

***SOURCE WATER DELINEATION AND
ASSESSMENT REPORT***

**LDS Church, Clinton
Public Water System**

PWSID # MT0003640

Date of Report: 6/30/03

Dave Strate
Operator
P.O. Box 16204
Missoula, MT 59808
(406) 543-7535

Table of Contents

ACKNOWLEDGMENTS	i
GLOSSARY	ii
GLOSSARY	ii
INTRODUCTION	v
CHAPTER 1: BACKGROUND	2
The Community	2
Geographic setting	2
General description of the Source Water	2
The Public Water Supply	3
Water Quality	3
CHAPTER 2: DELINEATION	4
Hydrogeologic Conditions	5
Conceptual Model and Assumptions	6
Well(s) Information	7
CHAPTER 3: INVENTORY	8
Inventory Results/Control Zone	9
Inventory Results/Inventory Region	9
Inventory Results/Surface Water Buffer Zones	9
CHAPTER 4: SUSCEPTIBILITY ASSESSMENT	10
Limitations	11
REFERENCES	12
APPENDIX A	0
PWS System Layout and Sanitary Survey	0
APPENDIX B	0
Well Log for PWS	0
APPENDIX C	0
MBMG-GWIC Well Logs for Area	0
APPENDIX D	0
Letter of Concurrence	0

Figures

- [Figure 1](#) - *Clinton* Location Map
- [Figure 2](#) - *Clinton LDS Church* Area Map
- [Figure 3](#) - General Surficial Geologic Map
- [Figure 4](#) - General Potentiometric Surface Map
- [Figure 5](#) - *Clinton* Inventory Region
- [Figure 6](#) - Surface Water Buffer Zones
- [Figure 7](#) - Land Use Classification
- Figure [\(8a\)](#) [\(8b\)](#)-Concentration/Classification of Septic Systems within Inventory Region

Tables

- [Table 1](#) -- Clinton area background water quality
- [Table 2](#) -- Methods and criteria for delineating source water protection regions for PWSs.
- [Table 3](#) -- Geologic and hydrogeologic studies of area
- [Table 4](#) -- Geologic and hydrogeologic maps of area
- [Table 5](#) -- Source water (aquifer) sensitivity table.

- [Table 6](#) – PWS Information
- [Table 7](#) – Land use types and map codes.
- [Table 8](#) - Non-point source relative hazard ratings
- [Table 9](#) -- Relative susceptibility based on hazard and barriers

ACKNOWLEDGMENTS

This Delineation and Assessment Report for the Clinton LDS Church PWS (source #003640) was completed by Michelle Hutchins, Jon Harvala and Travis Ross, Environmental Health Specialists with the Missoula Valley Water Quality District. Clinton is located in Missoula County. The system can be contacted through Dave Strate (406) 543-7535.

GLOSSARY AND LIST OF ACRONYMS*

Acute Health Effect An adverse 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.

Best Management Practices (BMPs) Methods that have been determined to be the most effective, practical means of preventing or reducing pollution from nonpoint sources.

Coliform Bacteria Bacteria found in the intestinal tracts of animals. Their presence in water is an indicator of pollution and possible contamination by pathogens.

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 that inhibits the flow of water.

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.

Delineation A process of mapping source water management areas.

Hardness Characteristic of water caused by presence of various chemical compounds. Hard water may interfere with some industrial processes and prevent soap from lathering.

Hazard A measure of the potential of a contaminant leaked from a facility to reach a public water supply source. Proximity or density of significant potential contaminant sources determines hazard.

HazMat Hazardous Materials Response Team.

Hydraulic Conductivity A coefficient of proportionality describing the rate at which water can move through an aquifer.

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

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.

MGWPCS Montana Ground Water Pollution Control System.

MPDES Montana Pollution Discharge Elimination System.

Nitrate An important plant nutrient and type of inorganic fertilizer. In water, the major sources of nitrate pollution are septic tanks, sanitary sewers, feed lots and fertilizers.

NOAA National Oceanic and Atmospheric Administration.

Nonpoint-Source Pollution Pollution sources such as stormwater runoff that are diffuse and do not have a single point of origin or are not introduced into a receiving stream from a specific outlet.

NPL National Priority List (Superfund).

Pathogens Bacterial organisms typically found in the intestinal tracts of mammals, capable of producing disease.

Point-Source A stationary location or fixed facility from which pollutants are discharged.

Public Water System A system that provides piped water for human consumption to 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 Source water management region that is generally the entire area that could contribute water to an aquifer used by a public water system. 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.

SDWA Safe Drinking Water Act.

Source Water Protection Area For surface water sources, the land and surface drainage network that contributes water to a stream or reservoir used by a public water supply.

Static Water Level (SWL) Water level elevation in a well when the pump is not operating.

Susceptibility (of a PWS) The potential for a public water system to draw water with contamination 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) Manmade organic chemical compounds such as 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.

Transmissivity The ability of an aquifer to transmit water.

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

UST Underground storage tank.

Volatile Organic Compounds (VOC) Any organic compound that evaporates readily to the atmosphere.

MWQA Montana Water Quality Act.

WQD Missoula Valley Water Quality District.

* Definitions taken from EPA's Glossary of Selected Terms and Abbreviations
(<http://www.epa.gov/ceisweb1/ceishome/ceisdocs/glossary/glossary.html>)

INTRODUCTION

This report is intended to meet the technical requirements for the completion of the delineation and assessment report for Clinton LDS Church PWS as required by the Montana Source Water Protection Program and the federal Safe Drinking Water Act (SDWA).

