

SOURCE WATER DELINEATION AND ASSESSMENT REPORT

**Wilderness Treatment Center
Public Water Supply
PWSID # MT0002952
This report has been modified for publication**

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INTRODUCTION

This Delineation and Assessment Report was prepared by Jeffrey Frank Herrick, a hydrogeologist with the Source Water Protection Program of the Montana Department of Environmental Quality (DEQ). The Wilderness Treatment Center public water supply (PWS) is located along the Little Bitterroot River, about 0.5 miles south of Montana Highway 2 on Hubbart Dam Road, about 4 miles east of McGregor Lake, and approximately 5 miles southwest of Marion (see Figures 1-4 in Appendix A). The DEQ PWS identification number, operator name, and operator number for the Wilderness Treatment Center PWS appear on the title page of this report.

Purpose

This report is intended to meet the technical requirements for the completion of a source water delineation and assessment for the Wilderness Treatment Center PWS as required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 (P.L. 104-182). The Montana Source Water Protection Program is intended to be a practical and cost-effective approach to the protection of public drinking water supplies from contamination. The primary purpose of this source water delineation and assessment report is to provide information to assist the Wilderness Treatment Center PWS operators and owners in the identification of potential contaminant sources near the PWS water intake and to assess the need for source water protection planning to protect the Wilderness Treatment Center drinking water source.

Delineation and assessment constitute major components of the Montana Source Water Protection Program. Delineation entails mapping the boundaries of source water protection areas, which encompass ground water and/or surface waters contributing to public water supply sources. Assessment involves identifying locations or regions within source water protection areas where contaminants may be generated, stored, transported, or disposed, and determining the relative susceptibility of drinking water to contamination from these sources.

Limitations

This report was prepared to assess threats to the Wilderness Treatment Center public water supply, and is based on published data and information obtained from local residents familiar with the community. The terms “drinking water supply” and “drinking water source” refer specifically to the sources of the public water supplies, and not any other public or private water supply. Also, not all potential or existing sources of groundwater or surface-water contamination in the area of the McGregor Lake are identified. Only potential sources of contamination in areas that contribute water to the identified drinking water sources are considered. A significant limitation exists in that some businesses/facilities in the area (that may be potential contaminant sources) may not have been identified. Additionally, little factual information is known about groundwater flow in the vicinity of the center and the extent of groundwater / surface water interactions in the area.

Considerable background information and data specific to this PWS were compiled to form the basis of this source water delineation and assessment report. This information is typically in the form of data summaries, evaluations and reports, and regulatory correspondence. These have been included in the report as

appendices. These appendices are maintained and are available at the DEQ Source Water Protection Program file library.

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

CHAPTER 1

BACKGROUND

The Surrounding Area

The Wilderness Treatment Center is a residential treatment program for drug and alcohol abusing adolescents and young adults. It is based on a 4,000 acre working cattle ranch in the Rocky Mountains, specifically within the Salish Mountains along the Little Bitterroot River, and east of Kalispell, Montana. The main facility is about 0.5 miles south of Highway 2 on Hubbart Dam Road, about 4 miles east of McGregor Lake, and approximately 5 miles southwest of Marion (see Figures 1-4). U.S. Highway 2 connects McGregor Lake and Libby to the west, and Marion and Kalispell to the east. The U.S. Census Bureau estimates the 2000 population of Flathead County at 95,802 people; very few of these people reside in the area of McGregor Lake or along Highway 2. Although the 2000 census doesn't list Marion, it is believed that somewhat fewer than 200 people live in the vicinity.

Over the last century timber harvesting has contributed significantly to the economy of the area around McGregor Lake and Marion. In recent years, the economic mainstay of tourism and more recently, real estate development, have sustained the local economy. Within the area, residents obtain their drinking water from private wells or surface water intakes (in streams or local lakes). This is the case of the Wilderness Treatment Center obtains its water from a pair of shallow wells that are located at the facility as seen on Figures 5 and 6. There is no central sewer system for the residents in the area or for the Wilderness Treatment Center facilities. All residents in the area and the center utilize on-site septic systems for waste disposal.

Geographic Setting

McGregor Lake is located just west of a major drainage divide within the Salish Mountains of northwestern Montana. The elevation of McGregor Lake itself is approximately 3,892 feet above mean sea level (MSL) and the lake drains to the west via McGregor Creek. McGregor Creek is a tributary of the Thompson River, which drains south to the Clark Fork River and converges with it near Thompson Falls. Little Bitterroot Lake is in the center of a watershed and receives water mostly from Herrig Creek. This lake drains to the south through the Little Bitterroot River. Sickler Creek is a tributary that drains into the Little Bitterroot River as it approaches Highway 2. The Little Bitterroot River flows through the valley occupied by the Wilderness Treatment Center, which is at an elevation of around 3,860-3,870 feet above MSL. The river flows south from that point toward Hubbart Reservoir. South of the reservoir the Little Bitterroot River continues until its confluence with the Flathead River in the Mission Valley just west of Charlo. The glaciated topography in the vicinity of McGregor Lake and Marion exhibits relatively varied relief typical heavily glaciated U-shaped valleys. Present are sculpted mountains, extensive glacial till deposition on hills and within all valleys, glacial kettles (pothole lakes) and kame terraces, extensive glacial fluvial outwash materials, glacial lakes trapped behind terminal moraines, lateral moraines along valley margins, and common recessional moraines. Some of this topography is seen on the topographic maps of Figures 3 and 4 in Appendix A.

Geology & Hydrology

The following is primarily drawn from Kendy and Tresch (1996), Alt and Hyndman (1986), and LaFave, Smith, and Patton (2004). A geologic map is provided on Figure 7 in Appendix A. The McGregor Creek drainage (inclusive of the McGregor Lake area) is located in the Salish Mountains of northwestern Montana

and is within a east-west trending intermontane stream valley. It drains south to the Thompson River, which reaches the Clark Fork River near Thompson Falls. The Little Bitterroot River flows south out of Little Bitterroot Lake and interconnects a series of small valleys before it flows further south toward the Flathead Indian Reservation and the Little Bitterroot Valley west of the Flathead River valley / Mission Valley.

