE MILK RIVER

		mg/L	meq/L			mg/L	meq/L
Calcium	(Ca)	57.5	2.87	Bicarbonate	(HCO3)	950.4	15.58
Magnesium	(Mg)	30.9	2.54	Carbonate	(CO3)		0.00
Sodium	(Na)	259.9	11.31	Chloride	(Cl)	19.0	0.54
Potassium	(K)	3.2	0.08	Sulfate	(SO4)	500.	10.41
Iron	(Fe)	<.05	0.00	Nitrate	(as N)	2.75	0.20
Manganese	(Mn)	.011	0.00	Fluoride	(F)	.272	0.01
Silica	(SiO2)	7.0		OrthoPhosphate	(as P)	<.1	0.00
Total Cations:			16.83	Total Anions:			26.73

Calculated Dissolved Solid:	1348.72	Total Hardness as CaCO3:	270.76
Sum of Diss. Constituent:	1830.94	Field Hardness as CaCO3:	
Field cnductvy, micromhos:	1529.	Total Alkalinity as CaCO3:	779.49
Lab cnductvy, micromhos:	1634.	Field Alkalinity as CaCO3:	
Field PH:	7.42	Ryznar Stability Index:	5.91
Laboratory PH:	7.79	Langlier Saturation Index:	0.94
		Sodium Adsorption Ratio:	6.87

Parameter	Value	Parameter	Value
Field Temp, Air		Field Temp, Water	8.0 C
ALUMINUM, DISS (UG/L-AL)	<30.	LITHIUM,DISS(UG/L AS LI)	23.
ANTIMONY,DIS(UG/L AS SB)	<2.	MOLYBDENUM,DISS(UG/L-MO)	<10.
ARSENIC,DISS(UG/L AS AS)	<1.	NICKEL,DISS (UG/L AS NI)	2.1
BARIUM,DISS (UG/L AS BA)	10.2	NITRITE,DISS(MG/L-NO2)	<.05
BERYLL,DISS (UG/L AS BE)	<2.	PHOSPHATE,TO,DIS(MG/L-P)	<.2
BORON,DISS (UG/L AS B)	330.	SELENIUM, DISS (UG/L-SE)	1.9
BROMIDE,DISS (UG/L AS BR)	<50.	SILVER, DISS(UG/L AS AG)	<1.
CADMIUM,DISS(UG/L AS CD)	<2.	STRONTIUM,DISS (UG/L-SR)	1148.
CHROMIUM, DISS (UG/L-CR)	<2.	TITANIUM DIS(UG/L AS TI)	<10.
COBALT,DISS (UG/L AS CO)	<2.	VANADIUM,DISS(UG/L AS V)	<5.
COPPER,DISS (UG/L AS CU)	4.8	ZINC, DISS (UG/L AS ZN)	2.6
LEAD,DISS(UG/L AS PB)	<2.	ZIRCONIUM DIS(UG/L - ZR)	<20.

Explanation: mg/L = milligrams per liter, ug/L = micrograms per liter, meq/L = milliequivalents per liter. FT = feet, Mt = meters, TR = total recoverable, TOT = total, BIO = biologically available.
Qualifiers: A = Hydride Atomic Absorption, E = Estimated due to interference, H = Exceeded Holding Time, N = Spiked sample recovery not within control limit P = Preserved Sample, S = Method of Standard Additions, * = Duplicate Analysis not within control limits

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Percent Meq/L (For Piper Plot)

Ca	Mg	Na	K	Cl	SO4	HCO3	CO3
17.1	15.1	67.3	0.5	2.0	39.2	58.7	0.0

NOTE: In correspondence, please refer to Lab Number: 96Q0107

MONTANA BUREAU OF MINES AND GEOLOGY
BUTTE, MONTANA 59701 (406)496-4101

WATER QUALITY ANALYSIS
LAB NO.: 96Q0101

State:	MT	County:	TOOLE
Latitude-Longitude:	D ' 'N D ' 'W	Site Location:	37N 04W 12 DBCDAB 01
Topographic Map:	HILLSIDE COLONY 7 1/2'	MBMG Site:	M:90394
Geologic Source:		Project Id:	GLACCO
Drainage Basin:	FB	Station Id:	
Agency + Sampler:	MBMG*RMT	Sample Source:	WELL
Bottle number:	370412D	Land Surface Altitude:	3660.0 FT.
Date Sampled:	15 JUL 1995	Sustained Yield:	
Time Sampled:	17:00	Yield Meas Method:	
Lab + Analyst:	MBMG*TSH	Total Depth of Well:	117.0 FT. rept.
Date Complete:	21 SEP 1995	SWL above(-) or below GS:	
Sample Handling:	3120	Casing Diameter:	
Method Sampled:	PUMPED	Casing Type:	-
Procedure Type:	DISSOLVED	Completion Type:	STEEL
Water Use:	DOMESTIC	Perforation Interval:	-3.0 to 117.0 FT.

Sampling Site: HILLSIDE COLONY
Drainage Basin: MILK RIVER BTWN FRESNO DAM AND RED RIVER OF THE MILK RIVER

		mg/L	meq/L			mg/L	meq/L
Calcium	(Ca)	34.	1.70	Bicarbonate	(HCO3)	886.9	14.54
Magnesium	(Mg)	15.9	1.31	Carbonate	(CO3)		0.00
Sodium	(Na)	1309.	56.94	Chloride	(Cl)	32.5	0.92
Potassium	(K)	3.2	0.08	Sulfate	(SO4)	2270.	47.26
Iron	(Fe)	<.02	0.00	Nitrate	(as N)	1.5	0.11
Manganese	(Mn)	.004	0.00	Fluoride	(F)	.812	0.04
Silica	(SiO2)	6.8		OrthoPhosphate	(as P)	<1.	0.00
Total Cations:			60.09	Total Anions:			62.86

Calculated Dissolved Solid:	4110.73	Total Hardness as CaCO3:	150.34
Sum of Diss, Constituent:	4560.74	Field Hardness as CaCO3:	
Field cnductvy, micromhos:	6360.	Total Alkalinity as CaCO3:	727.41
Lab cnductvy, micromhos:	4780.	Field Alkalinity as CaCO3:	
Field PH:	8.08	Ryznar Stability Index:	6.12
Laboratory PH:	8.09	Langlier Saturation Index:	0.98
		Sodium Adsorption Ratio:	46.46

Parameter	Value	Parameter	Value
Field Temp, Air		Field Temp, Water	13.0 C
ALUMINUM, DISS (UG/L-AL)	74.9	LITHIUM,DISS(UG/L AS LI)	144.
ANTIMONY,DIS(UG/L AS SB)	<10.	MOLYBDENUM,DISS(UG/L-MO)	<50.
ARSENIC,DISS(UG/L AS AS)	1.0	NICKEL,DISS (UG/L AS NI)	2.6
BARIUM,DISS (UG/L AS BA)	5.8	NITRITE,DISS(MG/L-NO2)	<.05
BERYLL,DISS (UG/L AS BE)	<10.	PHOSPHATE,TO,DIS(MG/L-P)	<.2
BORON,DISS (UG/L AS B)	1114.	SELENIUM, DISS (UG/L-SE)	6.9
BROMIDE,DISS (UG/L AS BR)	250.	SILVER, DISS(UG/L AS AG)	<5.
CADMIUM,DISS(UG/L AS CD)	<10.	STRONTIUM,DISS (UG/L-SR)	2307.
CHROMIUM, DISS (UG/L-CR)	<10.	TITANIUM DIS(UG/L AS TI)	<10.
COBALT,DISS (UG/L AS CO)	<10.	VANADIUM,DISS(UG/L AS V)	<25.
COPPER,DISS (UG/L AS CU)	24.8	ZINC, DISS (UG/L AS ZN)	21.5
LEAD,DISS(UG/L AS PB)	<10.	ZIRCONIUM DIS(UG/L - ZR)	<20.

Field remarks:
1: SAMPLE TAKEN AT TAP IN HOUSE - TEMP. NOT REPRESENTATIVE
2: OF WELL

Explanation: mg/L = milligrams per liter, ug/L = micrograms per liter, meq/L = milliequivalents per liter. FT = feet, Mt = meters, TR = total recoverable, TOT = total, BIO = biologically available.
Qualifiers: A = Hydride Atomic Absorption, E = Estimated due to interference, H = Exceeded Holding Time, N = Spiked sample recovery not within control limit P = Preserved Sample, S = Method of Standard Additions, * = Duplicate Analysis not within control limits

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Percent Meq/L (For Piper Plot)

Ca	Mg	Na	K	Cl	SO4	HCO3	CO3
2.8	2.2	94.9	0.1	1.5	75.4	23.2	0.0

NOTE: In correspondence, please refer to Lab Number: 96Q0101

CHAPTER 2
DELINEATION

This report delineates three source water management areas. The goal of source water management is protecting 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.

CONCEPTUAL MODEL AND ASSUMPTIONS

Hillside Colony's production wells are located in the Upper Milk watershed (USGS Hydrologic Unit Code 10050002), which is located within Montana's Lower Missouri River watershed (Heath, 1984). As detailed above, Hillside Colony's drinking water source is interpreted to be sandstone of Two Medicine Formation. The direction of groundwater flow beneath the site is presumed to be from the southwest towards northeast. The aquifer is semi-confined to unconfined and recharge to the wells is primarily from infiltration of surface water and precipitation where the formation is exposed. The formation is exposed relatively close to the well.

As the aquifer is semi-confined to unconfined, it is considered to have **Moderate Source Water Sensitivity** to contamination. Sensitivity is defined as the degree of ease with which contaminants may migrate to the source water aquifer. This determination is according to the DEQ Source Water Protection Program criteria for ranking aquifer sensitivity (DEQ 1999).

DELINEATION

Methods and criteria for delineating source water protection areas are specified in the Montana Source Water Protection Program (DEQ, 1999). The delineated management zones for the wells are shown on Figure 3.

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

Inventory Region – According to the DEQ's Source Water Protection Program criteria for an unconfined aquifer (DEQ, 1999), the inventory zone was delineated based EPA Analytical Method (Appendix C). The region was based on groundwater flow direction and on the Red River surface-water divide. This established using a simple groundwater flow model according to the uniform flow equation (EPA, 1991). All sources of potential contaminants are inventoried in this region.

Recharge Region –Is the division of the Upper Milk watershed that pertains to the PWS. 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 Hillside Colony PWS wells is based on published reports and lithology indicated on the well logs. The interaction of surface water with the alluvial channel deposits is not completely understood and the changes in the flow regime under seasonal conditions are not known. 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*. Source Water Management Areas**

CHAPTER 3
INVENTORY

INVENTORY METHOD

Significant potential contaminant sources in the source water management areas were inventoried to assess the susceptibility of Hillside Colony's wells to contamination, and to provide a foundation for source water protection planning. The inventory for Hillside Colony 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.

The inventory focus is slightly different in each of the delineated management areas. The inventory for Hillside Colony focuses on all activities in the control zones for the wells; certain types of facilities and land uses in the inventory region; potential sources of nitrates and pathogens in the 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: Urban and agricultural 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 (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: 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 designated to be 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

CONTROL ZONE INVENTORY RESULTS

Land use in the control zone consists completely of agricultural activities. There are no known contamination sources other than the agricultural practices.

INVENTORY REGION RESULTS

The inventory results for Hillside Colony's source water are summarized in Table 3 and are shown on Figure 4. The inventory region includes agricultural land. Adjacent to the well is two petroleum wells. The primary hazards are chemical or fuel spills, and excess application of herbicide (Table 3).

Table 3. 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
EPA Envirofacts Sites (Step 2)		
None Identified		
DEQ Databases (Step 3)		
None Identified		
Miscellaneous Others, including Step 4		
None Identified		

Notes: Individual sites identified are evaluated in Chapter 4.

***Figure 4*. Land Use and Potential Sources of Contamination in the Protection Areas**

RECHARGE REGION INVENTORY RESULTS

Land uses within the Recharge Region include agriculture (small grains, cattle and hay) and oil/gas production. Except for facilities such as pumping stations for pipelines, most petroleum facilities are in agricultural areas. Potential threats to the Hillside Colony well include field lots along Red River, petroleum pipeline leaks/spills or leaking petroleum well casings. In the early 1990's a pipeline break occurred where a crude oil pipeline crosses Red River a few hundred yards above the well. The spill was cleaned up, and monitoring of the site indicates that the contamination did no reach the well (Norebeck, 1997).Additional 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 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.

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 Hillside 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

HAZARD DETERMINATION

The threat of contamination is referred to as *hazard*. The degree of hazard is determined either by the proximity of a potential contaminant source to a spring or well intake, potential contaminant migration pathways, or by the density of potential non-point contaminant sources.

DISCUSSION OF 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 Hillside Colony PWS managers and operators. Alternative management approaches that could be used by the PWS managers and operators to reduce susceptibility are recommended in this chapter.

Susceptibility is determined by considering the hazard rating for each potential contaminant source relative to any contaminant barriers (Table 4). Barriers to contamination are 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 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.

Table 4. 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

No barriers have been identified for the well because of the lack of information concerning the lithology and completion details of the well.

A summary of the susceptibility assessment for Hillside Colony production well is provided in Table 5. This table only includes the potential contaminant sources (identified in Chapter 3) 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.