The Montana Source Water Protection Program is intended to be a practical and cost-effective approach to protecting public drinking water supplies from contamination. A major component of the Montana Source Water Protection Program is termed delineation and assessment. The emphasis of this delineation and assessment report is identifying significant potential contaminant threats to public drinking water sources and providing the information needed to develop a source water protection plan for Clinton LDS Church PWS. Delineation is a process whereby areas that contribute water to aquifers or surface waters used for drinking water, called source water protection areas, are identified on a map. Geologic and hydrologic conditions are evaluated in order to delineate source water protection areas. Assessment involves identifying locations or regions in source water protection areas where contaminants may be generated, stored, or transported and then determining the potential for contamination of drinking water by these sources. Clinton LDS Church can use this information to protect their drinking water source. Although voluntary, source water protection plans are the ultimate focus of source water delineation and assessment. This delineation and assessment report is written to encourage and facilitate the Clinton LDS Church PWS operator and the community to complete a source water protection plan that meets their specific needs.

CHAPTER 1: BACKGROUND

The Community

Clinton is located on the Clark Fork River, approximately 20 miles upstream from the City of Missoula ([Figure 1](#)). The population of the Clinton area is 549 (U.S. Census 2000). The population of Missoula County in 2000 was 95,802 with 57,053 people living in the city of Missoula (Census 2000). Interstate 90 runs along the northern edge of Missoula and along the southern edge of Bonner ([Figure 2](#)). Much of the Clinton population works in Missoula. Major Missoula area employers include the University of Montana, and the two local hospitals, each employing more than 1000 people. Stimson Lumber operates a lumber and plywood mill in the Bonner area, and employs 450 people. Other economic contributors include Smurfit-Stone Container, several transportation companies, as well as tourism, small businesses and outlying agriculture and timber operations. Clinton residences and businesses currently rely upon onsite septic systems for sewage treatment. Drinking water is supplied by private and small public supply wells.

Geographic setting

Clinton is located in the upper Clark Fork Valley, upstream of Missoula, Montana, on the Clark Fork River. Milltown Dam and Milltown Reservoir are located downstream from Clinton, at the confluence of the Clark Fork and Blackfoot Rivers. Clinton is approximately 3470 feet above sea level. The Valley is bordered on the south/west by the Sapphire Range, and on the north/east by the Garnet Range. The annual average precipitation is approximately 12.6 inches (43 inches of snow); the annual average temperature is 44°F with highest average maximum temperatures (83°F) occurring in July and lowest average minimum temperatures (12°F) occurring in January (estimates based on NOAA data).

General description of the Source Water

The Clinton LDS Church PWS is a transient, non-community water system that obtains water from one well finished in the Clark Fork Valley aquifer. The aquifer consists of unconsolidated alluvial sand, gravel and cobbles with a many lenses of clay and is recharged mainly by underflow from the Clark Fork Valley and leakage from the Clark Fork River (Gestring, 1994).

The Public Water Supply

The well is located at 19075 East Mullan Road in Missoula County. The well draws from an approximate depth of 84 feet below the ground surface. The Clinton LDS Church PWS currently serves an estimated population of approximately 100 people with 1 active service connection. The location of the well is shown in [Figure 2](#). The well links to two captive air tanks prior to distribution. The tanks are located in a room adjacent to the boiler room. There is currently ion exchange water softening treatment prior to distribution. A general plan showing the layout of the distribution system is presented in Appendix A, with a copy of the sanitary survey and the driller's well log.

Water Quality

Every PWS is required to perform monitoring for contamination to their water supply. Water is typically monitored for total coliform and fecal coliform bacteria, nitrates and metals. The monitoring schedule depends on the population served, the number of wells and the source water for the PWS. DEQ defines monitoring programs and protocols that are specific to each PWS. PWS 3640 has had no reported violations of MCL standards.

Portions of the upper Clark Fork watershed are on the National Priority List (NPL) under the Comprehensive Environmental Response, Compensation and Liability Act (Superfund). Historic mining activity resulted in the release and deposition of toxic mine tailings, and contamination of large areas along and within the river course. Some of these contaminated sediments accumulated behind Milltown Dam, approximately ten miles downstream from Clinton, and contaminated groundwater in the Milltown area with arsenic and other metals. The contamination for which the EPA has proposed remediation, upstream and downstream of Clinton, does not appear to significantly impact PWS 3640. Analytic results from this and nearby wells support this conclusion. Arsenic and other metals levels measured in samples from the Clinton LDS Church PWS have been consistently below water quality standards. Cleanup of the upper Clark Fork, mandated by the Environmental Protection Agency, will further minimize this threat.

Table 1. Sample water quality data for the upper Clark Fork aquifer, Turah/Clinton Area (Juday and Keller, 1978; Nimick, 1993).

Sample date	Well #/ Location	PH	Ca Mg/L	Mg Mg/L	Na Mg/L	SiO ₂ Mg/L	S0 ₄ Mg/L	NO ₃ Mg/L	P Mg/L	Cl Mg/L	HCO ₃ Mg/L	TDS Mg/L	Fe Mg/L	K Mg/L	As Mg/L
1978 (Ave.)	#210, 211 Turah	7.4	49	15.9	8.5	15.3	68.3	0.18	0.024	3.8	163	327	--	2.6	--
1987	12N17W 18ADDB01	7.3	59	13	9.1	19	45	0.29	<0.1	3.1	210	253	<2	2.0	.0011

(-- = not tested for this analyte)

CHAPTER 2: DELINEATION

The source water protection area, the land area that contributes water to Clinton LDS Church PWS, is identified in this chapter. Three management areas are identified within the source water protection area. These three regions are the control zone, inventory region, and surface water buffer region. A 100-foot radius control zone and a one-mile radius inventory region were delineated for Clinton LDS Church, as required for transient, non-community public water supplies, under the Montana Source Water Protection Program (DEQ, 1999). Because the Clark Fork River and the tributary streams in the area influence ground water, surface water buffer zones were delineated based on standard distance criteria of 10 miles upstream from the ground water inventory zone and encompassing ½ mile width of land area on each side of the drainages. [Figure 2](#) lists methods and criteria for delineating source water protection regions for public water supplies.