Metasedimentary rocks of the Belt Supergroup surround the area, comprising a majority of the Salish Mountains. These rocks include argillite, siltite, quartzite, limestone, and dolomite Precambrian age. No Tertiary sediments are present in the vicinity, but are present south of the area along the Little Bitterroot River Valley. Continental and local mountain glacial activity have heavily sculpted and influenced this region. Four major glacial advances occurred in Montana during the Pleistocene Epoch (Two million to 10,000 years ago) (Alden, 1953). Ice covered the northern third of the state during the maximum extent of each glacial advance. The Rocky Mountain Trench was a primary avenue for the repeated southward advance and retreat of the Flathead Lobe of the Cordilleran Ice Sheet. The Rocky Mountain Trench runs north-northwest from Saint Ignatius through Eureka and into Canada. A splay of the Flathead Lobe turned west/southwest and repeatedly covered this area with moving ice. It appears that these glacial episodes are recorded in the Marion / McGregor Lake area and they deposited Pleistocene age glacial till throughout the area basins. The glacial till spread throughout the region is composed of heterogeneous, poorly sorted sand, gravel, pebbles, cobbles, and boulders in a sandy to clayey matrix. Glacial till of unknown thickness covers the basin floors with a significantly thinner mantle along the sides of the valley or higher on the ridges. Distinctive U-shaped glacial valleys are common, though many are backfilled with till and glacial outwash. As glacial ice melted or the glaciers retreated, streams and rivers carried large volumes of reworked glacial debris, which settled out of suspension as unconsolidated, moderately sorted, glacial-outwash deposits of sand, gravel, pebbles, and cobbles. These deposits are collectively called Quaternary Alluvium in this area. Glacial outwash can be found on top of or buried beneath glacial till. Some other features of the extensive and repeated glaciations of the area are the aligned ridges of sediment and scoured out lake basins, polished bedrock outcrops, and the isolated cirques and arêtes found higher in the mountains. Modern streams have continued to erode and transport any remaining glacial material. Examination of the well logs for wells located around and north of the Wilderness Treatment Center do not tell a clear story about the shape of the bedrock trough beneath the glacial till filled valley, but the thickness of the till appears to range from a few to several hundred feet thick and is probably thickest near the center of the valleys.

Groundwater is present within the fractures of the surrounding bedrock of the Belt Supergroup Ravalli Group and Wallace formations. This groundwater is contained within and moves through the fractures, because the primary porosity of the rock is negligible. Recharge to the fractured bedrock aquifer in the mountains is by direct infiltration from precipitation and from discharge from lakes and streams. Groundwater movement from the mountains is primarily toward the larger stream valleys, then subparallel with the streams as the water moves toward the larger stream system (e.g., the Little Bitterroot River). Water-bearing sedimentary layers (often buried paleo-stream channels) can be contained within or buried beneath the mantle of fine grained (and less permeable) glacial till. These water-bearing units may or may not be laterally continuous and not only are hard to find during well drilling, but they may contain varying amounts of water. A water-bearing unit that is contained within the finer grained glacial till may be considered to be confined or unconfined. It is considered confined if the water is under pressure and the water level in a well tapping that water-bearing unit rises up in the well casing to a level that is above the top of the water-bearing unit. If the pressure is sufficient, the water level in the well casing can be above the ground surface and the well will flow without pumping. That particular well is considered to be an artesian

well. Groundwater beneath the Wilderness Treatment Center facility appears to be moving through the valley from north to south and is present within water-bearing units within or beneath the glacial outwash or glacial till materials seen at the surface. At the Wilderness Treatment Center, the water levels in the wells is higher than the top of the water-bearing sediments, thus the water-bearing units comprise a confined aquifer. Recharge to this aquifer occurs up-valley to the west (near McGregor Lake) and north along the Little Bitterroot Valley. The groundwater reaches the confined sediments beneath the center through discharge of water from surface streams and transferring of water from the surrounding fractured bedrock. A geologic map for the area is presented on Figure 7 in Appendix A. The geologic mapped units seen on Figure 7 are taken from the Montana Bureau of Mines and Geology, Geologic Map of Montana completed in 1955. At the time, the field geologists did not differentiate the various glacial or fluvio-glacial sedimentary units scattered along the stream and lake valleys of the area. As such, the glacial sediments (Qgl) and the alluvial materials (Qal) might be, and probably are, interchangeable depending on location. As such it isn't clear to this author if the valley surrounding the Wilderness Treatment Center is actually topped off with glacial till or reworked glacial outwash. Either way, the material appears to act as a localized confining unit.

Climate

The climate in the vicinity of McGregor Lake and Marion is typical of mid-elevation intermountain basins of the Northern Rocky Mountains west of the Continental Divide. Based on Western Regional Climatic Center data for the period of record at the nearest weather station, annual precipitation averages 18.78 inches. Monthly average precipitation ranges from 1.06 inches in July to 2.26 inches in January. Early summer thunderstorms and winter snows provide a majority of the precipitation in the area. The annual mean snowfall in area is 90.5 inches. A summary of the available climatic data for the area is presented on Table 1 below.

Table 1. Climatic Summary
Pleasant Valley, Montana (246576)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	30.0	38.7	43.3	52.9	63.2	69.7	79.4	78.7	68.8	56.1	40.9	32.5	54.5
Average Min. Temperature (F)	9.2	14.7	17.2	26.4	32.8	38.9	40.2	38.6	32.9	27.5	21.0	14.6	26.2
Average Total Precipitation (in.)	2.26	1.56	1.22	1.21	1.51	1.99	1.06	1.07	1.27	1.63	2.08	1.91	18.78
Average Total Snowfall (in.)	24.7	14.1	12.1	3.7	0.8	0.2	0.0	0.0	0.2	2.8	11.5	20.4	90.5
Average Snow Depth (in.)	11	12	8	1	0	0	0	0	0	0	1	5	3

Source: Western Regional Climate Center, wrcc@dri.edu

The Public Water Supply

The Wilderness Treatment Center PWS is classified as a transient non-community system under the Federal Safe Drinking Water Act (as administered by the Montana DEQ Public Water Supply Section) because the system serves more than 25 persons, but less than 25 year-round residents, through more than 15 service connections. The PWS services approximately 35 transients and 7 non-transients via 16 active service connections. A pair of relatively good air photos for the facility are found on Figures 5 and 6 found in Appendix A.