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 Hillside Colony drinking water supply are detailed in the susceptibility table (Table 5). 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 5. Susceptibility Assessment of Significant Potential Contaminant Sources

Potential Contaminant Source	Potential Contaminants	Hazard	Hazard Rating	Barriers	Susceptibility	Management Recommendations
Inventory Region						
Cropped Agricultural Land Use	Nitrate and SOCs from fertilizer, pesticides and herbicides. Pathogens (if grazing occurs)	Contaminants leaching into groundwater	***Moderate***	None	***High Susceptibility***	*E*ncourage and support efforts to provide educational information, materials, and resources to land owners on the proper application and storage of pesticides and fertilizers and implementing agricultural best management practices (BMPs).
Recharge Region						
Oil and Gas Wells and Test Holes, pipeline	Total Dissolved Solids (TDS), Petroleum hydrocarbons	Improperly sealed or abandoned wells may facilitate contaminant transport to shallow or deeper aquifers.	***Moderate***	Areas of exploratory drilling are substantial distances from the wells.	***Moderate Susceptibility***	Encourage monitoring of drilling activities and oil field development near or adjacent the Inventory and Recharge Regions.
Agricultural Crop Land	Nitrate and SOCs from fertilizer, pesticides and herbicides. Pathogens (if grazing occurs)	Contaminants leaching into groundwater	***Moderate***	Distance to well	***Moderate Susceptibility***	Encourage use of agricultural best management practices (BMPs) in the recharge region

Notes: VOCs - Volatile organic compounds (i.e. solvents, fuel components) SOCs - Synthetic Organic Compounds (i.e. pesticides, herbicides, plasticizers)
UST - Underground Storage Tank LUST - Leaking Underground Storage Tank
BMPs - Best Management Practices DEQ- Montana Department of Environmental Quality
RR – Recharge Region

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 conducting 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.

The drinking water for Hillside Colony is supplied by one well located approximately three miles northwest of the Colony. Based on the sanitary survey, well log, and the depth of the well, it appears that the Two Medicine Formation is providing water to the PWS's well. In accordance with the Montana Source Water Protection Program criteria (1999), the aquifer (source water) is considered to have a moderate sensitivity to potential contaminant sources. 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 Hillside Colony 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:

- Potential contaminant sources identified within the control zone include: agricultural practices. 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 well and all sources of potential contaminants should be excluded in this region.
- Significant potential contaminant sources identified within the inventory region include: agricultural activities and two petroleum wells. The inventory region should be managed to prevent contaminants from reaching the well before natural processes reduce their concentrations. The inventory region includes the area of land overlying the aquifer upgradient southwest of the well that is expected to supply groundwater recharge to the well over the next three years.
- Potential contaminant sources identified within the recharge region include: agriculture and oil/gas production. 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 Two Medicine Formation where this formation outcrops upgradient south/southwest of the well.

The Hillside Colony public water supply has a moderate susceptibility to the following potential contaminant sources: agricultural practices and stockyards. The hazard rating for all of the other potential contaminant sources identified is low because the distance of the sources in relation to the well intake. 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 Hillside 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, 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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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 (e.g. dry well). 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.

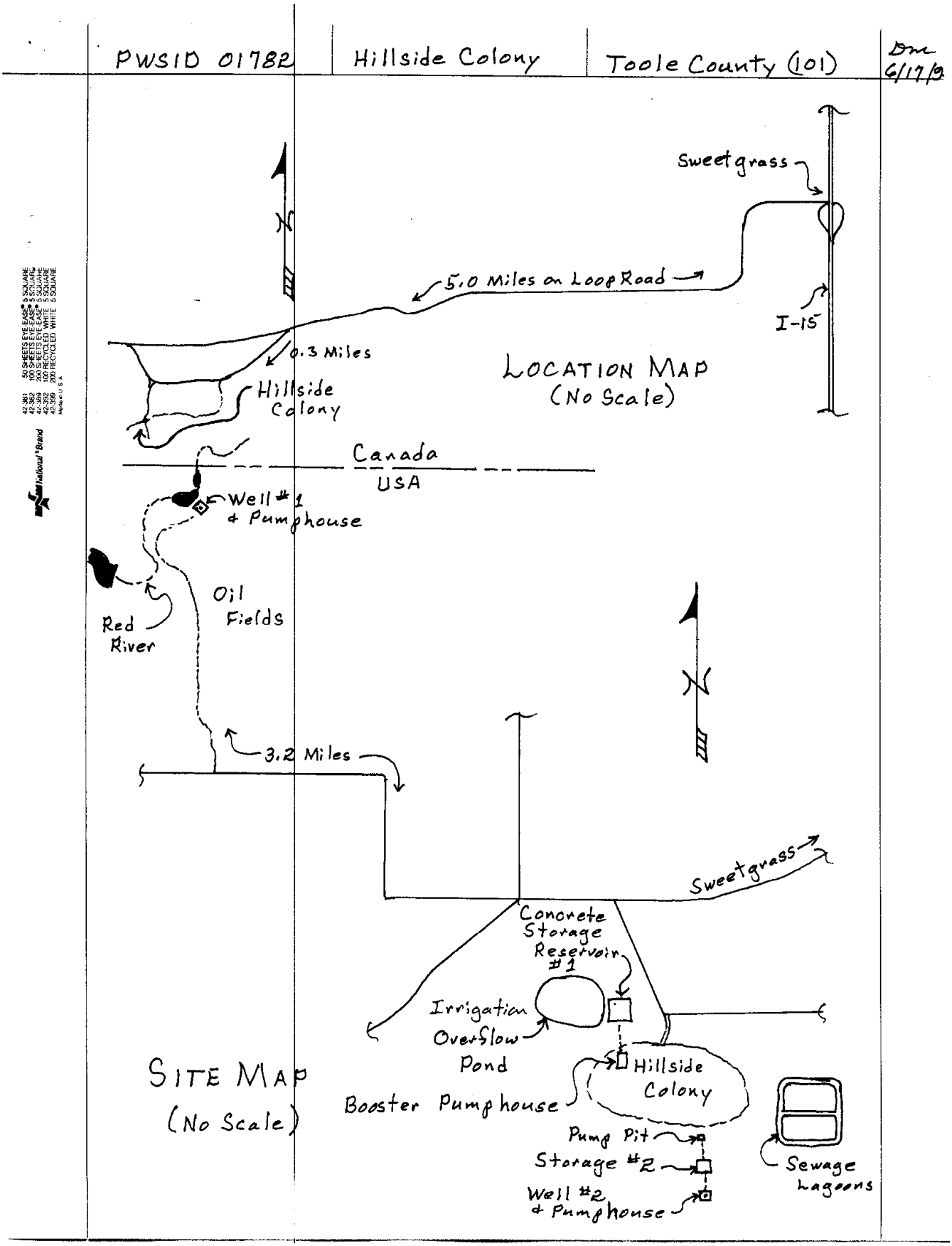
* With the exception of the definitions for Lacustrine, Phase II and Phase V Rules, and Standard Industrial Classification Code, definitions were adapted from EPA's Term References System (formerly known as Glossary of Selected Terms and Abbreviations) which can be found at: http://www.epa.gov/trs/index.htm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



Drawing from 1994 sanitary survey by Darrell Mc Nenny.

The Cadmus Group, Inc
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Helena, MT 59601
Telephone: 406-443-9194
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SDWIS
7/22/04
RB.

December 3, 2003

Hillside Colony
C/O William Wurz
P.O. Box 169
Sweetgrass, MT 59484

TOOLE COUNTY

RE: PWSID # MT0001782 – HILLSIDE COLONY

Dear Mr. Wurz:

On November 18, 2003, I conducted a sanitary survey of the Hillside Colony Public Water Supply (PWS). I would like to thank you for showing me the water system. This Colony has two separate water systems; one system provides drinking water, and the other system provides water for agricultural use (each system has its own well). However, the two systems are connected in the distribution system with a pipe that is equipped with a valve that is normally closed; therefore, the agricultural water system could be used to supply the Colony drinking water system during an emergency. The water system serves a Hutterite Colony with a resident population of approximately 130 persons through 25 service connections.

This system is classified as a Community water supply due to the residential nature of the population served. This was a routine sanitary survey conducted under contract with the Montana Department of Environmental Quality (MDEQ). The State completes sanitary surveys on all Montana public water supply systems at about 3-5 year intervals. Sanitary Surveys are required of public water systems by both State and Federal regulations, and the MDEQ provides the sanitary surveys as a service to the regulated community.

I work for The Cadmus Group, Inc., and Cadmus is a contractor for the MDEQ. The following report contains a description of the water system; any recommendations for the system are numbered at the end of the report.

Well 1 Near Red River (Well 1)--Potable

This 12-inch diameter well is located approximately three miles northwest of the Colony. Very little information was provided on the Ground Water Information Center (GWIC) well log. The log shows the well was drilled and cased (with PVC casing) to a depth of 42 feet. The log also shows a pumping

Date Entered
RB.

water level of 10.5 feet. This well operates off of a timer and pumps water to the 60,000 gallon Storage Facility 1. The well is equipped with a 5-HP submersible pump capable of delivering 80 gpm. As stated in the last sanitary survey for this system, the vent for this well terminates at a 90 degree angle from the casing, rather than being U-shaped and terminating in a downward position.

Well 2 South Hill (Well 2)—Stock (Emergency Well)

This well is located in a pit south of the Colony and is used primarily for agricultural purposes. The well is separated from the primary potable water supply by a closed valve. This well could be used for your drinking water supply during an emergency by opening a valve located in a pit.

The log for this well shows that it was constructed to a depth of 130 feet on February 1, 1997. The log shows that 6-inch steel casing was installed to a depth of 40 feet, and 6-inch plastic casing was installed between 10 and 130 feet (this doesn't make sense, since two same sized casings would not telescope). The well was grouted with bentonite to a depth of 40 feet. This well is equipped with a 3-HP submersible pump that operates based off of a float level in Storage Facility 2. The well is equipped with a split-seal sanitary seal well cap (no vent).

Storage Facility 1 and Pumping Facility 1

Well 1 pumps to a buried 60,000 gallon storage tank located on the northwest side of the Colony. This tank is allowed to overflow to an adjacent pond that is used for irrigation. Two parallel 5-HP centrifugal pumps take suction from this storage facility and deliver water to the Colony residence buildings. The booster pumps operate full-time and are alternated manually on a monthly basis.

Storage Facility 2 and Pumping Facility 2—Stock (Emergency)

The facilities under this heading are used primarily for agricultural purposes; however, this system is connected to the potable water system in the distribution system and could be used for drinking water during an emergency by opening a valve. For this system, Well 2 pumps to a buried storage tank (+/- 15,000 gallons) located just down the hill from the well. A single 1.5-HP centrifugal pump takes suction from this storage tank and provides water to the Colony for agricultural use.

Recommendations for the Hillside Colony

1. As stated in the previous sanitary survey, there is a check valve but no backflow prevention on the hose for filling water trucks at the building housing Pumping Facility 1. Any use of this connection requires an air gap between the end of the hose and the vessel you are pumping water into. Otherwise, proper mechanical backflow prevention is needed.

2. The screened vent on Well 1 should be U-shaped and terminate in a downward position. This was also stated on the last sanitary survey.

Hillside Colony
C/O William Wurz
P.O. Box 169
Sweetgrass, MT 59484

12/03/03

3. If you were required to use Well 2 during an emergency, entry point sampling (VOCs, SOCs, rads, etc.) would be required for the entry point sometime during the same quarter you used the well. You would still be required to have satisfactory bacteriological and nitrate/nitrite sampling done prior to using this well as a drinking water well.

4. Cleaning and disinfection of storage facilities is recommended on a routine basis, and you claimed that you regularly clean your storage tanks. Your storage tanks are considered a confined space; therefore, it is important that confined space entry procedures be followed whenever entering the storage tank. Confined spaces can have anoxic or poisonous conditions that could lead to death if someone entered the tank without the proper precautions. You can contact the Department of Labor & Industry Safety Bureau (406-444-6401) to determine what the requirements are for confined space entry.

Please contact me if you have questions about this report or any other concerns. I am providing copies of this letter, the report, and the chemical results (if applicable) to the MDEQ Drinking Water Program. You may also call DEQ at (406) 444-4400 with any questions you may have. Thank you very much for your time and cooperation during my visit.

Sincerely,

Denver Fraser

Denver Fraser
The Cadmus Group, Inc.
dcfraser@cadmusgroup.com

Enclosure: Copy of sanitary survey form and pictures.

cc: County Sanitarians
Sanitary Survey file

ITARY SURVEY FORM - INVENTORY

MT0001782 | SYSTEM NAME HILLSIDE COLONY

E OF SURVEY 11/18/2003 | COUNTY TOOLE | SURVEYOR NAME -DENVER FRASER, THE CADMUS GROUP, INC.

(SYSTEM REPRESENTATIVE) WILLIAM WURZ--PLUMBER/OPERATOR | (OTHER REPRESENTATIVE)

SYSTEM ADDRESS (Primary Address)

Addressee HILLSIDE COLONY

Street P.O. BOX 169

City SWEETGRASS State MT Zip 59484

System Phone (406) 937-2566 Fax (____) ____

SYSTEM OWNER (Owner Address)

Addressee SAME

Street ____

City ____ State ____ Zip ____

Owner Phone (____) ____ Fax (____) ____

LOCATION OF SYSTEM

Nearest City SWEETGRASS Description or Physical Address APPROXIMATELY 6 MILES WEST OF SWEETGRASS ON LOOP ROAD.