Table 2. Methods and criteria for delineating source water protection regions for PWSs.

If Your Source Water Is:	Delineate These Water Protection Regions:	Method For Each Region:	Minimum Distance Values & Type of Inventory Required: -- Land Uses; Pathogens and Nitrate sources
1. Ground Water that is: <ul style="list-style-type: none"> ▪ Unconfined/Semi-confined, ▪ Confined *Ground water that is hydraulically connected to surface water	Control Inventory Control Inventory Buffer Zone	Fixed radius Fixed radius Fixed radius Fixed radius Fixed distance	100 feet 1 mile 100 feet 1000 feet ½-mile buffer extending upstream a distance corresponding to a 4-hour TOT but not to exceed 10 miles or the nearest intake. Buffer will not exceed the extent of the watershed.
Surface water	Spill Response	Fixed distance	½-mile buffer extending upstream a distance corresponding to a 4-hour TOT but not to exceed 10 miles or the nearest intake. Buffer will not exceed the extent of the watershed.

Hydrogeologic Conditions

Tables 3 and 4 list geologic and hydrogeologic studies of the upper Clark Fork region; the following description is based on those reports.

Faulting and folding along the Lewis and Clark Lineament has shaped the upper Clark Fork Valley’s complex geologic structure. Precambrian metasedimentary rocks of the Belt Supergroup, and a few interspersed Mesozoic and Paleozoic sedimentary rocks surround the valley, with peaks of 5000 to 7000 feet elevation. This relatively impermeable and deeply eroded landscape was partially filled with Tertiary and Quaternary alluvium. Portions of the Tertiary sediments were scoured from the valley during the repeated draining of Glacial Lake Missoula approximately 12,000 to 15,000 years ago, during the Wisconsin glacial stage, and were replaced with layers of coarse-grained sand, gravel and cobbles, deposited during these catastrophic events. Lenses of silt and clay residue from the glacial lakebed remain, but yield little water.

The upper Clark Fork Valley aquifer is predominantly unconfined and composed of unconsolidated Quaternary alluvium, with Tertiary alluvium in some areas. In this area there are many lenses of clay interbedded with sand and gravel units. Depth to the water table ranges from approximately 6 feet to 70 feet below land surface. The seasonal fluctuation of the groundwater table is approximately 5 feet. The lateral extent of the aquifer varies from about 0.6 miles near Turah, to approximately one mile wide just downstream from Clinton. The aquifer has high source water sensitivity because it is unconfined and comprised of relatively coarse-grained material. Groundwater flows generally northward through Clinton, roughly paralleling the flow of the Clark Fork River, and joins the Missoula Valley Aquifer near the mouth of Hellgate Canyon, approximately 18 miles downstream from Clinton. The Missoula Valley Aquifer has been designated a “Sole Source Aquifer” by the U.S. EPA. A geologic map of the Clinton area is presented in [Figure 3](#). [Figure 4](#) represents a generalized ground water flow map.

Table 3. List of geologic and hydrogeologic investigations in the upper Clark Fork area.

Title of Project	Reference	Area Covered	Project Purpose.
Preliminary Groundwater Modeling To Estimate Effects of Dam and Sediment Removal on the Alluvial Aquifer in Milltown, Montana	Christine Brick, 2003	East Missoula to Piltzville	Likely hydrogeological effects of removing Milltown Dam
Hydrogeology and water resources of the Missoula Basin, Montana	A.L. Geldon, 1980	Missoula Basin	To determine the storage potential of the basin
The Interaction of the Clark Fork River and the Hellgate Valley Aquifer Near Milltown, Montana.	S.L. Gestring, 1994	Hellgate Canyon, Missoula, Montana	To quantify the interaction between the Clark Fork River and the Hellgate Valley Aquifer
Geographic, Geologic, and Hydrologic Summaries of Intermontane Basins of the Northern Rocky Mountains, Montana	Kendy and Tresch, 1996.	Intermontane basins of the northern Rocky Mountains	Summarize the geographic, geologic and hydrologic characteristics of the Rocky Mountain region in western Montana.
Geology and Ground-water Resources of the Missoula Basin, Montana	McMurtrey, et. al, 1965	Missoula Basin	Summary of geology and hydrogeology
Hydrology and Water Chemistry of Shallow Aquifers Along the Upper Clark Fork, Western Montana	D.A. Nimick, 1993	Upper Clark Fork region	Analyze hydrology of bedrock and unconsolidated Tertiary and Quaternary deposits

Table 4. List of geologic or hydrogeologic maps available for the upper Clark Fork area.