The Wilderness Treatment Center source water is obtained through 2 production wells located in within the boundaries of their institution. These wells withdraw water from a shallow, but confined aquifer. The wells are located as depicted on Figures 5 and 6. Diagrams for the layout of the PWS facilities are found in the Sanitary Survey, which is provided in Appendix C. It appears that Well #2 is active, but very rarely used. It is best described as a backup well for emergency use only. Water is treated by pellet chlorination to precipitate iron (not for disinfection), followed by filtration, followed by ion exchange softening. Pressure is provided to water from Well #1 by 2, Wel-X-Trol 302 captive air tanks. Pressure is provided to water from Well #2 (the emergency-use-only well) by 1, Wel-X-Trol 302 captive air tank. Table 2 below lists the facilities of the Wilderness Treatment Center PWS according to the DEQ PWS records.

Table 2. List of Sources & Facilities
Wilderness Treatment Center PWS

Facility	PWS Facility ID per the DEQ PWS Section Database	Location	Description	Notes
Well 1 1948	WL002, active	West side of Main Office building	This 63-foot deep well is the main water supply well for the entire facility.	
Well 2 1987 backup	WL003, active	East of the Main Office building and on the east side of the access road / driveway	This 38 foot deep well is considered the backup well and hasn't been used for considerable time.	This well provided poor water quality and yield, so was not maintained as the main production well.
Pressure Control Assembly	PC001 for Well 1, active PC002 for Well 2, inactive	Located in utility room on the west side of Main Office Located in basement of East Classroom building	2, Well-X-Trol 302 Tanks for Well 1 2, Well-X-Trol 302 Tank for Well 1	Well 1 tanks are active. Well 2 tanks are inactive.
Treatment Plant	TP001, for Well 1, active With EP502 TP002, for Well 2, inactive With EP503	Pellet Chlorinator, followed by a filter, and an ion exchange softener Treatment for water from Well 2 is not performed at this time	Treatment systems are located with the pressure tanks	
Distribution System	DS001 With SP001		The lines are made up of small diameter galvanized steel, copper, and plastic pipe.	It is described as adequately serving the domestic needs of the facility, but does not provide fire control capacity.

The Wilderness Treatment Center PWS obtains its drinking water from a confined aquifer. As a result and from the perspective of hydrogeology, the source water is classified as having a low sensitivity to contamination, in accordance with Montana Source Water Protection Program aquifer/source water sensitivity criteria (1999). These criteria are discussed in more detail in the next chapter.

Water Quality

Coliform bacteria have not been detected and confirmed in water samples from the Wilderness Treatment Center PWS system except once in 2001. Repeat sampling did not confirm their presence. Nitrate and nitrite collected from the system have always been below 0.05 or 0.06 mg/L. These are well below the federal maximum contaminant level (MCL) of 10 mg/L. A summary of the water system as recorded in DEQ Files along with water monitoring results are included with the DEQ PWS database output which is contained in Appendix B of this report.

CHAPTER 2 DELINEATION

Delineation Process

The source water protection regions are identified in this chapter. They are the delineated land areas that contribute source water to the wells at Wilderness Treatment Center PWS. Three management or source water protection regions are usually identified. These three regions are the Control Zone, Inventory Region, and Recharge Region. The Control Zone, also known as the exclusion zone, is an area at least 100-foot radius around the PWS wellhead, spring collection box, or surface water intake. Human activity in this area can have an immediate impact on water quality by introducing contaminants into the area directly above a well screen or other intake structure. As such, management of this Control Zone is critical to protect a PWS. For groundwater sources the Inventory Region usually represents the zone of contribution of the well, which can approximate a three-year groundwater time-of-travel distance or a 1-mile radius around a wellhead. The Inventory Region comprising a 1-mile radius circle around a well is often a conservative value that is used either for convenience or when insufficient geologic or hydrogeologic information is available about an area or details are lacking on the construction of a production well. In certain circumstances where a PWS well taps into an aquifer that has been characterized as being confined, the Inventory Region can be limited to an approximate 1,000-foot radius around the wellheads, and the inventory of potential contaminant sources and the susceptibility analysis is only completed for those sources within 1,000-feet of the well. Activities or contaminant releases within the Inventory Region have the potential to reach a PWS well in a period of a few years. The Recharge Region represents the entire portion of the aquifer or an area that contributes water to the local aquifer and over time supplies water to a well. This extended region of groundwater recharge is often, but not always, inclusive of the limits of a watershed. At times an entire watershed is too large to be realistically manageable by a PWS or community, so a subsection of that watershed is delineated as the Recharge Region. Long-term water quality at a PWS can be affected by contaminant releases or certain land use activities in the Recharge Region.

Groundwater is an important resource in the valleys of the Salish Mountains, and it provides domestic water for most residents. Quaternary deposits comprise the major aquifers in the valleys along the Little Bitterroot River. Wells found in the area vary in depth from 44 to 400 feet deep, with little consistency. Lithologic logs for other wells located in the area surrounding the school are contained in Appendices D along with a figure depicting their locations. The wells at Wilderness Treatment Center are 63 and 38 feet deep, and appear to be shallower than most other area wells. The school wells withdraw water from water-bearing units within the Pleistocene glacial till or outwash. Because of shallow water levels (about 2 feet below ground surface) the wells are almost artesian in that they almost flow without pumping.

Based on the above hydrogeologic conditions, the Wilderness Treatment Center PWS wells are characterized as having low source water sensitivity to contamination. Table 3 below details the determination of the sensibility rating; highlighting shows classifications that may pertain to the wells at the center.

Table 3. Source Water (Aquifer) Sensitivity

High Source Water Sensitivity	Moderate Source Water Sensitivity	Low Source Water Sensitivity
<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 Aquifers

Delineation Results

A 100-foot radius Control Zone is delineated around the wellheads at the Wilderness Treatment Center.

A 1,000-foot fixed radius Inventory Region was delineated around the wells, and the resulting Inventory Region is shown in Figure 8. This Inventory Region includes a portion of the Little Bitterroot River and a stretch of Hubbard Dam Road.