OPERATOR OF SYSTEM

ame WILLIAM WURZ

ertified Operator? ☒ Yes ☐ No ☐ Not required

opy of Certificate? ☒ Yes ☐ No Certification # 5157

hone # (406) 937-2566

umber of Employees ____ Full Time ____ Part Time

ALTERNATE OPERATOR OF SYSTEM

Name ____

Certified Operator? ☐ Yes ☐ No ☐ Not required

Copy of Certificate? ☐ Yes ☐ No Certification # ____

Phone # (____) ____

SYSTEM STATUS

☒ A = Active ☐ P = Pending (Add New System)

☐ I = Inactive

SYSTEM CLASS

☒ C = Community

☐ NTNC = Non-Transient Non-Community

☐ TNC = Transient Non-Community

tal Service Connections: Residential / Non-Transient: 25
Transient: 0

al Active Connections: Residential / Non-Transient: 25
Transient: 0

vice Connections Metered? ☐ Yes ☒ No
Percent Metered ____ %

es and Rate Structure

Resident Population (Number of permanent residents utilizing PWS daily) Summer: 130 Winter: 130

Non-Transient Population (Number of non-transient persons utilizing PWS daily) Summer: 0 Winter: 0

Transient Population (Number of transient persons served by PWS daily) Summer: 0 Winter: 0

Collection Rate ____ %

OWNER TYPE

1 Federal Government
2 Private Subdivision, Investor, Trust, Cooperative, Water Association, etc.
3 State Government
☐ 4 Local Government Authority, Commission, District, Municipality, City, etc.
☐ 5 Mixed Public/Private
☐ 6 Native American

SERVICE AREA CHARACTERISTICS LIST

BR Bar
DC Day Care Center
DI Dispenser
HS Head Start
HA Homeowners Assoc.
MM Hotel/Motel
HR Highway Rest Area
I Industrial/Agricultural
IC Interstate Carrier
L Institution
MF Medical Facility
MH Mobile Home Park
MU Municipality
OA Other Area
ON Other Non-Transient Area (____ Average Daily Visitors TNC)
OR Other Residential Area
OT Other Transient Area

☐ PA Recreation Areas
☐ RA Residential Area
☐ RE Retail Employees
☐ RS Restaurant
☐ RV RV Park
☐ SC School
☐ SI Sanitary Improvement District
☐ SK Summer Camp
☐ SR Secondary Residences
☐ SS Service Station
☐ SU Subdivision
☐ WB Water Bottler
☐ WH Wholesaler (Sells Water)

a Category Description HUTTERITE COLONY.

Comments: WILLIAM WURZ SAYS THAT THE COLONY SYSTEM IS NOT SET UP LIKE IT IS DRAWN AND EXPLAINED IN THE LAST SANITARY SURVEY. THE TWO SYSTEMS ARE APPARENTLY PHYSICALLY CONNECTED AND THEIR WATER SYTEM THAT SUPPLIES WATER FOR AGRICULTURAL USE COULD BE USED FOR THEIR POTABLE WATER SYSTEM DURING AN EMERGENCY BY OPENING A VALVE.

SANITARY SURVEY FORM – WATER SYSTEM FACILITIES

PWS ID: MT0001782 | SYSTEM NAME: HILLSIDE COLONY

Water System Facilities (WSF) numbers are WSF Type Codes plus an assigned number. (I.e. source facility numbering starts with 002 and all non-source facilities start with 001). See instruction sheet for a list of WSF Type Codes. When a source is operational it is considered Active, this includes systems that are seasonal. Inactive sources are those which are shut down but can return to active status, such as a system out of business. Proposed sources are those that have been identified through the Plan Review process, but are not connected to the water system.

A water source facility is a well, spring, intake, infiltration gallery or consecutive connections from which a system draws or purchases water.

Total Number of Source Facilities 2

WATER SYSTEM FACILITIES SUMMARY (WSF)

WSF ID	Facility Name	Water Type Code	Purchase
DS 001	Distribution System		
WL002	WELL 1 NEAR RED RIVER	GW	☐ Yes
WL003	WELL 2 SOUTH HILL--EMERGENCY--STOCK	GW	☐ Yes
ST001	STORAGE FACILITY 1--60,000 GALLONS		☐ Yes
ST002	STORAGE FACILITY 2--EMERGENCY		☐ Yes
PF001	PUMPING FACILITY 1		☐ Yes
PF002	PUMPING FACILITY 2--EMERGENCY		☐ Yes
EP502	EP FOR WL002		☐ Yes
EP503	EP FOR WL003--EMERGENCY		☐ Yes
			☐ Yes
			☐ Yes ☐ No

Ly La, PF001, PF002 instead of PC001, PC002. Its pumping Faculty not pressure control.

Description of Water System Facility flow: THE COLONY HAS TWO SEPARATE WATER SYSTEMS. ONE SYSTEM PROVIDES DRINKING WATER AND THE OTHER PROVIDES WATER FOR THE SLAUGHTER HOUSE AND OTHER AGRICULTURAL USES. THE DISTRIBUTION SYSTEM BETWEEN THE TWO WATER SYSTEMS, HOWEVER, IS CONNECTED. THE PIPE BETWEEN THE TWO SYSTEMS IS EQUIPPED WITH A VALVE THAT IS NORMALLY CLOSED; HOWEVER, THE AGRICULTURAL WATER SYSTEM COULD BE USED TO SUPPLY THE COLONY DRINKING WATER SYSTEM DURING AN EMERGENCY.

WELL 1 NEAR RED RIVER (WL002) PUMPS TO THE 60,000 GALLON STORAGE FACILITY 1 (ST001). PUMPING FACILITY 1 (PF001) TAKES SUCTION FROM ST001 AND PUMPS THROUGH A SINGLE ENTRY POINT (EP502) TO THE COLONY DRINKING WATER DISTRIBUTION SYSTEM (DS001).

IF THE EMERGENCY SYSTEM WAS REQUIRED, THE CLOSED DISTRIBUTION SYSTEM VALVE WOULD OPEN, ALLOWING WATER FROM THE EMERGENCY SYSTEM INTO THE POTABLE WATER DISTRIBUTION SYSTEM. FOR THE EMERGENCY SYSTEM, WELL 2 SOUTH HILL (WL003) PUMPS INTO STORAGE FACILITY 2 (ST002). PUMPING FACILITY 2 (PF002) TAKES SUCTION FROM ST002 AND DELIVERS WATER TO THE DISTRIBUTION SYSTEM (DS001) THROUGH A SECOND ENTRY POINT (EP503).

Example: Well 1(WL002) is pumped into pumphouse where chlorine is applied (TP001) and from there to the storage tank (ST001). The treated water flows by gravity to the distribution system (DS001)

EMERGENCY POWER

Does the system have emergency power? ☐ Yes ☒ No

If yes, what type: _____ Frequency of testing: THERE IS NO EMERGENCY POWER GENERATION FOR WL002; HOWEVER, A STANDBY GENERATOR COULD BE USED TO OPERATE WL003

Record of primary power failures: UNKNOWN in last year Switchover: ☐ Automatic ☐ Manual

FLUORIDATION:

Type: N/A

Fluoride supply adequate?	☐ Yes ☐ No	Logs or records kept?	☐ Yes ☐ No
Properly stored?	☐ Yes ☐ No	Details:	

Fluoride setup (description)

Model: _____

Settings: Stroke _____

Frequency _____

Saturators:

Make-up Water Softened?	☐ Yes ☐ No
Make-up Water Metered?	☐ Yes ☐ No
Is there a flow sensor shut-off on the line?	☐ Yes ☐ No

Comments: _____

PWSID MT0001782 SYSTEM NAME HILLSIDE COLONY

(Please copy this sheet for additional wells & pumps)

COMPLETE ONE PAGE FOR EACH SOURCE STATUS OF SOURCE ☒ (A)ctive ☐ (I)nactive ☐ (P)roposed

WSF ID WL002 *Entry Point ID* EP002

Source Name WELL 1 NEAR RED RIVER

Location of Water Source (TRS or street address) NW OF COLONY, T37N R6W SEC 3

Entry Point Name EP FOR WL002

Location of Entry Point FOLLOWING BOOSTER PUMPS

Available ☒ Perm ☐ Emerg ☐ Interim ☐ Seasonal ☐ Other
If seasonal: ____ to ____

GWUDISW PA Completed ☒ Yes ☐ No

Log Available? ☒ Yes ☐ No

Average Production 80 GPM

Maximum Production 80 GPM

Date Drilled +/- 1982

Casing Size 12-INCH PVC

Case Depth 42 FEET

Well Depth 42 FEET

Grout Depth UNKNOWN

Log SWL UNKNOWN

Log PWL 10.5 FEET

Pump Capacity 80 GPM

Intake Type SUBMERSIBLE

Screened Interval UNKNOWN

Well Yield UNKNOWN

Latitude 48° 59' 51" N

Longitude 112° 07' 10" W

Elevation ____

WELLS

	Yes	No	Unk	N/A
Is well site protected from flooding?	☒	☐	☐	☐
Is well protected from potential sources of pollution (includes: surface water, known chemical spills, agricultural use, etc.)?	☐	☒	☐	☐
If no . . explain WITHIN 40 YARDS OF RED RIVER AND NEAR AGRICULTRAL FIELDS (WHEAT)				
Does casing extend at least ☐ 18 inches above outside ground level; ☒ 12 inches above finished floor inside well house; and ☐ 3 feet above 100 year flood elevation? Check for appropriate distance)	☒	☐	☐	☐
Is top of the well casing properly sealed? (sanitary seal)	☒	☐	☐	☐
Is well vented?	☒	☐	☐	☐
Is well vent properly screened and terminated a downward position?	☐	☒	☐	☐
Does well have suitable sampling tap? Raw Water	☒	☐	☐	☐
Treated	☐	☐	☐	☒
Are check valves, blow-off valves and water meters maintained and operating properly?	☒	☐	☐	☐
Is upper termination of well protected (housed or pitless)?	☒	☐	☐	☐
Is intake located below the maximum drawdown?	☒	☐	☐	☐
Is there a concrete pad around well head?	☒	☐	☐	☐

Comments: (Such as, detailed information on any items with identified deficiencies)

THE DOWIS LOG FOR THIS WELL LACKS MUCH INFORMATION.

PUMPS

Type 5 HP SUBMERSIBLE PUMP
(example: 30 hp line shaft turbine)

Rated Capacity 80 GPM

	Yes	No	Unk	N/A
Are pumps operable?	☒	☐	☐	☐
How frequently are pump(s) replaced? ____			☒	☐
Are backup pumps/motors provided?	☐	☒	☐	☐
Are controls functioning properly and adequately protected?	☒	☐	☐	☐
Do underground compartments have a drain?	☒	☐	☐	☐
Is facility properly protected against trespassing and vandalism?	☒	☐	☐	☐
Are pump records maintained (amp, drawdown, discharge, pressure, maintenance schedule, manuals, etc.)?	☐	☒	☐	☐
Is the plumbing adequately painted to prevent excessive corrosion?	☒	☐	☐	☐
Are adequate heating, lighting, and ventilation provided?	☒	☐	☐	☐
Is a preventive maintenance program in operation?	☒	☐	☐	☐
Are recommended spare parts on hand?	☐	☒	☐	☐
Cross connection protection provided?	☒	☐	☐	☐

Explain Controls: THIS WELL OPERATES OFF OF A TIMER. THE STORAGE TANK IS ALLOWED TO OVERFLOW TO FILL A POND ADJACENT TO THE TANK FOR IRRIGATION PURPOSES.

Comments: (Such as, detailed information on any items with identified deficiencies)

GWUDISW COMPLETED BY PAUL MONTGOMERY AND FAILED WITH A SCORE OF 40.

SANITARY SURVEY FORM – WELLS & WELL PUMPS

PWSID MT0001782 | SYSTEM NAME HILLSIDE COLONY

(Please copy this sheet for additional wells & pumps)

COMPLETE ONE PAGE FOR EACH SOURCE — **STATUS OF SOURCE** ☐ (A)ctive ☒ (I)nactive ☐ (P)roposed

WSF ID WL003 (These are State assigned identification numbers) *Entry Point ID* EP503

Source Name WELL 2 SOUTH HILL (Name of Source – Example: Well 1 or South well, etc.)

Location of Water Source (TRS or street address) SOUTH OF THE COLONY BUILDINGS.

Entry Point Name EP FOR WL003 (Name of EP – Example: Entry point for Norm Well 1 & South Well 2)

Location of Entry Point DOWNSTREAM OF PF002

Available ☐ Perm ☒ Emerg ☐ Interim ☐ Seasonal ☐ Other
If seasonal: _____ to _____

GWUDISW PA Completed ☒ Yes ☐ No

Log Available? ☒ Yes ☐ No

Average Production 25 GPM (indicate units)

Maximum Production 25 GPM (indicate units)

Date Drilled 02/01/1997 (well date drilled)

Casing Size 6" STEEL TO 40' AND 6" PVC FROM 10' TO 130' (size of casing installed in well)

Case Depth 130 FEET (depth of casing installed in well)

Well Depth 130 FEET (depth of well expressed in feet)

Grout Depth 40 FEET BENTONITE (depth of grout used to seal well casing)

Log SWL 27 FEET (static) expressed in feet below ground elevation

Log PWL 62' @ 25 GPM @ 12 HR AIR TEST (pumping) expressed in feet below ground elevation

Pump Capacity _____ capacity of pump installed expressed in gallons per min

Intake Type SUBMERSIBLE (type of intake mechanism)

Screened Interval 114'-127' SLOTS (expressed in feet below ground elevation)

Well Yield +/- 25 GPM (pump tested in gallons per minute)

Latitude 48° 58' 35" N

Longitude 112° 04' 13" W

Elevation _____

WELLS

	Yes	No	Unk	N/A
Is well site protected from flooding?	☒	☐	☐	☐
Is well protected from potential sources of pollution (includes: surface water, known chemical spills, agricultural use, etc.)?	☒	☐	☐	☐
If no . . explain _____				
Does casing extend at least ☐ 18 inches above outside ground level; ☐ 12 inches above finished floor inside well house; and ☐ 3 feet above 100 year flood elevation? (Check for appropriate distance)	☐	☒	☐	☐
Is top of the well casing properly sealed? (sanitary seal)	☒	☐	☐	☐
Is well vented?	☐	☒	☐	☐
Is well vent properly screened and terminated in a downward position?	☐	☐	☐	☒
Does well have suitable sampling tap? Raw Water	☐	☒	☐	☐
Does well have suitable sampling tap? Treated	☐	☐	☐	☒
Are check valves, blow-off valves and water meters maintained and operating properly?	☐	☒	☐	☐
Is upper termination of well protected (housed or fenced)?	☒	☐	☐	☐
Is intake located below the maximum drawdown?	☒	☐	☐	☐
Is there a concrete pad around well head?	☒	☐	☐	☐

Comments: (Such as, detailed information on any items with identified deficiencies)

WELL IS LOCATED IN AN 8' CONCRETE PIT. BACTI, NITRATE, AND EP SAMPLING WOULD BE REQUIRED IF THIS WELL WAS TO BE USED.