Title or Description	Area Covered	Reference
Water table map from measured values; Distribution of hydraulic conductivity in the calibrated model	Hellgate Canyon, Missoula County	Brick, C., 2003. Preliminary Groundwater Modeling To Estimate Effects of Dam and Sediment Removal on the Alluvial Aquifer in Milltown, MT
Model Calibrated Hydraulic Conductivity	Hellgate Canyon, Missoula County	Gestring, S.L., 1994. The Interaction of the Clark Fork River and the Hellgate Valley on the Aquifer Near Milltown, MT
Geology of the Bonner Quadrangle Montana	Missoula to east of Bonner Montana	Nelson, W.H., and Dobell, J.P., 1961. Geologic Map and Sections of the Bonner Quadrangle, Montana. USGS Bulletin 1111 - F
Generalized geologic map of the Butte 1 X 2 degree quadrangle, Montana	Approximately 100 X 70 mi. area of Missoula, Powell, Lewis & Clark and Deer Lodge Counties	Wallace, C.A., 1987, USGS Miscellaneous Field Studies Map MF-1925
Geology of the Bonner Quadrangle Montana	Missoula to east of Bonner Montana	Nelson, W.H., and Dobell, J.P., 1961. Geologic Map and Sections of the Bonner Quadrangle, Montana. USGS Bulletin 1111 - F

Table 5. Source Water (Aquifer) Sensitivity Table.

<u>High Source Water Sensitivity</u>	<u>Moderate Source Water Sensitivity</u>	<u>Low Source Water Sensitivity</u>
<ul style="list-style-type: none"> ▪ Surface water and GWUDISW ▪ Unconsolidated alluvium (unconfined) ▪ Fluvial-glacial gravel ▪ Terrace and pediment gravel ▪ Shallow fractured or carbonate bedrock 	<ul style="list-style-type: none"> ▪ Semi-consolidated valley fill sediments (semi-confined) ▪ Unconsolidated alluvium (semi-confined) 	<ul style="list-style-type: none"> ▪ Consolidated sandstone bedrock ▪ Deep fractured or carbonate bedrock ▪ Semi-consolidated (confined)

Conceptual Model and Assumptions

A conceptual hydrogeologic model is a simplified representation of the hydrogeologic system. This section describes the conceptual model used for this report.

The ground water in the upper Clark Fork Valley is predominantly unconfined and occurs in unconsolidated sand and gravel units beneath the valley floor, which are laterally and basally bounded by the relatively impermeable bedrock. Fractured bedrock yields small quantities of water in some areas. Recharge is derived mainly from the Clark Fork River, and underflow from the Clark Fork Valley, with minor recharge from tributary drainages and excess irrigation and precipitation. The Clark Fork is a losing river along most of its path through the Clark Fork Valley. Ground water flows generally north northwestward through the Clinton area, flowing the same overall direction as the Clark Fork River.

Well(s) Information

The wells are located at 20,000 Highway 10 East in Missoula County. The well draws from an approximate depth of 80 feet below the ground surface. Table 6 is a summary of the well information and Appendix B contains copies of the driller’s well log.

Table 6. Source well information for Clinton LDS Church PWS.

Information	Well #1
PWS Source Code	003640 - 002
Well Location (T, R, Sec or lat, long)	Lat: 46.7881 Long: - 113.7199
MBMG#	128951
Date Well was Completed	5/9/1992
Total Depth	80 ft
Perforated Interval	--
Static Water Level	25.5 ft
Pumping Water Level	33.0 ft.
Drawdown	7.5 ft
Test Pumping Rate	80 gpm
Specific Capacity	10.67 gpm/ft.

CHAPTER 3: INVENTORY

An inventory of potential sources of contamination was conducted for the Clinton LDS Church PWS within the control zone, inventory region and surface water buffer zone. The Montana Source Water Protection Program (Montana DEQ, 1999) requires that land uses and all potential sources of nitrate and microbial pathogens within the control zone, inventory region and surface water buffer zone be identified.

Inventory Method

Available databases were searched to identify businesses and land uses that are potential sources of regulated contaminants in the inventory region. A “windshield survey” was conducted to obtain additional information for this assessment. The following steps were followed:

Step 1: Urban and agricultural land uses were identified from the U.S. Geological Survey's Geographic Information Retrieval and Analysis System. Sewered and unsewered residential land use was identified from boundaries of sewer coverage obtained from municipal wastewater utilities. Septic system density outside of the sewered area was evaluated using the Montana Department of Revenue Computer Assisted Mass Appraisal (CAMA) database.

Step 2: The Permit Compliance System (PCS) was queried using Envirofacts to identify Concentrated Animal Feeding Operations with MPDES permits.

Step 3: A “windshield survey” was undertaken to identify additional potential contaminant sources not listed in the databases.

Step 4: Major road and rail transportation routes were identified throughout the inventory region.

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

- 1) Animal feeding operations.
- 2) Wastewater treatment facilities, sludge handling sites, or land application areas.
- 3) Septic systems.
- 4) Sewer mains.

Table 7. Land Use Types and Map Codes.

Land Use Type	Map Code	Land Use Type	Map Code
Sewered residential	SR	Industrial	I
Sewered commercial	SC	Railroad right-of-way	RRW
Sewered mixed	SM	Highway right-of-way	HRW
Unsewered residential	UR	Agricultural dryland crop	ADC
Unsewered mixed	UM	Agricultural irrigated crop	AIC
Unsewered commercial	UC	Agricultural irrigated pasture	AIP
		Agricultural dryland pasture	ADP
		Forest	F

Inventory Results/Control Zone

There are no significant potential contaminant sources identified for the control zone of this PWS ([Figure 5](#)).

Inventory Results/Inventory Region

Septic system density for the inventory region is approximately 44/mi². Land use is primarily evergreen forest (71%), crop/pasture (19%), residential/commercial (8%), and grass/rangeland (2%) ([Figure 7](#)) ([Figure 8a](#)) ([Figure 8b](#)).