No Recharge Region was delineated or mapped for Wilderness Treatment Center. Surrounding topography as well as a lack of potential contaminant sources made delineation of this protection region unnecessary. Those responsible for the operation and maintenance of the PWS facilities are, of course, encouraged to remain informed of and involved in activities in areas surrounding the PWS well in order to ensure its protection and the protection of public health.

Limiting Factors

Groundwater behavior in general terms is reasonably well understood in the valley surrounding the Wilderness Treatment Center, but is not easily predictable beneath specific locations and especially around a certain well that is drawing water from a specific depth. Groundwater flow direction fluctuates seasonally and from year to year. Here, several conservative assumptions were made in the delineation of the source water protection areas and the development of this report. Also, reliance on some basic hydrogeologic principals to define the aquifer boundaries and groundwater movement was employed. The SWDAR, however, can and should be revised if more data becomes available that alters the assumed groundwater flow direction(s) or confinement.

CHAPTER 3 INVENTORY

General Discussion of Inventory

An inventory of potential sources of contamination was conducted for the Wilderness Treatment Center PWS within the Control Zone and Inventory Region. Potential sources of all primary drinking water contaminants and Cryptosporidium were identified, however, only significant potential contaminant sources were selected for detailed inventory. The most significant potential contaminants in the Wilderness Treatment Center PWS's Inventory Region are nitrates and pathogens from the onsite septic systems. The inventory for the Wilderness Treatment Center PWS focuses on all activities in the Control Zone, and on certain sites or land use activities in the Inventory Region.

Inventory Method

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

Step 1: Land cover is identified from the National Land Cover Dataset compiled by the U.S. Geological Survey and U.S. Environmental Protection Agency (U.S.G.S., 2000). Land cover types in this dataset were mapped from satellite imagery at 30-meter resolution using a variety of supporting information. Alternately, an examination was made of agricultural land use as described by the county tax records, which is based on agricultural land appraisal for tax purposes. This is useful as it highlights irrigated, grazing, and continuously cropped agricultural land. Additionally, agricultural land uses were identified based on data provided by Flathead County.

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

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

Step 4: Major road and rail transportation routes were identified.

Step 5. All significant potential contaminant sources were identified in the inventory region and land uses and facilities that generate, store, transport, or dispose large quantities of hazardous materials were identified within the recharge region.

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

- Large quantity hazardous waste generators
- Landfills
- Hazardous waste contaminated sites
- Underground storage tanks
- Major roads or rail transportation routes

- Cultivated cropland
- Animal feeding operations
- Wastewater lagoons or spray irrigation
- Septic systems
- Sewered residential areas
- Storm sewer outflows
- Floor drains, sumps, or dry wells, and
- Abandoned or active mines

Inventory Results

Control Zone

The wellheads for both of the Wilderness Treatment Center wells are located among the campus buildings. The density of these buildings is not high, but at the time of writing, the author had no information on the location of sewer lines, septic tanks, or septic drainfields. The Control Zones around each of the wells probably include both the Main Office and East Classroom buildings. The 2001 Sanitary Survey (found in Appendix C) did not mention any activities or significant potential contaminant sources within 100 feet of either of the wellheads.

Inventory Region

The Inventory Region for the wells is depicted on Figure 8. The region encompasses most of the Wilderness Treatment Center campus, the access driveway, a stretch of the Little Bitterroot River, and some portion of Hubbart Dam Road. The 2001 Sanitary Survey did not indicate the presence of any activities or potential contaminant sources within or adjacent to the Control Zone (that is within 100 feet of the wellhead) or around the wellheads. Figure 6 shows an air photo of the area and Figure 8 identifies select agricultural land uses within the Inventory Region boundary. There is little to note. The inventory process did not identify any potential contaminant sources within the Inventory Region. But an examination of the air photo for the site suggests a couple of things to the author. There is no wastewater treatment facility that shows up, so it is assumed that there are several to many large capacity septic collection and treatment systems servicing the cabins, offices, classes, shops, or other buildings on campus. It is assumed that these large capacity septic systems are located in the area surrounding the wells. This facility is located on and services a large acreage cattle ranch. As such, the fenced fields seen on the photo to the south, west, and north of the campus are undoubtedly meant to hold cattle. Although temporary, these concentrations of animals tend to accumulate animal wastes. The large capacity septic systems concentrated in the area around the wells are considered significant potential contaminant sources. The animal pastures are a relatively temporary land use and probably shouldn't be considered a significant potential contaminant source. There is land identified in the county tax records (for predominant agricultural land use) as grazing land, which is located north of the school along the west side of the river. There is also private forest/timber land located east of the school campus. Neither of these land uses is considered a significant potential contaminant source. A few underground fuel storage tanks did show up during the inventory, but all were located outside of the region. A list of these tanks is provided in Appendix D.

Inventory Update

To make this SWDAR a useful document in the years to come, the owners, managers, or the water system operator(s) for the Wilderness Treatment Center public water supply should update the inventory for their records every year. Changes in land uses or the presence of new potential contaminant sources should be

noted and additions made as needed. The complete inventory should be submitted to DEQ at least every 5 years to ensure that this report/plan stays current in the public record.

Inventory Limitations

The accuracy of the potential contaminant source inventory is limited in several respects. The inventory is based on data that is readily available through state documents, published maps and reports, GIS data, and discussions with people that are familiar with the area. Documentation may not be readily available on some potential sources. As a result, all potential contaminant sources may not have been identified or recognized as being significant potential contaminant sources. Little or no information is available concerning the facilities at the school; septic system status and location; or any animal management activities at the school. The author of this SWDAR is depending on local knowledge of the PWS owner and/or operator for site-specific knowledge.

CHAPTER 4 SUSCEPTIBILITY ASSESSMENT

Introduction

The Susceptibility of the PWS production wells to various types of contamination is assessed in the following paragraphs. The proximity of a potential contaminant source to a spring or well intake, potential contaminant migration pathways, or the density of potential non-point contaminant sources determines the threat of contamination, referred to here as hazard.