PUMPS

Type 3 HP SUBMERSIBLE (example: 30 hp line shaft turbine)
Rated Capacity UNKNOWN

	Yes	No	Unk	N/A
Are pumps operable?	☒	☐	☐	☐
How frequently are pump(s) replaced? _____			☒	☐
Are backup pumps/motors provided?	☐	☒	☐	☐
Are controls functioning properly and adequately protected?	☒	☐	☐	☐
Do underground compartments have a drain?	☐	☒	☐	☐
Is facility properly protected against trespassing and vandalism?	☒	☐	☐	☐
Are pump records maintained (amp, drawdown, discharge, pressure, maintenance schedule, manuals, etc.)?	☒	☐	☐	☐
Is the plumbing adequately painted to prevent excessive corrosion?	☒	☐	☐	☐
Are adequate heating, lighting, and ventilation provided?	☒	☐	☐	☐
Is a preventive maintenance program in operation?	☒	☐	☐	☐
Are recommended spare parts on hand?	☐	☒	☐	☐
Cross connections eliminated?	☒	☐	☐	☐

Explain Controls: THIS WELL OPERATES OFF OF A FLOAT IN ST002.

Comments: (Such as, detailed information on any items with identified deficiencies)

GWUDISW PA DID NOT APPEAR TO BE COMPLETED FOR THIS WELL ON THE LAST SURVEY. PA PASSED WITH THIS SURVEY WITH A SCORE OF 10.

SANITARY SURVEY FORM - PUMPING FACILITIES (Other than Well Pumps)

PWSID MT0001782 | SYSTEM NAME HILLSIDE COLONY

WSF ID PC001

Number of Pumps TWO

Type: 5-HP GOULDS CENTRIFUGAL PUMPS

Capacity UNKNOWN

Controlled by PUMP OPERATES 24/7. THE PARALLEL PUMPS ARE ALTERNATED MANUALLY ON A MONTHLY BASIS. THIS PUMPING FACILITY TAKES SUCTION FROM STORAGE FACILITY 1 (ST001).

Schematic of installation:

SEE ACCOMPANYING PICTURES.

	Yes	No	Unk	N/A
Are pumps operable?	☒	☐	☐	☐
Is redundancy provided?	☒	☐	☐	☐
Protected against trespass/vandalism?	☒	☐	☐	☐
Records maintained?	☒	☐	☐	☐
Property maintained?	☒	☐	☐	☐
Metered?	☒	☐	☐	☐
Cross Connections eliminated?	☒	☐	☐	☐
For booster stations:				
Does each pump have standard P-gage on discharge side?	☒	☐	☐	☐
Does each pump have compound gage on suction side?	☐	☒	☐	☐
For boosters on suction lines directly connected to storage reservoirs, is there automatic cutoff for suction pressure ≤ 2.5 psi?	☐	☐	☒	☐

Comments: ____

PWSID MT0001782 SYSTEM NAME HILLSIDE COLONY

WSF ID PC002--PUMPING FACILITY 2--EMERGENCY
These are State assigned identification numbers

Number of Pumps ONE

Type: 1.5-HP CENTRIFUGAL
(example: "2 line shaft turbines")

Capacity UNKNOWN

Controlled by THIS PUMP ALSO OPERATES 24/7 AND PROVIDES WATER PRIMARILY FOR AGRICULTURAL USE. IT COULD BE USED FOR THE POTABLE SUPPLY DURING AN EMERGENCY. THIS PUMP TAKES SUCTION FROM STORAGE FACILITY 2.

Schematic of Installation:

SEE ACCOMPANYING PICTURES.

	Yes	No	Unk	N/A
Are pumps operable?	☒	☐	☐	☐
Is redundancy provided?	☐	☒	☐	☐
Protected against trespass/vandalism?	☒	☐	☐	☐
Records maintained?	☒	☐	☐	☐
Property maintained?	☒	☐	☐	☐
Metered?	☐	☒	☐	☐
Cross Connections eliminated?	☒	☐	☐	☐
For booster stations:				
Does each pump have standard P-gage on discharge side?	☐	☒	☐	☐
Does each pump have compound gage on suction side?	☐	☒	☐	☐
For boosters on suction lines directly connected to storage reservoirs, is there automatic cutoff for suction pressure 2.5 psi?	☐	☐	☒	☐

Comments: THIS PUMP IS LOCATED IN A PIT NORTH OF STORAGE FACILITY 2 (ST002).

SANITARY SURVEY FORM - STORAGE

PWSID MT0001782 | SYSTEM NAME HILLSIDE COLONY

COMPLETE ONE SECTION FOR EACH STORAGE FACILITY

How much treated storage is provided? 75,000 gallons

Total number of days of supply? 5 days

Comments: THE MAIN STORAGE TANK PROVIDES 60,000 GALLONS OF STORAGE. THE EMERGENCY STORAGE TANK PROVIDES APPROXIMATELY 15, 000 GALLONS.

STORAGE FACILITY

WSF ID ST001 Location, Description STORAGE FACILITY 1. BURIED STORAGE TANK IS LOCATED NORTHWEST OF THE COLONY

Storage Volume? 60,000 gallons
Dimensions: UNKNOWN
Year constructed: UNKNOWN

	Yes	No	Unk	N/A
Does surface runoff and underground drainage drain away?	☒	☐	☐	☐
Is the site protected against flooding?	☒	☐	☐	☐
Is the site protected against trespass/vandalism?	☒	☐	☐	☐
Is tank inspected every 5 years by a structural engineer for structural integrity?	☐	☒	☐	☐

_____ Date of last inspection _____ By whom

Condition: ☐Good ☒Fair ☐Poor

Comments: _____

Foundation: ☐Slab ☐Ring ☒Other

Ladders caged and locked?	☐	☐	☐	☒
Are overflow lines, air vents, drainage lines or clean out pipes turned downward or covered, screened and terminated a minimum of 3 diameters above the ground or storage tank surface?	☒	☐	☐	☐
Overflow pad?	☒	☐	☐	☐
Is access hatch sealed properly and locked?	☒	☐	☐	☐
Are surface coatings in contact with water ANSI / NSF approved?	☒	☐	☐	☐
Is tank protected against icing and corrosion?	☒	☐	☐	☐
Can tank be isolated from system?	☐	☒	☐	☐
Is all treated water storage covered?	☒	☐	☐	☐

What is cleaning frequency for tanks? ANNUALLY OR MORE.

Are tanks disinfected after repairs are made?	☒	☐	☐	☐

Comments: THIS STORAGE FACILITY IS ALLOWED TO OVERFLOW TO AN ADJACENT POND THAT IS USED FOR IRRIGATION. THE WELL OPERATES ON A TIMER WHEN THE IRRIGATION WATER IS NO LONGER NEEDED.

(Include safety concerns of ladders, handrails, etc.)

STORAGE FACILITY

WSF ID ST002 Location, Description STORAGE FACILITY 2. LOCATED SOUTH OF THE COLONY UP THE HILL

Storage Volume? +/- 15,000 gallons

	Yes	No	Unk	N/A
Does surface runoff and underground drainage drain away?	☐	☐	☐	☐
Is the site protected against flooding?	☒	☐	☐	☐
Is the site protected against trespass/vandalism?	☒	☐	☐	☐
Is tank inspected every 5 years by a structural engineer for structural integrity?	☐	☒	☐	☐

_____ Date of last inspection _____ By whom

Dimensions: UNKNOWN

Year constructed: UNKNOWN

Condition: ☐Good ☒Fair ☐Poor

Comments: _____

Foundation: ☐Slab ☐Ring ☒Other

Ladders caged and locked?	☐	☐	☐	☒
Are overflow lines, air vents, drainage lines or clean out pipes turned downward or covered, screened and terminated a minimum of 3 diameters above the ground or storage tank surface?	☐	☒	☐	☐
Overflow pad?	☐	☐	☐	☒
Is access hatch sealed properly and locked?	☒	☐	☐	☐
Are surface coatings in contact with water ANSI / NSF approved?	☒	☐	☐	☐
Is tank protected against icing and corrosion?	☒	☐	☐	☐
Can tank be isolated from system?	☒	☐	☐	☐
Is all treated water storage covered?	☒	☐	☐	☐

What is cleaning frequency for tanks? ANNUALLY OR MORE.

Are tanks disinfected after repairs are made?	☒	☐	☐	☐

Comments: THIS TANK DOES NOT HAVE AN OVERFLOW OR DRAIN.

(Include safety concerns of ladders, handrails, etc.)

SANITARY SURVEY FORM - MISCELLANEOUS

PWSID MT0001782 | SYSTEM NAME HILLSIDE COLONY

DISTRIBUTION SYSTEM EVALUATION

System description: PRIMARILY 2-INCH PVC AND POLY PIPE

	Yes	No	Unk	N/A
System drawings available?	☐	☒	☐	☐
As-built drawings?	☐	☒	☐	☐
Date ____ Drawing on-site?	☒	☐	☐	☐
Lines adequately sized?	☒	☐	☐	☐
Adequate pressure maintained?	☒	☐	☐	☐
Mains protected from freezing?	☒	☐	☐	☐
Distribution system free of leaks?	☒	☐	☐	☐
Fire hydrants?	☐	☒	☐	☐
Dead end lines eliminated?	☐	☒	☐	☐
Flushing program?	☒	☐	☐	☐
Pressure reducing stations? Number ____	☐	☒	☐	☐
Booster stations? Number 2	☒	☐	☐	☐
Connections to other PWSs? Yes, please describe:____	☐	☒	☐	☐

Check one: ☒ No cross-connections were observed

☐ Cross-connections were observed. Describe below

Comments: LINES ARE FLUSHED WHEN THE CISTERN IS CLEANED.

SAFETY

Check one: ☐ No confined spaces were observed.
☒ Confined space(s) were observed.

Describe any confined spaces observed STORAGE FACILITIES DURING CLEANING WOULD BE CONSIDERED A CONFINED SPACE

Confined space safety adequate? ☐ Yes ☒ No

Fall risks adequately mitigated? ☒ Yes ☐ No

Describe ____

Note any other safety deficiencies (consider items such as ladders, tank supports, guards on rotating electrical equipment, lightning protection for pumps, etc.) ____

MONITORING AND RECORDKEEPING EVALUATION

	Yes	No	Unk	N/A
...ial monitoring records observed?	☐	☐	☐	☐
...cords kept appropriately? (5 years)	☐	☐	☐	☐
...ial Sample Site Plan submitted?	☐	☐	☐	☐
...miliar with repeat sampling?	☐	☐	☐	☐
...emical monitoring records observed?	☐	☐	☐	☐
...emical monitoring records maintained? (10 years)	☐	☐	☐	☐
Surveyor take a bacteriological sample?	☐	☐		

...ed,

Date of Sample: ____ Time of Sample ____

...er Records

...isinfection Profile (if required)?	☐N/A	☐ Yes	☐ No
...tage 1 Monitoring plan?	☐N/A	☐ Yes	☐ No
...sanitary surveys?		☐ Yes	☐ No
...ther? ____		☐ Yes	☐ No

...ments: ____

MANAGEMENT

Administrative Board – Describe PRIVATE CORPORATION

Training provided – Describe TRAINING SUPPLIED TO MAINTAIN CERTIFICATION

	Yes	No	Unk	N/A
By-laws or articles of incorporation?	☒	☐	☐	☐
Year of enactment:____ Are copies available?	☐	☐	☒	☐
Budget: Exists?	☒	☐	☐	☐
Adequate?	☒	☐	☐	☐
Are personnel adequately trained?	☒	☐	☐	☐
Are operators properly certified?	☒	☐	☐	☐
Are there sufficient personnel?	☒	☐	☐	☐
Is an emergency plan available and workable?	☐	☐	☐	☐
Are abandoned wells present?	☐	☒	☐	☐
Do abandoned wells appear to be properly abandoned?	☐	☐	☐	☒
Is operator aware of procedures regarding well abandonment?	☐	☐	☐	☒
Is there an O&M manual?	☐	☐	☒	☐
Is it current?	☐	☐	☐	☒
Is a copy on-site?	☐	☐	☐	☒
Does the system have a current Monitoring Schedule?	☒	☐	☐	☐
O&M log maintained?	☐	☐	☐	☒