Inventory Results/Surface Water Buffer Zones

Significant potential contaminant sources for the surface water buffer zone ([Figure 6](#)) are pathogens and nitrates from sewage disposal systems, and agricultural land use, which may contribute pesticides and herbicides to surface waters. Septic system density in the surface water buffer zone is approximately 15/mi². There are no permitted confined animal feeding units in the Clinton area.

CHAPTER 4: SUSCEPTIBILITY ASSESSMENT

The susceptibility of Clinton LDS Church wells to significant potential contaminant sources is assessed in this chapter. Susceptibility is the potential for a well to be contaminated by one of the sources inventoried in the previous chapter. Hazard ratings and the presence of barriers determine susceptibility (Table 9). Hazard ratings are determined by the proximity of a potential point-source contaminant or the density of a non-point source potential contaminants to the well. The susceptibility is then determined based upon the hazard and any barriers that mitigate the hazard. Barriers can be engineered structures, management actions and/or natural conditions. Spill catchments for fueling facilities and leak detection for underground storage tanks are examples of engineered barriers. Emergency planning and availability of trained hazardous materials response team, and best management practices are examples of management barriers. Clay soils, deep wells and a thick layer of substrate above an aquifer can be considered natural barriers.

Table 8. Non-point source relative hazard ratings.

Source Type	High Hazard	Moderate Hazard	Low Hazard
Septic Systems	>300 per sq. mi.	50-300 per sq. mi	<50 per sq. mi.
Municipal Sanitary Sewer (% Land Use)	>50% of region	20%-50% of region	<20% of region
Cropped Agricultural Land (% Land Use)	>50% of region	20%-50% of region	<20% of region

For non-point sources, the relative hazard is assigned based on the following table:

Table 9. Relative susceptibility to specific contaminant sources as determined by hazard and the presence of 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

Susceptibility of the Clinton LDS Church PWS to contamination from septic systems is low, based on an approximate density of 44 septic systems/mi², and susceptibility to contamination from agricultural land use is low, based on 19% agricultural land use.

Limitations

Identification of potential contaminant sources is limited to those regulated for this class of PWS and is generally based on readily available information and reports. Unregulated activities or unreported contaminant releases may not be considered in this report. The delineation method utilizes simplifying assumptions that may not fully represent complex ground water flow systems but is intended to be conservative and protective of public health.

REFERENCES

- Brick, C., 2003. Preliminary Groundwater Modeling To Estimate Effects of Dam and Sediment Removal on the Alluvial Aquifer in Milltown, Montana. Clark Fork Coalition, 24 p.
- CH2M Hill, 1984. Milltown Superfund Site Supplemental Data Interpretation of Geochemical Release Mechanisms and Arsenic Fate and Transport, Appendix 6-C, 83p.
- Clark, K.W., 1986. Interactions between the Clark Fork River and Missoula Aquifer, Missoula, Montana. University of Montana, M.S. thesis, 150 p.
- Driscoll, F.G., 1986. Groundwater and wells, 2nd Edition. Johnson Division, St. Paul, Minnesota.
- Fetter, C.W., Jr., 1980. Applied Hydrogeology. Charles E. Merrill, Columbus, Ohio, 488 p..
- Freeze, R.A., and Cherry, J.A., 1979. Groundwater. Prentice-Hall, Inc., Englewood Cliffs, NJ, 604 p.
- Gestring, S.L., 1994. The Interaction of the Clark Fork River and the Hellgate Valley Aquifer Near Milltown, Montana. University of Montana, M.S. thesis, 273 p.
- Kasenow, M., 2000. Easy To Use Tables Of Specific Capacity. Water Resources Publications, LLC, 55 p.
- Kendy, E., and Tresch, R.E., 1996. Geographic, Geologic, and Hydrologic Summaries of Intermontane Basins of the Northern Rocky Mountains, Montana. U. S. Geological Survey Water-Resources Investigations Report 96-4025, 233 p.
- Land and Water Consulting, 1994. Quantitative Groundwater Flow Model For the Hellgate Valley. Prepared for ARCO, Anaconda, Montana.
- Missoula Valley Water Quality District, 1996. Evaluation of Unsewered Areas in Missoula, Montana.
- Montana Department of Environmental Quality (DEQ), 1999. Montana Source Water Protection Program.
- National Oceanic and Atmospheric Administration, National Climatic Data Center online database.
- Nelson, W.H., and Dobell, J.P., 1961. Geology of the Bonner Quadrangle Montana. U.S. Geological Survey Bulletin 1111 – F, 235 p.
- Nimick, D.A., 1993. Hydrology and Water Chemistry of Shallow Aquifers Along the Upper Clark Fork, Western Montana. U.S. Geological Survey Water-Resources Investigations Report 93-4052, 63 p.
- Nyquist, D. L., 2001. A Depth to Bedrock Model of the Hellgate Canyon and Bandmann Flats Area, Western Montana, Using Constrained Inversion of Gravity Data. University of Montana M.S. Thesis, 186 p.

Salvato, J.A., 1992. Environmental Engineering and Sanitation. John Wiley & Sons, Inc. pp. 285-294.

Solley, W.B., Pierce, R.R. and Perlman, H.A., 1998. Estimated Use of Water in the United States in 1995. U.S.G.S. Circular 1200, pp. 24 – 27.

U.S. Environmental Protection Agency, 1997. Water on Tap: A Consumer's Guide to the Nation's Drinking Water.