Hazard Determination

Table 4 below describes the criteria to determine hazard within the Inventory Region as it was delineated in this SWDAR (the area within 1,000 feet of the wells). Note that this table is specific to PWSs that draw their water from confined aquifers. The determination of hazard is somewhat different for other types of water sources. Hazard and the existence of barriers to contamination together determine susceptibility, which is described in Table 11. For the situation involving the Wilderness Treatment Center, its deep production wells draw water from what has been characterized as a shallow, but confined aquifer. The well log for Well #1 does not indicate that the casing was grouted to seal the annulus between the outside of the well casing and the confining formation through which it was installed. The well log Well #2 indicates that it was adequately grouted between the casing and the confining formation to a depth of 21 feet below ground surface with neat cement. These logs are provided in Appendix C. Well logs for other area wells located in close proximity to the PWS wells are found in Appendix D. Since both of the production wells for this PWS are not necessarily sealed into the confining unit, any point source within the Inventory Region is considered to have a high hazard. Refer to the 2nd column from the left on Table 4 below. No community sewer mains or irrigated cropland is present, so these are not evaluated for their hazard.

Table 4. Hazard of Potential Contaminant Sources

For wells drawing water from confined aquifers

Potential Contaminate Sources within the Inventory Region	The PWS well is not sealed through the confining layer	Other wells in the Inventory Region are not sealed through the confining layer	All wells in the Inventory Region are sealed through the confining layer
Point Sources	High Hazard	Moderate Hazard	Low Hazard
Septic System Density (# per square mile)	High: > 300 Moderate: 50 to 300 Low: < 50	Moderate: > 300 Low: < 300	Low Hazard
Municipal or Community Sanitary Sewer Mains (% land are)	High: > 50 Moderate: 20 to 50 Low: < 20	Moderate: > 50 Low: < 50	Low Hazard
Cropland (% land use)	High: > 50 Moderate: 20 to 50 Low: < 20	Moderate: > 50 Low: < 50	Low Hazard

Notes:

- Highlighted areas are those relevant to this PWS’s Inventory Region. The PWS Well #2 was obviously sealed into the confining units. Well #1 has no records available on the seal. Other area wells are outside of the region. So the 2nd column from the left is used to determine hazard for potential contaminant sources affecting this PWS.

Susceptibility Determination

Susceptibility is determined by considering the hazard rating for each potential contaminant source and the existence of barriers that decrease the likelihood that contaminated water will flow to the PWS well/intake. First, hazard is rated by the proximity of a potential contaminant source to the PWS well and the quality of sealing through a confining unit above the well intake. Susceptibility ratings are then determined individually for each significant potential contaminant source and/or contaminant based on Table 5. These susceptibility ratings are the evaluation of the vulnerability of well to the potential contaminant sources and are presented on Table 6.

Table 5. 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

Discussion of Susceptibility

A summary of the susceptibility assessment for the Wilderness Treatment Center PWS well is located in Table 6. Below is a brief discussion of the susceptibility assessment.

Table 6. Susceptibility Assessment

Wilderness Treatment Center PWS – Inventory Region

Source	Contaminants	Hazard	Hazard Rating	Barriers	Susceptibility	Management
Several large capacity septic systems or a concentration of smaller septic systems (lines, tanks, and drainfields)	Nitrate, pathogens, other contaminants dumped down drains	Chronic leakage of effluent from poorly installed or maintained systems, improper disposal of other chemicals to floor drains or down sink drains	High Hazard	Depth of well intake below water level in well (>50 feet in Well 1).	High Susceptibility	Promotion of engineered and advanced septic treatment systems, public education on proper waste disposal, recycling efforts / program for liquid waste, remove floor drains in shop(s), consider the development of a centralized or community sewer collection and treatment system

Note: If the PWS Well #1 were adequately sealed into the confining unit, the initial hazard assigned would be Low. With a barrier in place between the potential contaminant source and the well intake, the susceptibility of the well would be Low. If additional barriers were in place, the susceptibility would be Very low.

Septic Systems

In one form or another, septic systems are the greatest potential contaminant source that is prevalent within the Inventory Region of this PWS. The septic systems for the facilities on the campus are in close proximity to the wells. Some of these septic systems service 1 or 2 of the cabins; others may serve more. The larger service building such as the offices or classrooms almost certainly use large capacity septic systems. A septic system that services more than 20 persons/day is considered a large capacity septic system. If these septic systems become overfull or if they are old and cracked, or if the lines leak, then raw septic effluent can rapidly escape the vaults and impact groundwater. The hazard posed by the large

capacity and smaller septic systems servicing the center is high (per Table 4 above). The depth of the well intake for Well #1 is 50 feet below the static water level (which is within 2 feet of the ground surface). Since this is the only well that is currently used, this separation between the water level and the intake is considered a barrier. Other barriers were not identified at the time of writing this report. Therefore with 1 barrier between the potential contaminant sources and the intake for the PWS well, the Wilderness Treatment Center's production well is considered to have a high susceptibility to nitrate and pathogens from any or all of these septic systems. Suggested management tools that can be used to further reduce the potential impacts from septic waste on the aquifer within the Inventory Region include:

- Promotion of engineered and advanced septic treatment systems. This is applicable to any systems that are newly installed or due for major repair.
- Education efforts concerning the proper handling and disposal of household and shop chemicals. This is applicable to the cabins, offices, shop(s), classrooms, or other buildings. This would include training for staff and the placement of posters or notices at all sinks and floor drains that advise personnel about proper waste handling and disposal.
- Develop a solids and liquid waste recycling program for the facility. This may include the development of a dry shop.
- Remove / seal up all floor drains in mechanical and shop areas. This is to reduce the dumping of liquid waste down these drains.
- Consider the development of a centralized sewer system that collects liquid waste from all buildings and transports it to a downgradient location where waste treatment occurs. This sewage treatment could be in the form of septic tanks and drainfields or facultative sewage treatment lagoons.