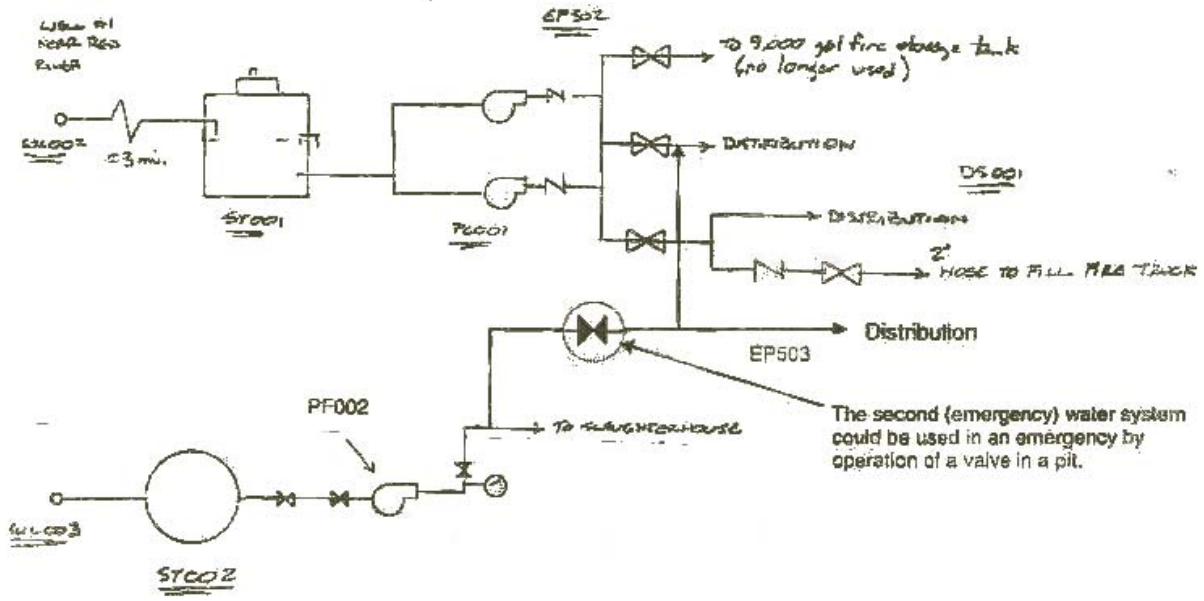
Comments: ____

SANITARY SURVEY FORM - DIAGRAMS

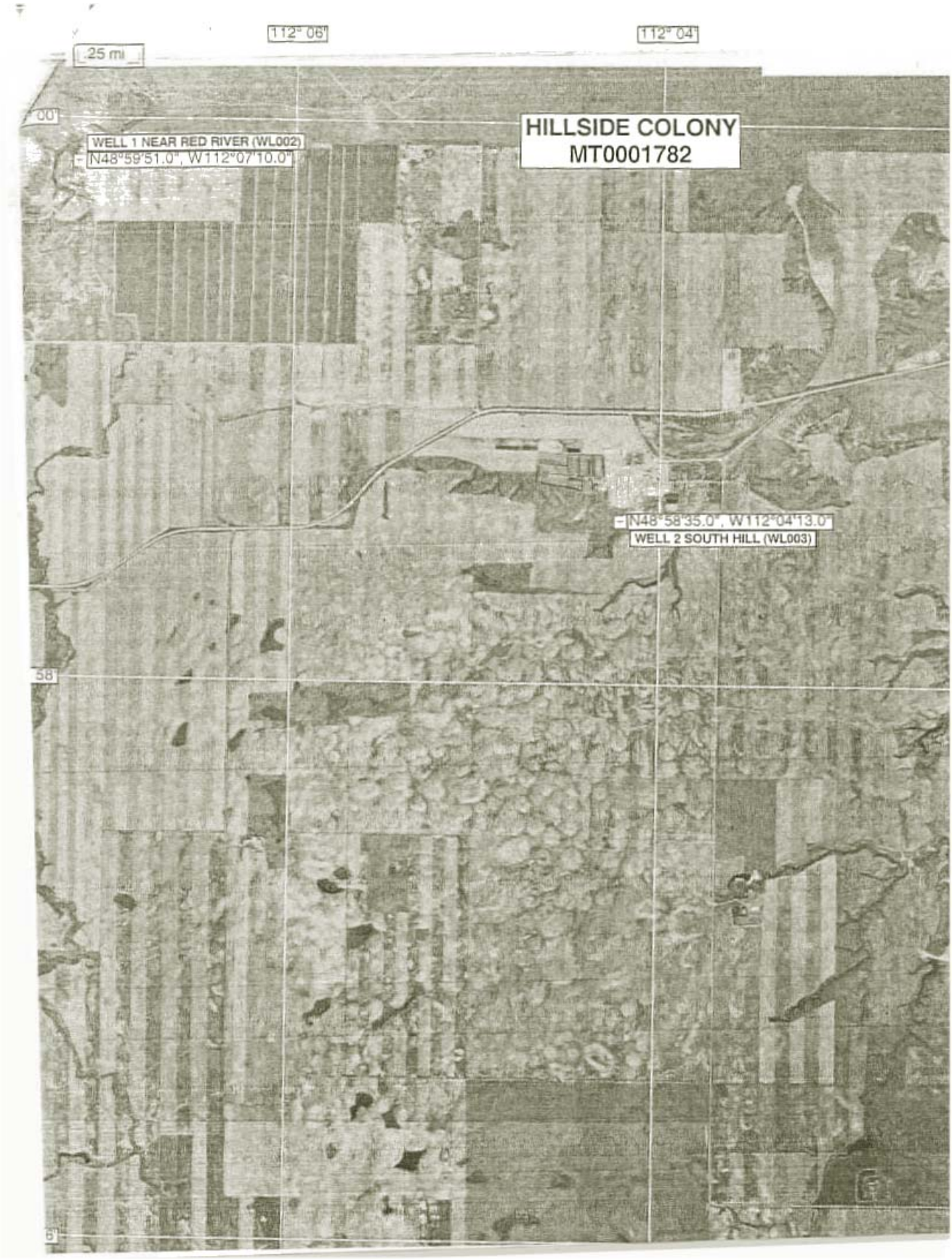
ID MT0001782	SYSTEM NAME HILLSIDE COLONY

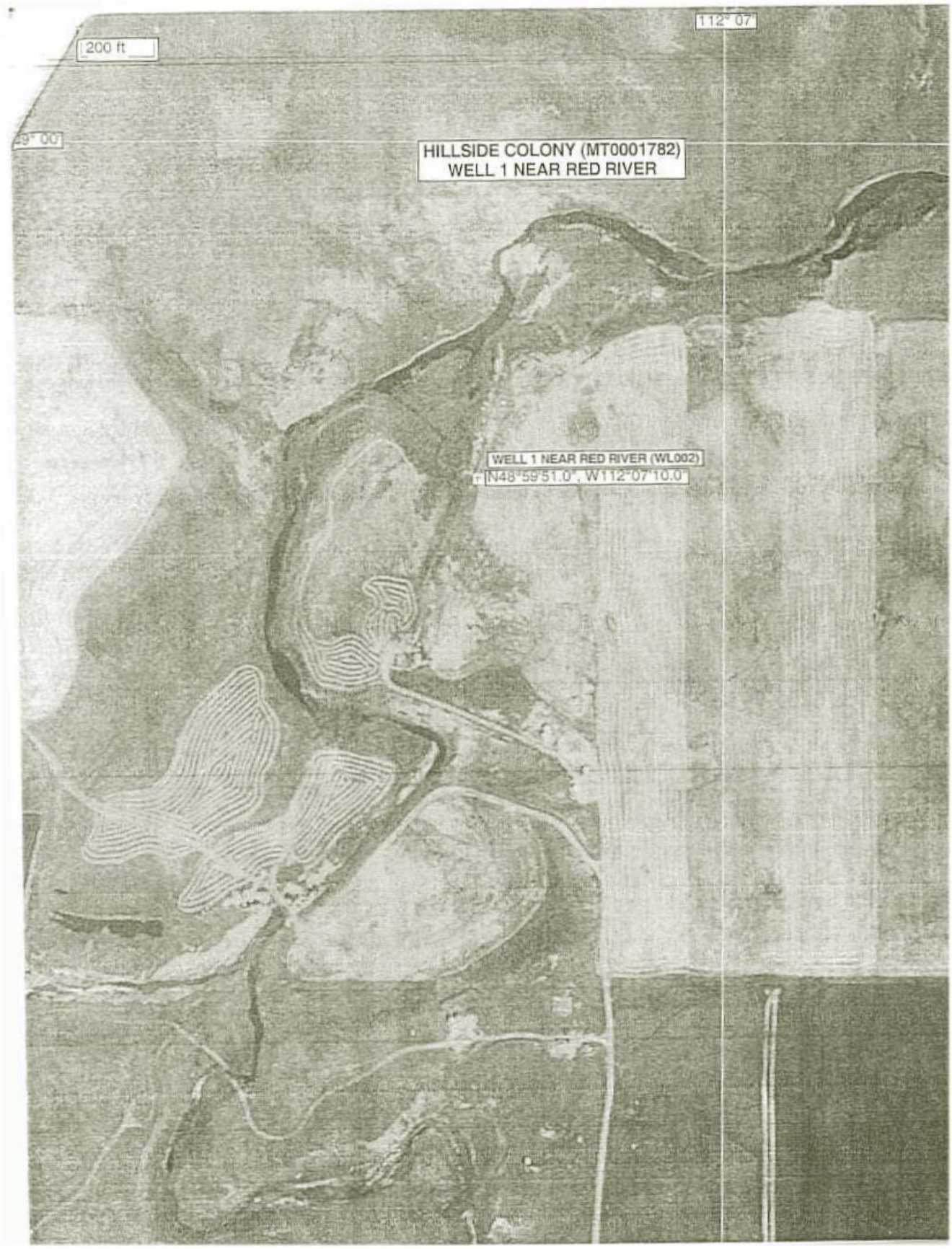
Draw brief site plan showing location of well(s), springs(s), water storage, distribution system, pumphouse(s), entry point(s), treatment, etc. and label with appropriate facility designation. Include interconnections with other PWSs.

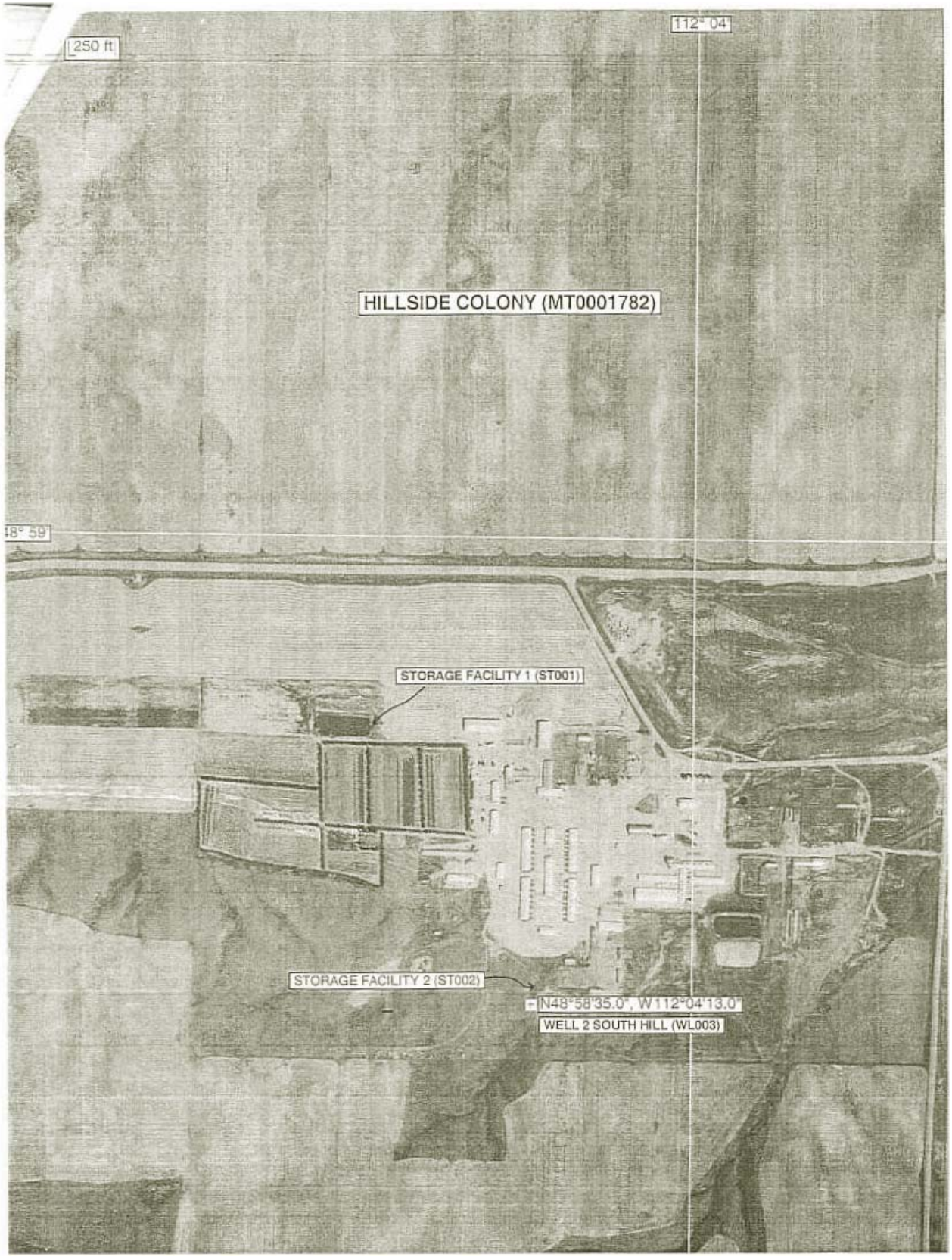
SEE ACCOMPANYING AERIAL PHOTOGRAPHS FOR SYSTEM LAYOUT



NO SCALE


112° 06'
112° 04'
.25 mi
HILLSIDE COLONY
MT0001782
WELL 1 NEAR RED RIVER (WL002)
N48°59'51.0", W112°07'10.0"
N48°58'35.0", W112°04'13.0"
WELL 2 SOUTH HILL (WL003)