APPENDIX A

PWS System Layout and Sanitary Survey

APPENDIX B

Well Log for PWS

**Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
LDS CHURCH - CLINTON**

Plot this site on a topographic map

Location Information

GWIC Id: 128951	Source of Data: LOG
Location (TRS): 12N 17W 22 ACBB	Latitude (dd): 46.7881
County (MT): MISSOULA	Longitude (dd): -113.7199
DNRC Water Right:	Geomethod: MAP
PWS Id: 03640002	Datum: 1927
Block:	Certificate of Survey:
Lot: C3A	Type of Site: WELL
Addition: COS 3952	
Site Notes: TRACT LOCATION BASED ON LOT PLOTTED ON TOPO MAP.	

Well Construction and Performance Data

Total Depth (ft): 80.00	How Drilled: ROTARY
Static Water Level (ft): 25.50	Driller's Name: CAMP
Pumping Water Level (ft): 33.00	Driller License: WWC007
Yield (gpm): 80.00	Completion Date (m/d/y): 5/9/1992
Test Type: PUMP	Special Conditions:
Test Duration: 6.00	Is Well Flowing?:
Drill Stem Setting (ft):	Shut-In Pressure:
Recovery Water Level (ft):	Geology/Aquifer: Not Reported
Recovery Time (hrs):	Well/Water Use: PUBLIC WATER SUPPLY
Well Notes:	

Hole Diameter Information

From	To	Diameter
0.0	80.0	6.0

Annular Seal Information

From	To	Description
0.0	20.0	CEMENT

Lithology Information

From	To	Description
0.0	35.0	CLAY SAND GRAVEL AND COBBLESTONES
35.0	63.0	CLAY SAND GRAVEL AND WATER
63.0	76.0	SAND AND WATER
76.0	80.0	SAND GRAVEL AND WATER

Casing Information¹

From	To	Dia	Description
-1.5	79.2	6.0	0.28 WALL STEEL

Completion Information¹

From	To	Dia	Description
79.2	79.2	6.0	OPEN BOTTOM

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

These data represent the contents of the GWIC databases at the Montana Bureau of Mines and Geology at the time and date of the retrieval. The information is considered unpublished and is subject to correction and review on a daily basis. The Bureau warrants the accurate transmission of the data to the original end user. Retransmission of the data to other users is discouraged and the Bureau claims no responsibility if the material is retransmitted. Note: non-reported casing, completion, and lithologic records may exist in paper files at GWIC.

APPENDIX C

MBMG-GWIC Well Logs for Area

Ground Water Information Center
Wells Report

The following data were returned from the GWIC databases for the area you requested. For a more detailed description of the data view the [GWIC Metadata report](#). If you notice data entry errors or have questions please let us know by clicking [here](#) to send us an E-mail. If you wish to view a one page report for a particular site, click the hyperlinked **Gwic Id** for that well. Scroll to the right of your screen to view all the data.

Retrieval Statistics *				
Field	Max	Min	Count	Avg
Total Depth	99.00	20.00	53	54.40
Pumping Water Level	60.00	2.70	32	31.48
Static Water Level	86.00	4.50	43	23.78
Yield (gpm)	750.00	2.00	41	56.26

* These statistics do not take any geographic, topographic, or geologic factors into consideration. Negative swl values are reported for water levels that are above land surface.

Gwic Id	DNRC WR	Site Name	Location	Ver?	Type	Td	Pwl	Swl	Yield	Date	Use
66677		BLACKFOOT TELEPHONE	12N17W27	NO	WELL	70.00	43.00	30.00	30.00	11/7/1984	DOMESTIC
66669	17158	CANNON RICHARD	12N17W27	NO	WELL	60.00	45.00	32.00	55.00	6/23/1977	DOMESTIC
66672		CLINTON WOMENS CLUB INC.	12N17W27	NO	WELL	40.00				1/1/1900	PUBLIC WATER SUPPLY
128974		HEATH JIM	12N17W27	NO	WELL	60.00	50.00	30.00	50.00	8/11/1992	DOMESTIC
66675		HENDERSON FREIDA DOUGLAS	12N17W27	NO	WELL	60.00		60.00		1/1/1956	DOMESTIC
66671		LARSON RACHEL A.	12N17W27	NO	WELL	35.00		35.00	2.00	1/1/1945	DOMESTIC IRRIGATION
66674		LARSON RACHEL A.	12N17W27	NO	WELL	86.00		86.00		1/1/1949	DOMESTIC
66676		LEISCHNER ALLEN	12N17W27	NO	WELL	32.00	2.70	11.00	15.00	12/4/1973	DOMESTIC
66678		LUBDERS JOHN	12N17W27	NO	WELL	60.00	40.00	32.00	50.00	1/19/1987	DOMESTIC
126225		OCEAN WEST ARIZONA CO.	12N17W27	NO	WELL	61.50	40.00	30.00	50.00	10/4/1989	DOMESTIC
66673		ROWE MARTIN	12N17W27	NO	WELL	51.00	50.00	7.00	75.00	9/5/1980	DOMESTIC
66670		SMITH RALPH T. & JOSEPH M.	12N17W27	NO	WELL	20.00		10.00	30.00	1/1/1954	DOMESTIC
66680		CLINTON COMMUNITY CENTER	12N17W27A	NO	WELL	55.00	45.00	22.00	60.00	10/27/1973	PUBLIC WATER SUPPLY
66682		MASSEY DAN	12N17W27A	NO	WELL	51.00	30.00	30.00	15.00	7/10/1963	DOMESTIC