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APPENDICES
Available Upon Request

Appendix A

Figure 1. Northwest Montana

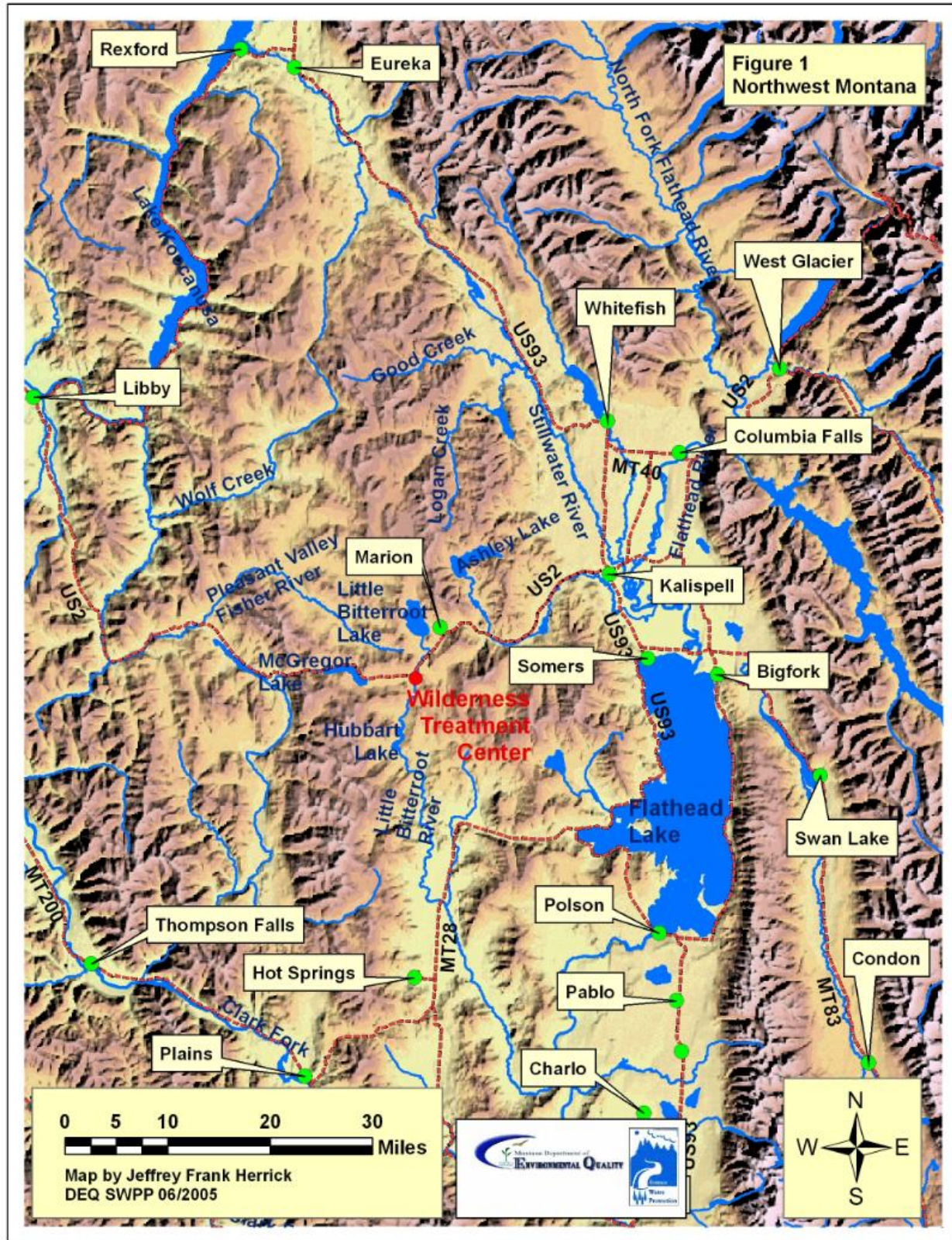