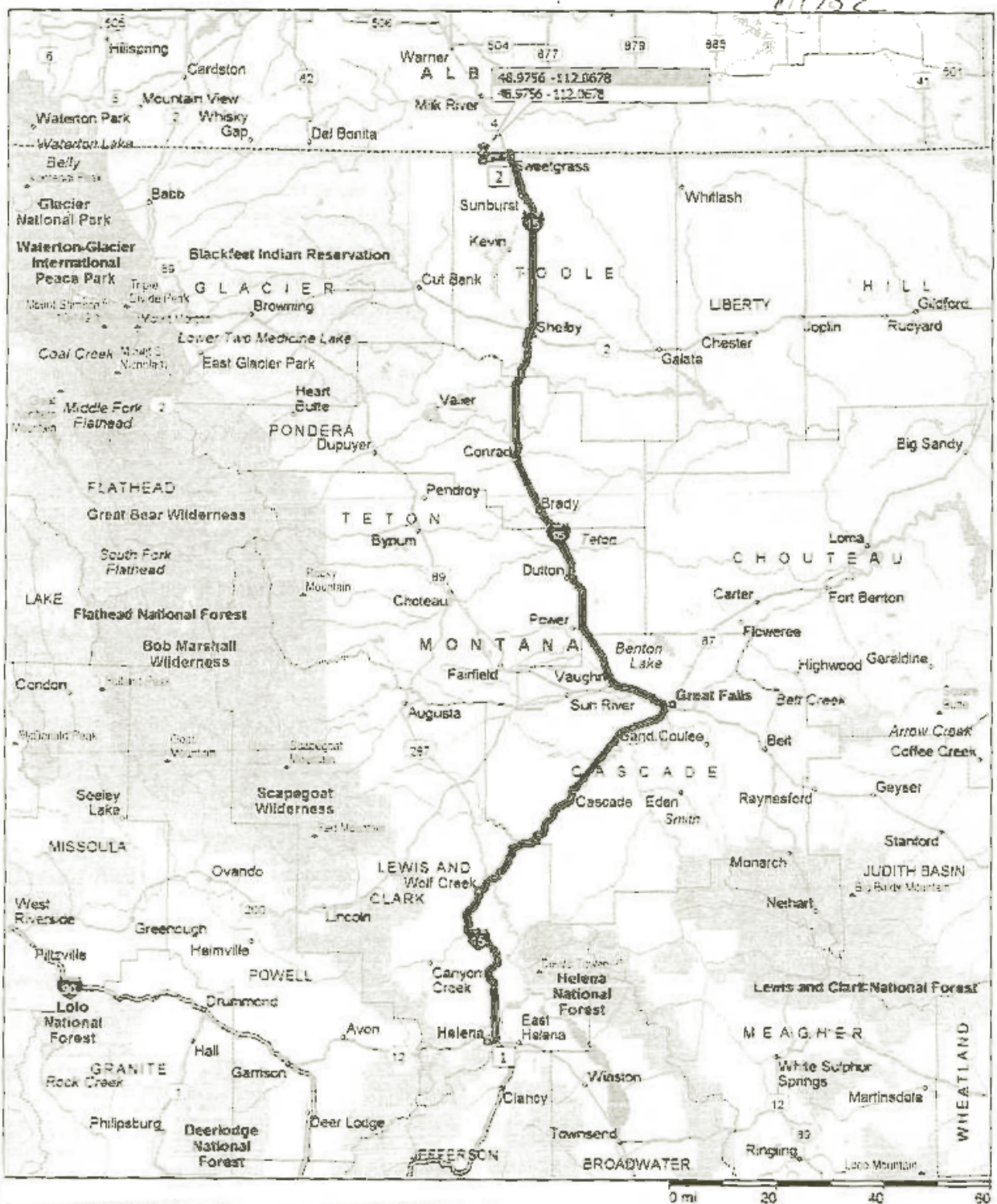

200 ft
112° 07'
HILLSIDE COLONY (MT0001782)
WELL 1 NEAR RED RIVER
WELL 1 NEAR RED RIVER (WL002)
N48°59'51.0", W112°07'10.0"


250 ft
112° 04'
HILLSIDE COLONY (MT0001782)
48° 59'
STORAGE FACILITY 1 (ST001)
STORAGE FACILITY 2 (ST002)
N48°58'35.0", W112°04'13.0"
WELL 2 SOUTH HILL (WL003)

Helena to
Hillside Colony
01752

Helena to 48.9756 -112.0678

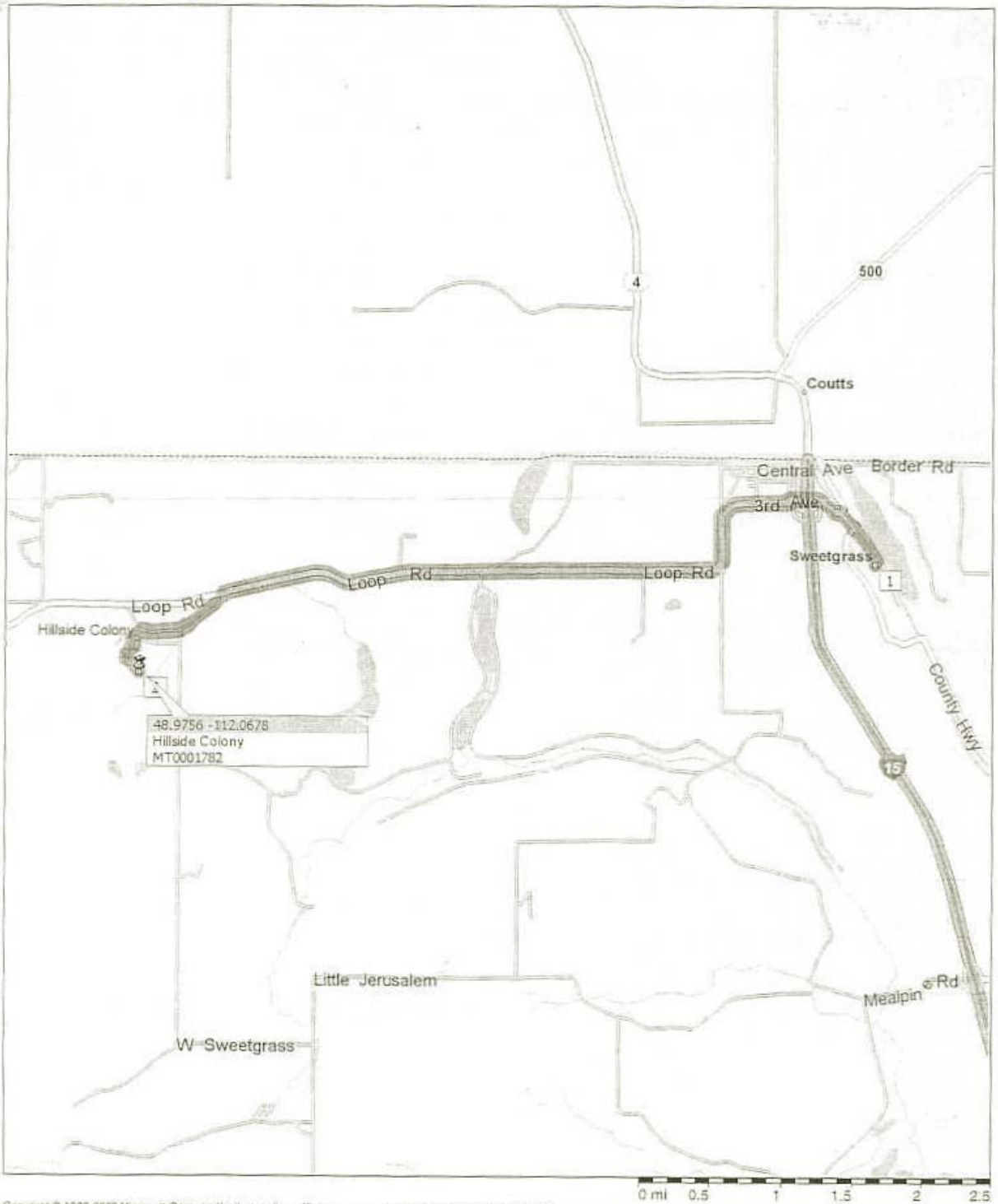
211.4 miles; 3 hours, 27 minutes

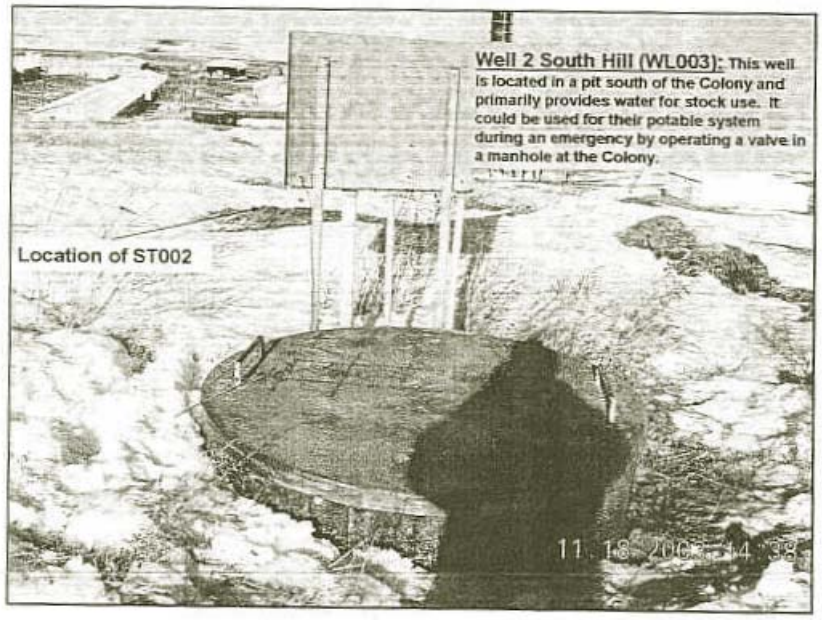


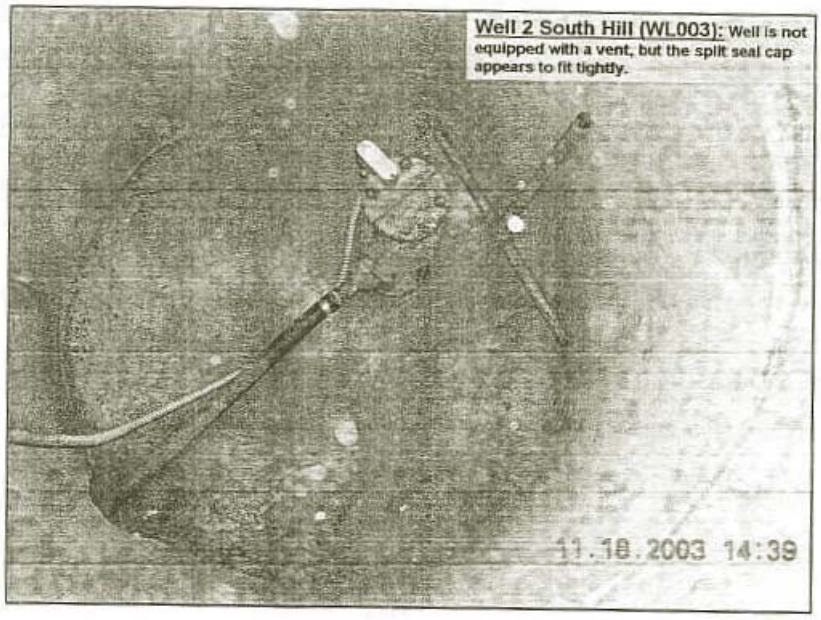
Hillside Colony
01782

Sweetgrass to 48.9756 -112.0678

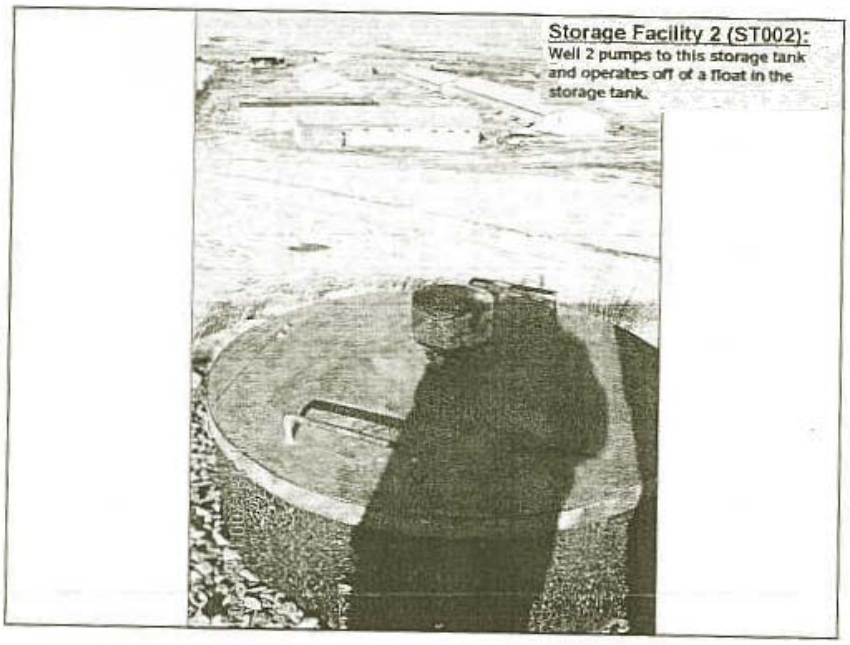
6.6 miles; 17 minutes

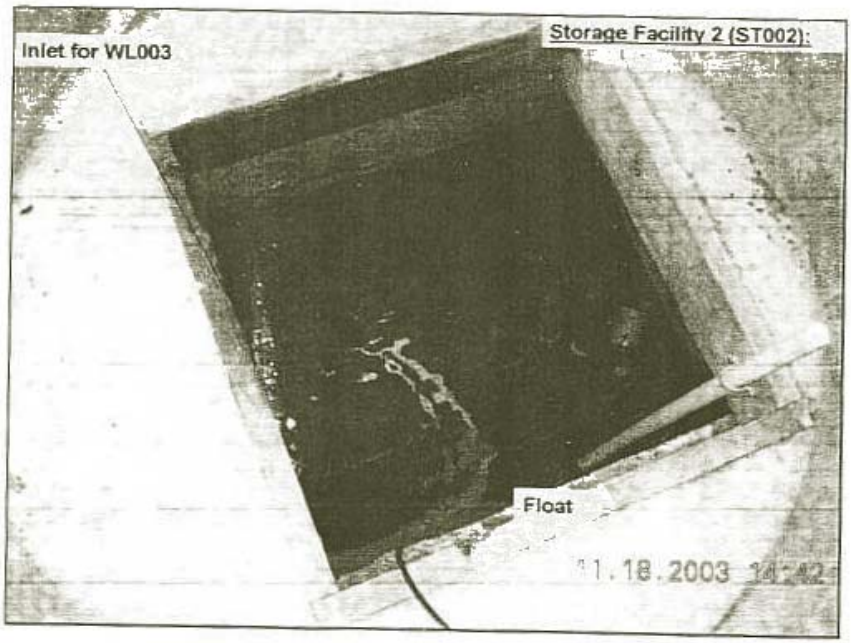






NOVEMBER 18 2003


Storage Facility 2 (ST002):
Well 2 pumps to this storage tank and operates off of a float in the storage tank.