<u>66681</u>	RIEGER LEONARD	12N17W27A	NO	WELL85.00				1/1/1947	DOMESTIC IRRIGATION
<u>66683</u>	WARD RALPH	12N17W27A	NO	WELL60.0055.0030.00	15.00	12/14/1971			DOMESTIC
<u>66686</u>	ALBRECHT LEONARD	12N17W27AA	NO	WELL57.0025.0024.00	15.00	9/13/1973			DOMESTIC
<u>66687</u>	BAILEY DANIAL B.	12N17W27AA	NO	WELL62.0027.0025.00	15.00	9/11/1973			DOMESTIC
<u>66685</u>	55260BAILEY DANIEL B.	12N17W27AA	NO	WELL50.0035.0032.00	40.00	12/14/1983			DOMESTIC
<u>66689</u>	FREE FARMS	12N17W27AA	NO	WELL60.0010.0010.00	50.00	11/17/1988			DOMESTIC
<u>143099</u>	KALLIS TIM	12N17W27AA	NO	WELL60.00	23.00	30.00	6/21/1994		DOMESTIC
<u>66688</u>	KING RUBY L.	12N17W27AA	NO	WELL36.00			1/1/1938		DOMESTIC
<u>173193</u>	BAILEY DAN	12N17W27AAA	NO	WELL59.0053.0029.00100.00			1/22/1999		
<u>706157</u>	MELOOR MARIE	12N17W27AABC	NO	WELL40.00			1/1/1997		DOMESTIC
<u>706156</u>	UNNAMED WELL FROM GWSI	12N17W27AABC	NO	WELL			1/1/1997		DOMESTIC
<u>706158</u>	UNNAMED WELL FROM GWSI	12N17W27AABD	NO	WELL			1/1/1997		DOMESTIC
<u>706159</u>	UNNAMED WELL FROM GWSI	12N17W27AACA	NO	WELL			1/1/1997		DOMESTIC
<u>66693</u>	W049074CLINTON SCHOOL	12N17W27AACD	YES	WELL50.00	30.00		1/1/1906		PUBLIC WATER SUPPLY
<u>706160</u>	UNNAMED WELL FROM GWSI	12N17W27AACD	NO	WELL			1/1/1997		DOMESTIC
<u>66690</u>	NPRR	12N17W27AB	NO	WELL62.00	30.00	10.00	1/29/1952		DOMESTIC
<u>169682</u>	SIMMONS JERRY	12N17W27AB	NO	WELL60.0015.00	30.00	12/15/1998			DOMESTIC
<u>202057</u>	SIMMONS JERRY	12N17W27AB	NO	WELL60.00	7.00	30.00	4/3/2003		DOMESTIC
<u>66691</u>	BUSBY VERNON R.	12N17W27AC	NO	WELL32.0010.0012.00	22.00	10/4/1948			DOMESTIC
<u>66692</u>	VULCANY INC.	12N17W27ACA	NO	WELL60.0060.0026.00	35.00	10/26/1984			DOMESTIC
<u>180943</u>	BAKER DAWN	12N17W27ACAA	NO	WELL47.00	27.00	50.00	11/11/1999		DOMESTIC
<u>171782</u>	LEWIS AND CLARK TRAILER COURT WELL 1	12N17W27ADBA	YES	WELL63.00					
<u>171783</u>	LEWIS AND CLARK TRAILER COURT WELL 2	12N17W27ADBB	YES	WELL99.0050.0031.00100.00			7/5/1988		
<u>126226</u>	VALDASTRI RAY	12N17W27ADC	NO	WELL59.0042.0030.50	25.00	10/20/1991			DOMESTIC
<u>706161</u>	UNNAMED WELL FROM GWSI	12N17W27ADCA	NO	WELL			1/1/1977		DOMESTIC
<u>706162</u>	UNNAMED WELL FROM GWSI	12N17W27ADCD	NO	WELL			12/31/1899		DOMESTIC
<u>706163</u>	HARRISON BEN	12N17W27ADDC	NO	WELL			1/1/1997		DOMESTIC
<u>200431</u>	HANDLEY FREIDA	12N17W27BA	NO	WELL55.00	30.00	30.00	12/19/2002		DOMESTIC
<u>66695</u>	SWARTZ C.	12N17W27D	NO	WELL72.0030.0025.00	20.00	6/4/1962			DOMESTIC
<u>66698</u>	WARD RALPH	12N17W27D	NO	WELL61.0030.0018.00	30.00	9/1/1966			DOMESTIC
<u>66694</u>	WARD RALPH S.	12N17W27D	NO	WELL57.00	20.00		5/9/1967		DOMESTIC
<u>181464</u>	DYKSTRA LEONARD	12N17W27DA	NO	WELL55.00	31.00	30.00	3/31/2000		DOMESTIC
<u>66697</u>	HEDGER CLIFFORD	12N17W27DA	NO	WELL55.00	22.50				DOMESTIC