Figure 2. Marion and Vicinity

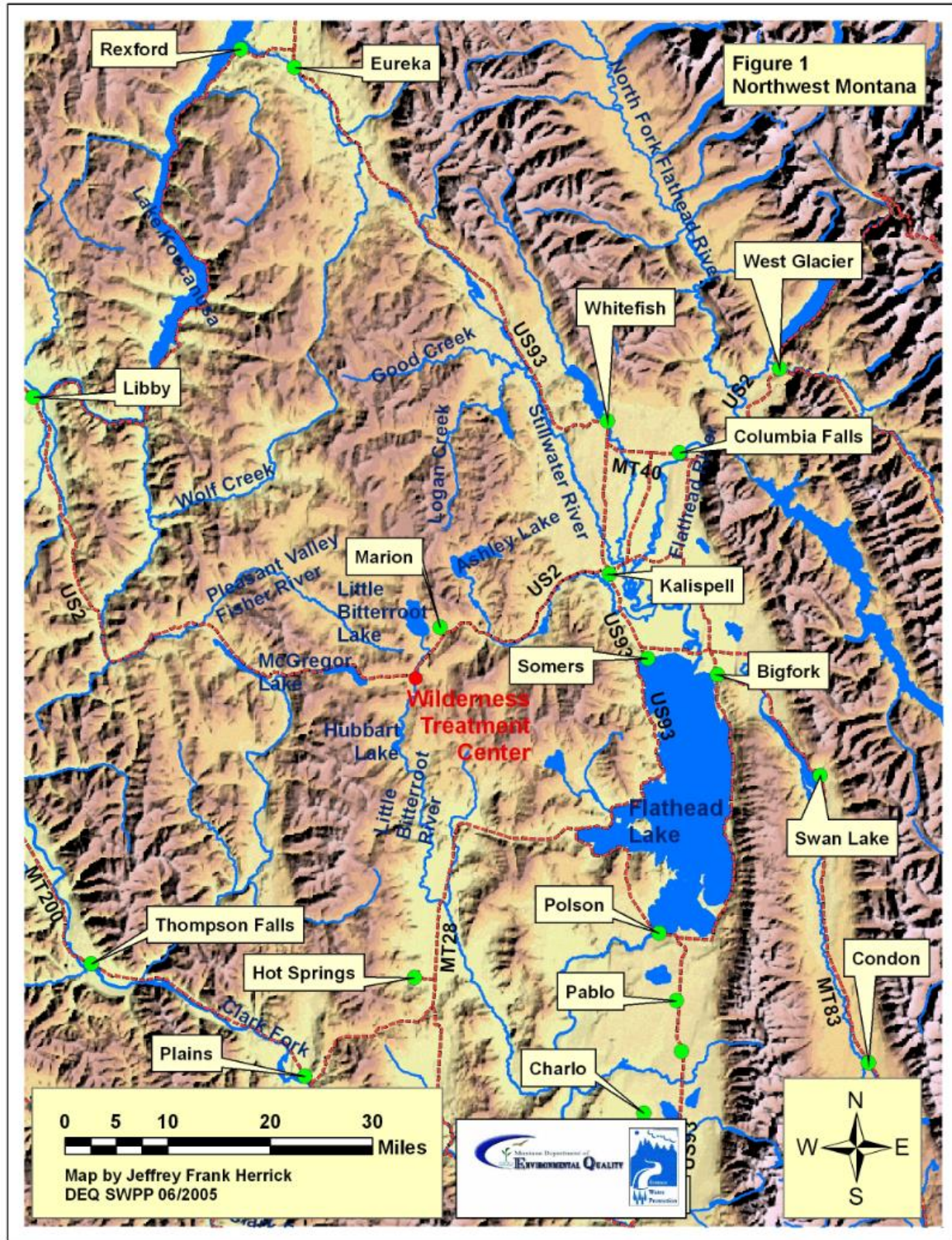


Figure 3. Area Map

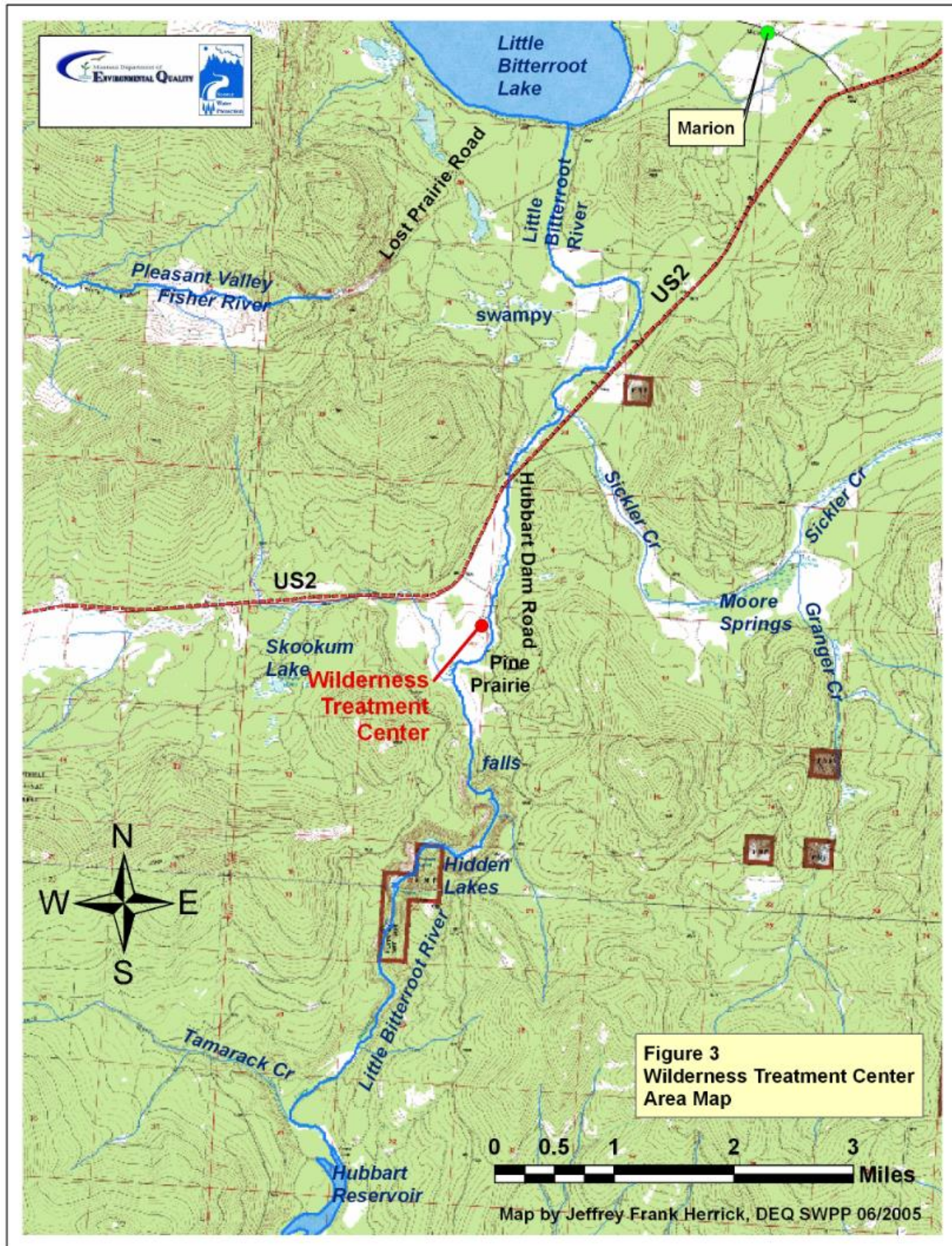


Figure 4. Topographic Map