Inlet for WL003
Storage Facility 2 (ST002):
Float
11.18.2003

Pumping Facility 2 (PF002): 1.5 HP pump takes suction from Storage Facility 2 (ST002) and delivers water primarily for stock water use. The water system could be used for the potable system during an emergency by turning a valve.

Appendix B
PWS Well Logs

Well 1 Near Red River

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
HILLSIDE COLONY

(W002)

Plot this site on a topographic map
View Water Quality for this Site

Location Information

TO0001782

GWIC Id: 149823
Location (TRS): 37N 04W 03 BABD
County (MT): TOOLE
DNRC Water Right: P046921-00
PWS Id: 01782002
Block:
Lot:
Addition:
Source of Data: QW
Latitude (dd): 48.9976
Longitude (dd): -112.1186
Geomethod: MAP
Datum: NAD27
Certificate of Survey:
Type of Site: WELL
Site Notes: TRACT LOCATION BASED ON LAT\LONG FROM DEQ.

Well Construction and Performance Data

Total Depth (ft): 42.00
Static Water Level (ft):
Pumping Water Level (ft): 10.50
Yield (gpm):
Test Type:
Test Duration:
Drill Stem Setting (ft):
Recovery Water Level (ft):
Recovery Time (hrs):
Well Notes:
How Drilled:
Driller's Name:
Driller License:
Completion Date (m/d/y):
Special Conditions:
Is Well Flowing?:
Shut-In Pressure:
Geology/Aquifer: 211TMDC
Well/Water Use: PUBLIC WATER SUPPLY

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

From	To	Dia	Description
-2.5	42.0	12.0	PVC

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

No Completion Records currently in GWIC.

Lithology Information

No Lithology Records currently in GWIC.

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

Well 2 South Hill (WL003)

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
HILLSIDE COLONY

Plot this site on a topographic map
View Water Quality for this Site

Location Information

GWIC Id: 160564
Location (TRS): 37N 04W 12 DBDCAB
County (MT): TOOLE
DNRC Water Right:
PWS Id:
Block:
Lot:
Addition:
Site Notes:

Source of Data: LOG
Latitude (dd): 48.9735
Longitude (dd): -112.0686
Geomethod: TRS-TWN
Datum: NAD27
Certificate of Survey:
Type of Site: WELL

Well Construction and Performance Data

Total Depth (ft): 130.00
Static Water Level (ft): 27.00
Pumping Water Level (ft): 62.00
Yield (gpm): 25.00
Test Type: AIR
Test Duration: 12.00
Drill Stem Setting (ft):
Recovery Water Level (ft):
Recovery Time (hrs):
Well Notes: NICKA FILE NO: 97

How Drilled: ROTARY BORED
Driller's Name: NICKA
Driller License: WWC475
Completion Date (m/d/y): 2/1/1997
Special Conditions:
Is Well Flowing?:
Shut-In Pressure:
Geology/Aquifer: 211VRGL
Well/Water Use: DOMESTIC

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

From	To	Dia	Description
-2.0	40.0	6.0	STEEL
10.0	130.0	6.0	PLASTIC

Annular Seal Information

From	To	Description
0.0	40.0	BENTONITE

Completion Information[1]

From	To	Dia	Description
114.0	127.0	6.0	.025 SLOTTED

Lithology Information

From	To	Description
0.0	12.0	SAND AND GRAVEL
12.0	63.0	SHALE
63.0	69.0	SANDSTONE 2 GAL
69.0	112.0	SHALES
112.0	127.0	SANDSTONE 25 GAL
127.0	130.0	SHALE

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

Appendix C
EPA Analytical Method and Figures

Hillside Colony - Potable Water Well
WELLHEAD PROTECTION AREA CALCULATIONS
37N04W03BACCD

EPA Analytical Method

Dist to Stagnation Point
Xl=-Q/(2*pi*K*b*I) Where b = saturated thickness
= 24 ft

Xl = - 117 ft

Boundary limit
Yl = +/- Q/(2*K*b*I)
Yl = +/- 369 ft

Time of Travel
Tx=[n/(K*i)]*{Xl-[Q/(2*pi*K*b*i)]*ln(1+2*pi*K*b*i*Xl/Q)}

Tx = travel time from point x to pumping well
Xl = distance from pumping well over which ground water travels in Tx (time)

n = aquifer porosity (percent) =		15	%
Q = pumping rate of well (ft^3/yr) =			
=	75 gpm =	5270053	ft^3/yr
K = hydraulic conductivity =		114	ft/day
b = aquifer thickness =		24	ft
i = hydraulic gradient =		0.00716	ft/ft

Tx		Xl (mi)	Xl (ft)
0.37	years	0.19	1000
1.00	years	0.45	2350
3.00	years	1.22	6440
5.00	years	1.98	10450

Hillside Colony - Wash & Stock Water Well
WELLHEAD PROTECTION AREA CALCULATIONS
37N04W12DBDCAB

EPA Analytical Method

Dist to Stagnation Point
XI=-Q/(2*pi*K*b*I) Where b = saturated thickness
= 20 ft

XI = - 71 ft

Boundary limit
YI = +/- Q/(2*K*b*I)
YI = +/- 223 ft

Time of Travel
Tx=[n/(K*i)]*{XI-[Q/(2*pi*K*b*i)]*ln(1+2*pi*K*b*i*XI/Q)}

Tx = travel time from point x to pumping well
XI = distance from pumping well over which ground water travels in Tx (time)
n = aquifer porosity (percent) = 15 %
Q = pumping rate of well (ft^3/yr) =
= 50 gpm = 3513369 ft^3/yr
K = hydraulic conductivity = 108 ft/day
b = aquifer thickness = 20 ft
i = hydraulic gradient = 0.01 ft/ft

Tx		XI (mi)	XI (ft)
0.31	years	0.19	1000
1.00	years	0.55	2900
3.00	years	1.56	8225
5.00	years	2.56	13500

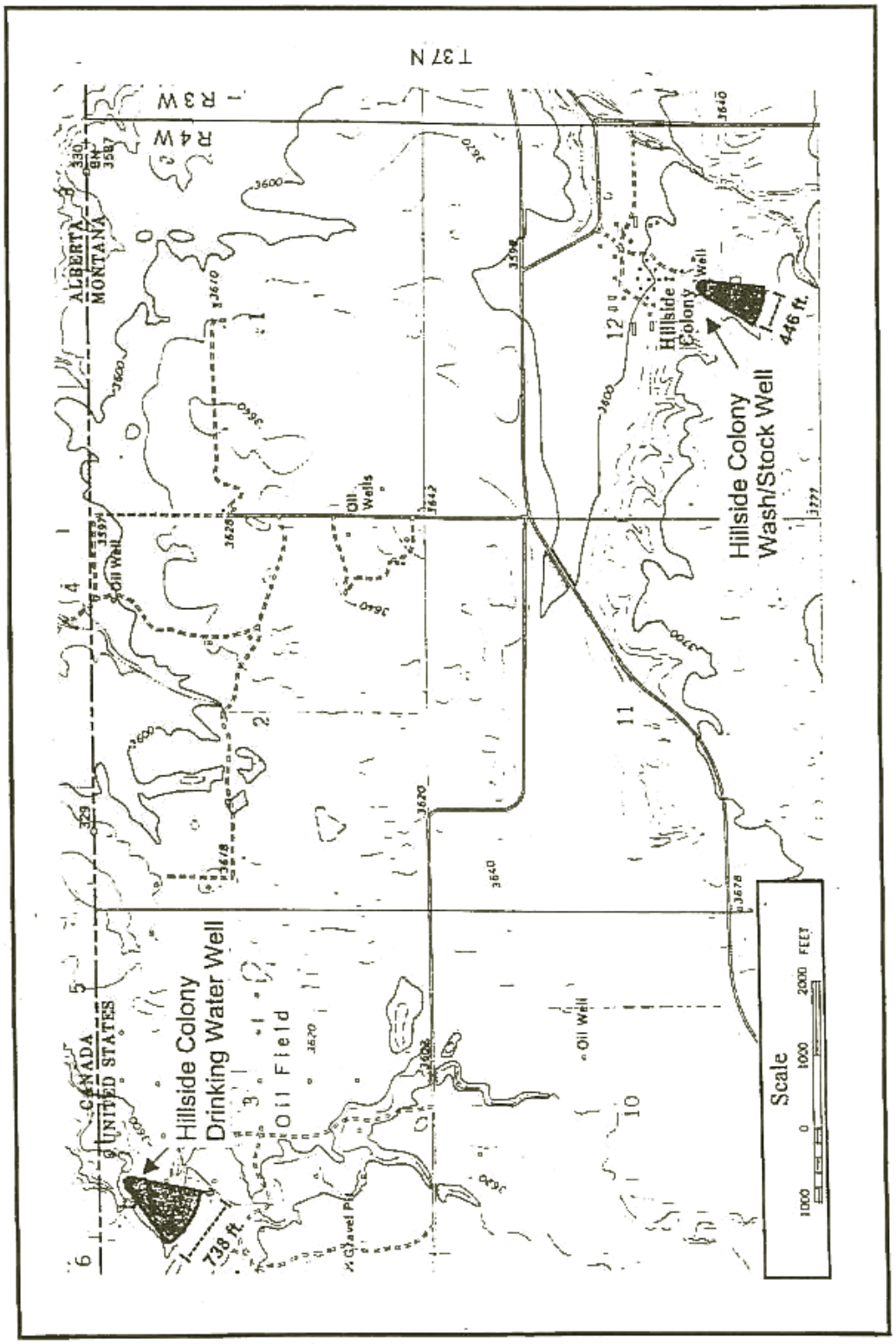


Figure 31. Special protection regions for Hillside Colony wells. *Base Map: Hillside Colony, 7.5 minutes, 1968*

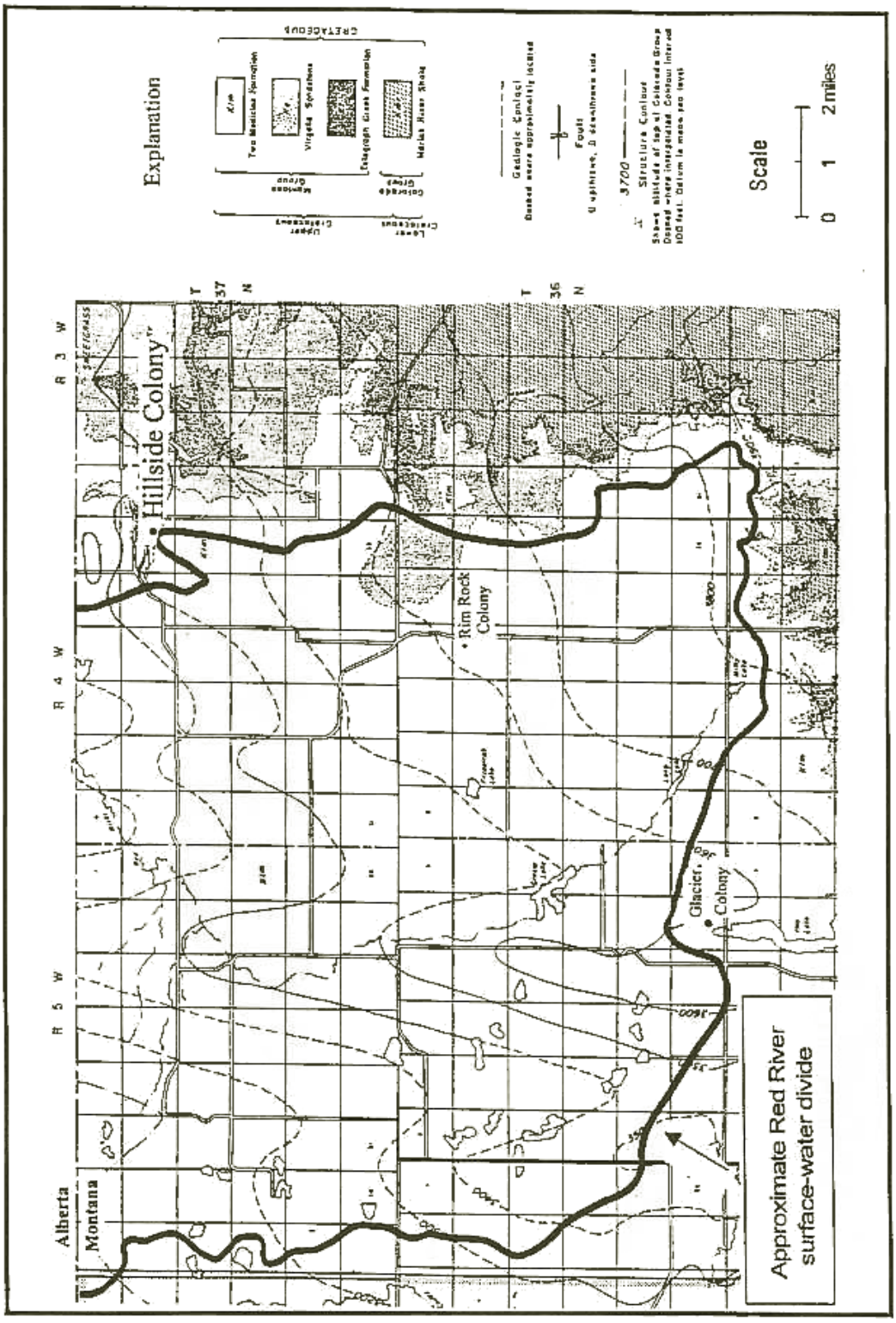


Figure 32. Geologic map for the area surrounding the Hillside Colony. *Source: Zimmerman, 1967*