	M. & BETTY J.								IRRIGATION
<u>66696</u>	NORTON DON H. & LUCILLE G.	12N17W27DA	NO	WELL50.00	750.00	1/1/1950	DOMESTIC		
<u>143728</u>	TAYLOR JAMES B. JR.	12N17W27DA	NO	WELL60.0050.00	4.50 75.00	8/4/1994	DOMESTIC		
<u>706164</u>	UNNAMED WELL FROM GWSI	12N17W27DAAB	NO	WELL		1/1/1932	DOMESTIC		
<u>706165</u>	GONSTAD	12N17W27DABA	NO	WELL		1/1/1997	DOMESTIC		
<u>706166</u>	UNNAMED WELL FROM GWSI	12N17W27DABA	NO	WELL		5/13/1952	DOMESTIC		
<u>706167</u>	UNNAMED WELL FROM GWSI	12N17W27DACA	NO	WELL		1/1/1997	DOMESTIC		
<u>706168</u>	UNNAMED WELL FROM GWSI	12N17W27DACA	NO	WELL		1/1/1966	DOMESTIC		
<u>706169</u>	UNNAMED WELL FROM GWSI	12N17W27DACD	NO	WELL		1/1/1997	DOMESTIC		
<u>167743</u>	CLINTON FARMS LORENZO DAVID	12N17W27DAD	NO	WELL60.0057.0028.00	60.00	8/6/1998	IRRIGATION		
<u>706170</u>	UNNAMED WELL FROM GWSI	12N17W27DADC	NO	WELL		1/1/1997	DOMESTIC		
<u>706171</u>	UNNAMED WELL FROM GWSI	12N17W27DADD	NO	WELL		1/1/1997	DOMESTIC		
<u>66699</u>	DRINVILLE CHARLES	12N17W27DB	NO	WELL56.0026.0021.00	50.00	7/29/1966	DOMESTIC		
<u>66700</u>	WARD RALPH S. & JANET L.	12N17W27DD	NO	WELL43.0040.0025.00		5/5/1971	DOMESTIC		
<u>137495</u>	DAVIS ROSANNA & TOBY	12N17W27DDA	NO	WELL45.00	7.50 6.00 25.00	9/19/1993	DOMESTIC		
<u>154066</u>	SHELDON RAY & DOROTHY	12N17W27DDA	NO	WELL39.00	6.00 5.00 50.00	8/30/1995	DOMESTIC		
<u>154068</u>	SHELDON RAY & DOROTHY	12N17W27DDA	NO	WELL41.50	8.00 6.00 50.00	8/30/1995	DOMESTIC		
<u>706173</u>	AILPORT BOBBY	12N17W27DDAB	NO	WELL		1/1/1997	DOMESTIC		
<u>706172</u>	UNNAMED WELL FROM GWSI	12N17W27DDAB	NO	WELL		1/1/1997	DOMESTIC		
<u>706174</u>	AGARD LISA	12N17W27DDAC	NO	WELL		1/1/1997	DOMESTIC		
<u>706175</u>	HAWLEY JUDY	12N17W27DDAC	NO	WELL		1/1/1977	DOMESTIC		
<u>136391</u>	SATHER KEVIN & JOE	12N17W27DDAC	YES	WELL44.00	8.00 7.00 25.00	8/18/1993	DOMESTIC		
<u>706176</u>	SPATZIERATH MARY	12N17W27DDAD	NO	WELL		1/1/1997	DOMESTIC		
<u>167603</u>	AGARD RICK	12N17W27DDD	NO	WELL47.00	9.00 8.00 40.00	4/2/1998	DOMESTIC		
<u>154069</u>	SHELDON RAY & DOROTHY	12N17W27DDD	NO	WELL40.00	8.00 6.50 50.00	9/5/1995	DOMESTIC		
<u>706178</u>	GOVER VERNON	12N17W27DDD	NO	WELL40.00		1/1/1997	DOMESTIC		
<u>706177</u>	UNNAMED WELL	12N17W27DDD	NO	WELL		1/1/1997	DOMESTIC		

<u>706179</u>	FROM GWSI UNNAMED WELL 12N17W27DDDANO WELL	1/1/1997DOMESTIC
<u>706180</u>	FROM GWSI WHEELER NANCY 12N17W27DDDDNO WELL60.00	1/1/1997DOMESTIC

End of Report. **75** record(s) listed.

This report is restricted to site types of **WELL, BOREHOLE, SPRING, and COAL BED METHANE WELL.**

Explanation of Columns: **Td** = Total depth of well in feet below ground

Pwl = Pumping water level in feet below ground

Swl = Static water level in feet above/below ground - Negative values are reported for water levels that are above land surface.

Yield = Yield in gallons per minute

Date = Completion date of well/borehole

Use = Reported use of water

Ver? = Was location verified?

The preceding materials represent the contents of the GWIC databases at the Montana Bureau of Mines and Geology at the time and date of the retrieval. The information is considered unpublished and is subject to correction and review on a daily basis. The Bureau warrants the accurate transmission of the data to the original end user at the time and date of the retrieval. Retransmission of the data to other users is discouraged and the Bureau claims no responsibility if the material is retransmitted.



GWICWEBDATA V9.1.0 1998-2003

[Privacy Policy](#)

Any questions or comments can be e-mailed to [GWIC WebMaster](#)

Page Created 6/5/2003 10:44:06 AM

APPENDIX D

Letter of Concurrence

Source Water Protection Section
Department of Environmental Quality
POB 200901
Helena, MT 59602-0901

RE: Source Water Delineation & Assessment Report

To Whom It May Concern:

The Clinton LDS Church public water system has reviewed the source water delineation and assessment report (SWDAR) dated June 2003. We concur that the delineation component appears to describe current conditions at the water system based on reasonably available information and that the susceptibility assessment identifies the origins of regulated contaminants to the extent practical.

We understand that the Clinton LDS Church PWS SWDAR will be made available to the public by DEQ as described in the Montana Source Water Protection Program. Also, we will make a copy of the report available for the public to view during our normal office hours and describe the results in subsequent releases of our consumer confidence report.

Signed,

Signature

Title and Date

Figures