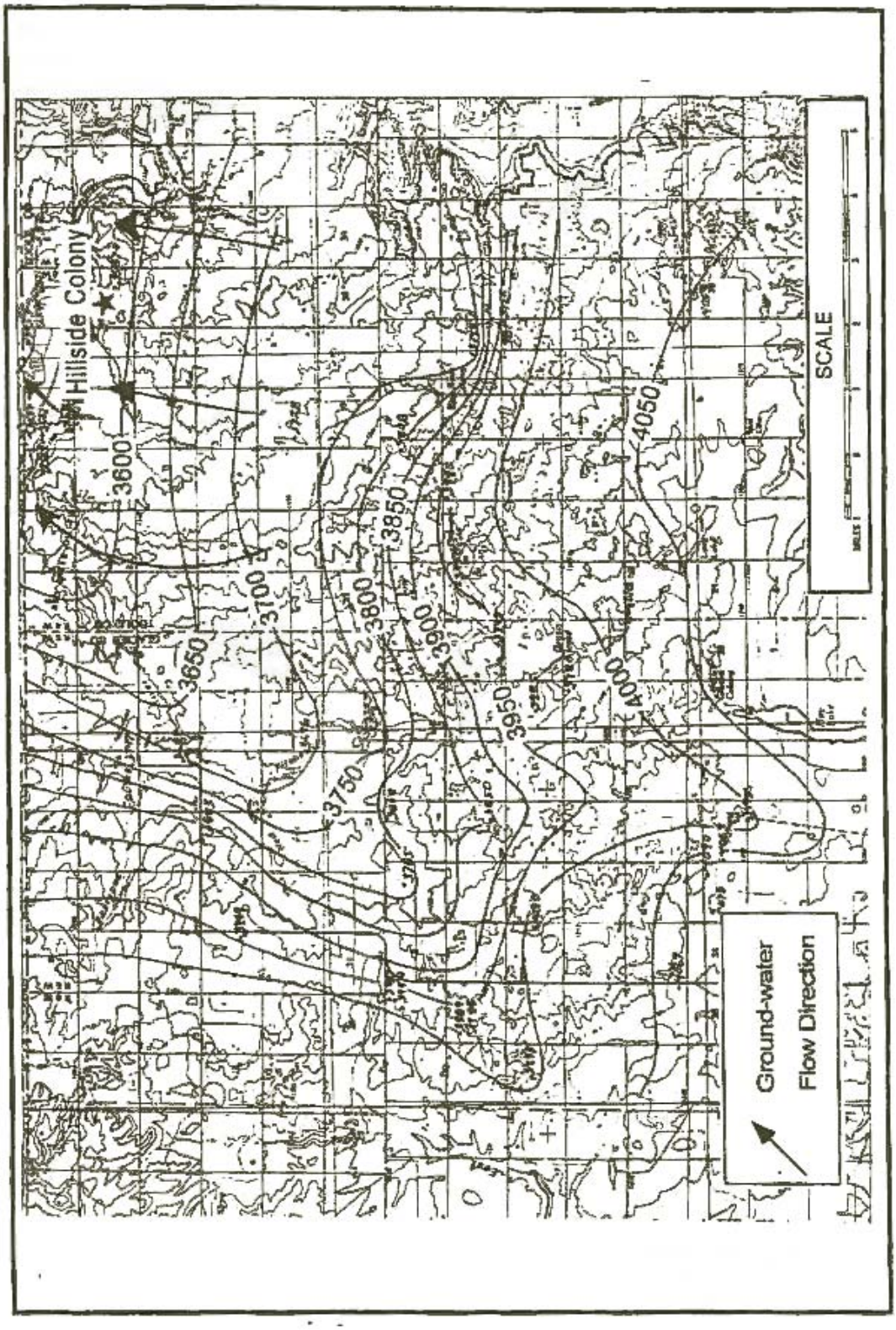


Figure 33. Potentiometric surface map showing regional ground-water flow direction near Hillside Colony. *Base Map: Cut Bank 1:100,000, 30 x 60 minute quad, 1984*

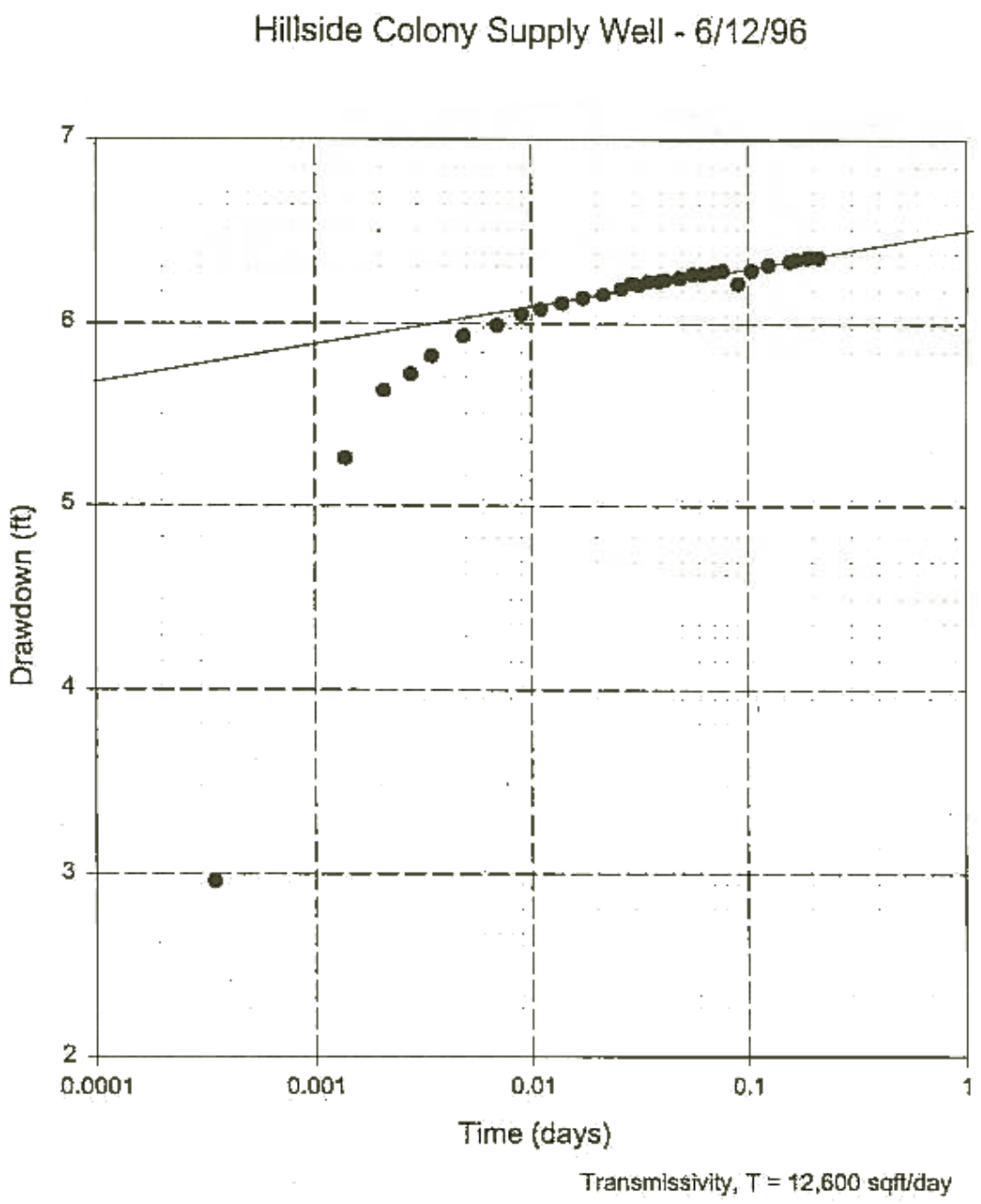


Figure 34. Aquifer test results, Hillside Colony drinking water well.

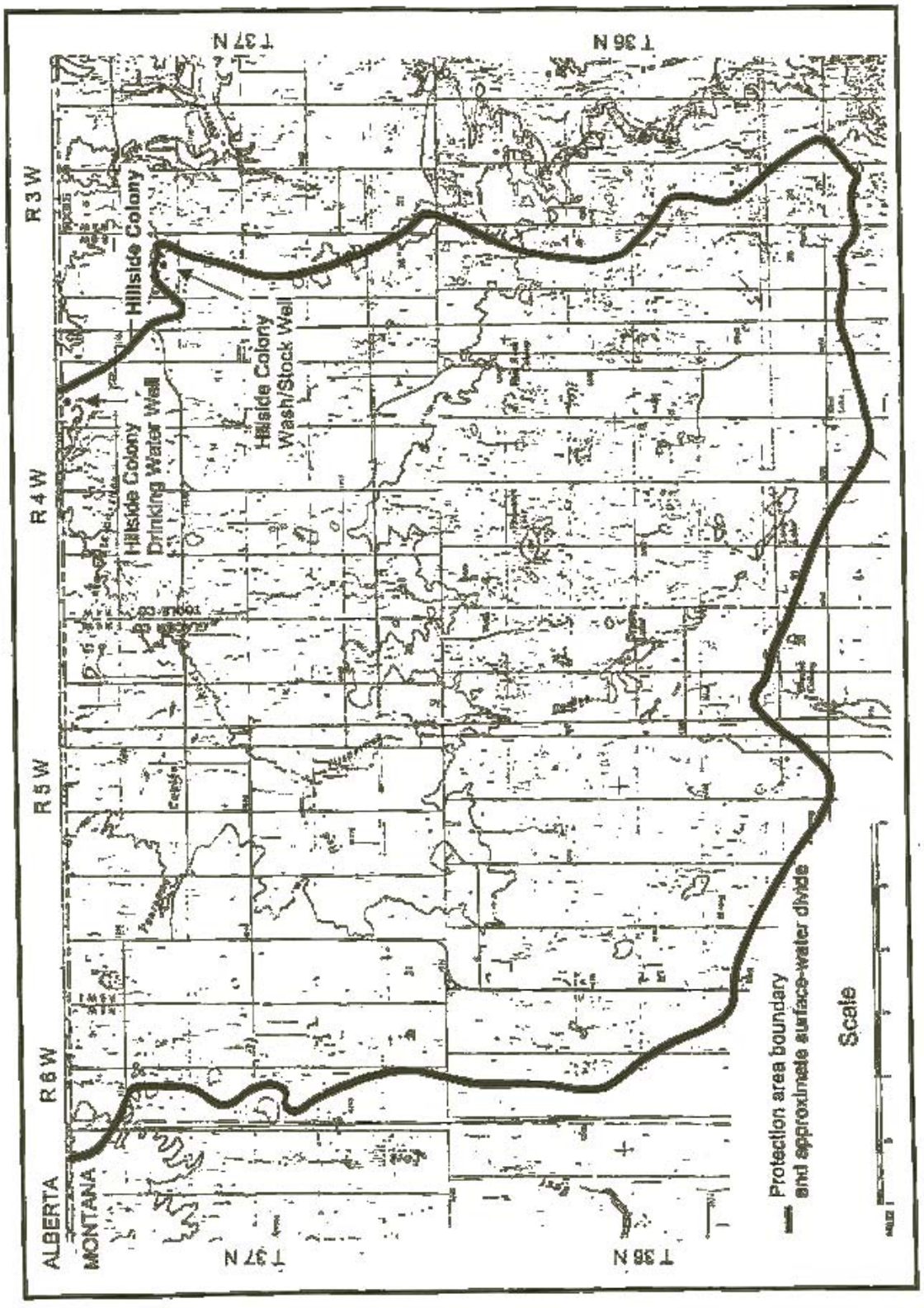


Figure 35. General protection region for Hillside Colony. *Base Map: Cut Bank 1:100,000, 30 x 60 minute quad, 1984*

Appendix D
Monitoring Waivers

MONITORING WAIVERS

Waiver Recommendation

The Hillside Colony PWS has a waiver for Phase 2 inorganics (which includes barium, cadmium, chromium, fluoride, mercury and selenium). 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 Hillside 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 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
Agricultural Cropped Areas	Nitrates and SOCs	**Moderate**	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.

Appendix E
Concurrence Letter