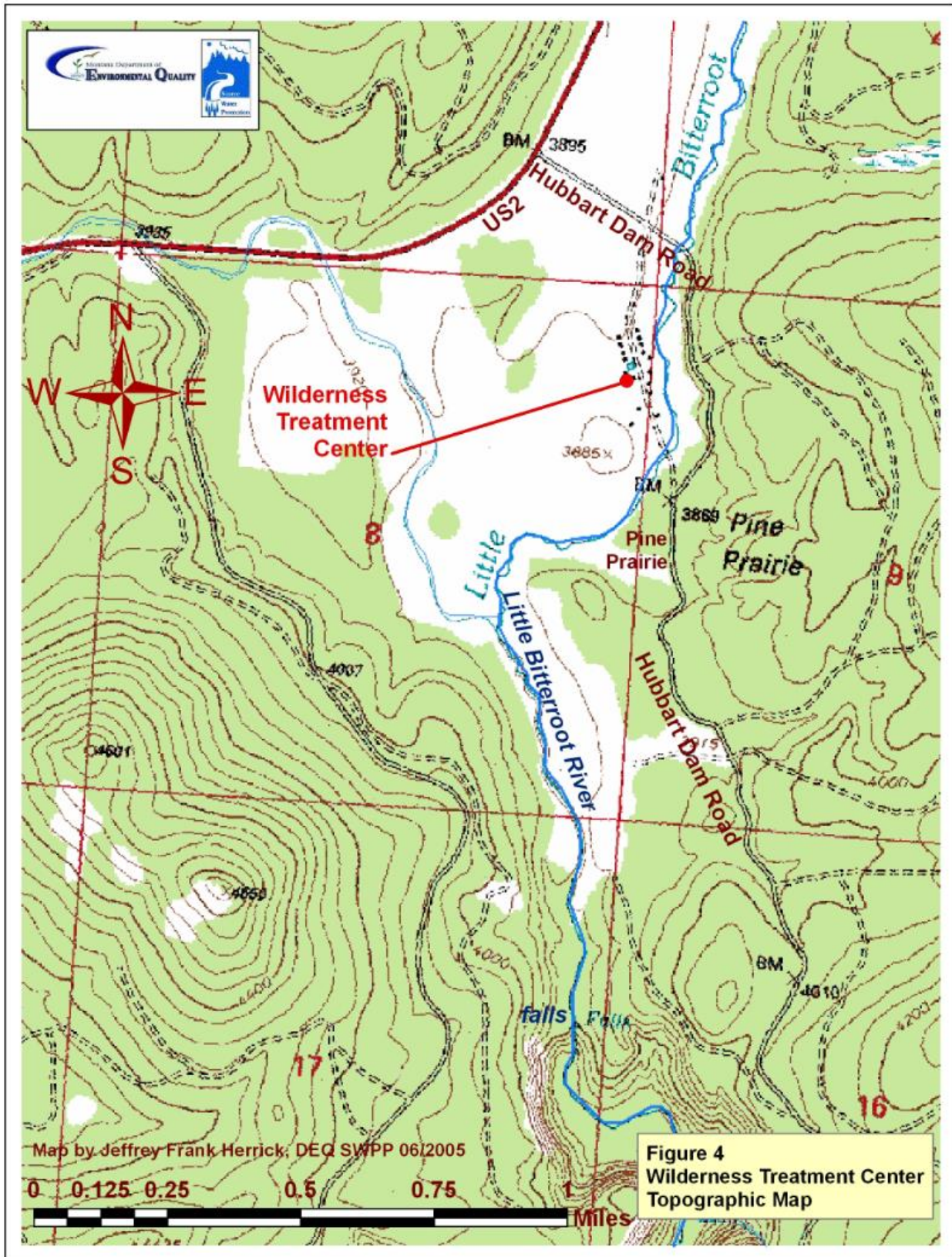


Figure 5. Air Photo

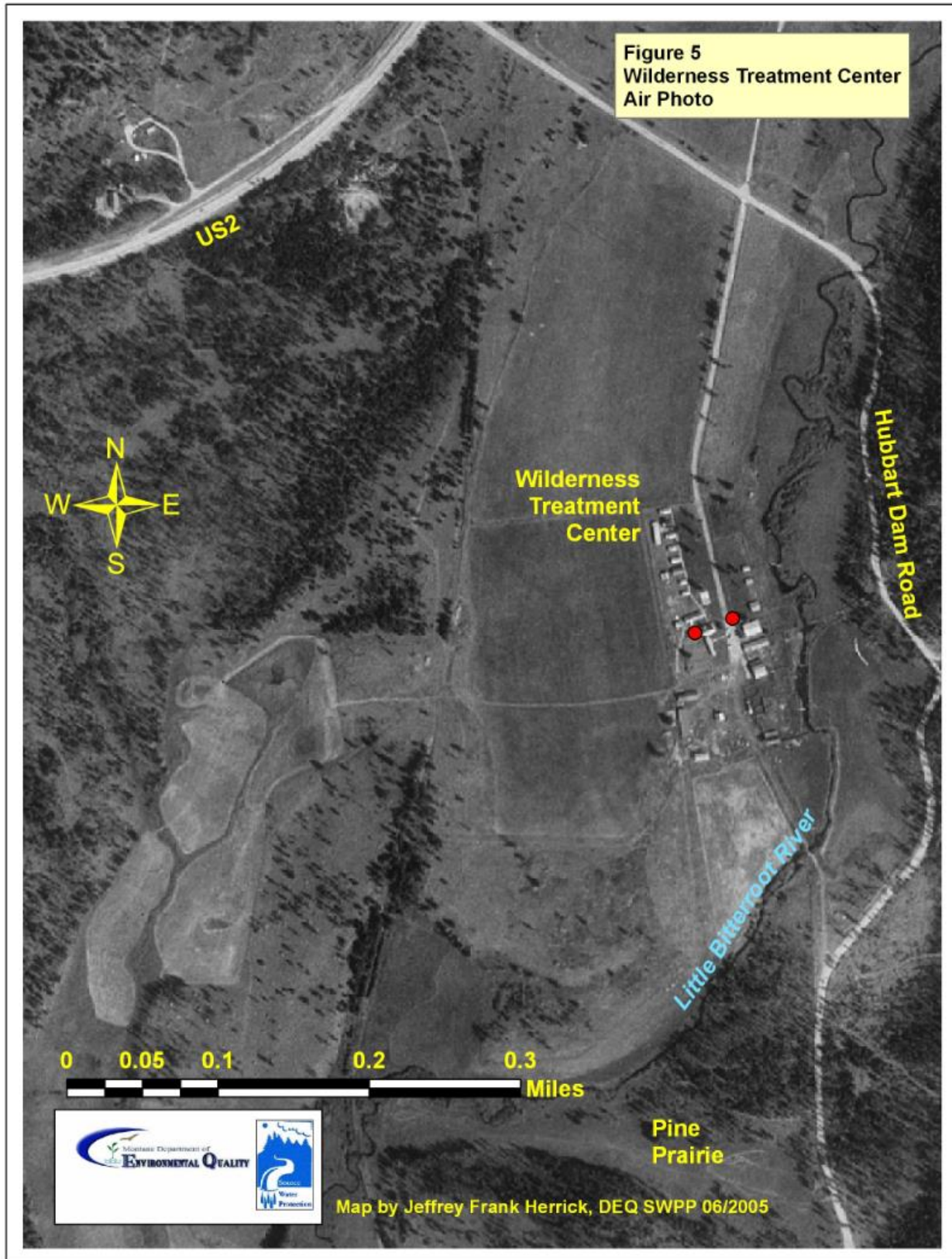


Figure 6. Wilderness Treatment Center, Facilities

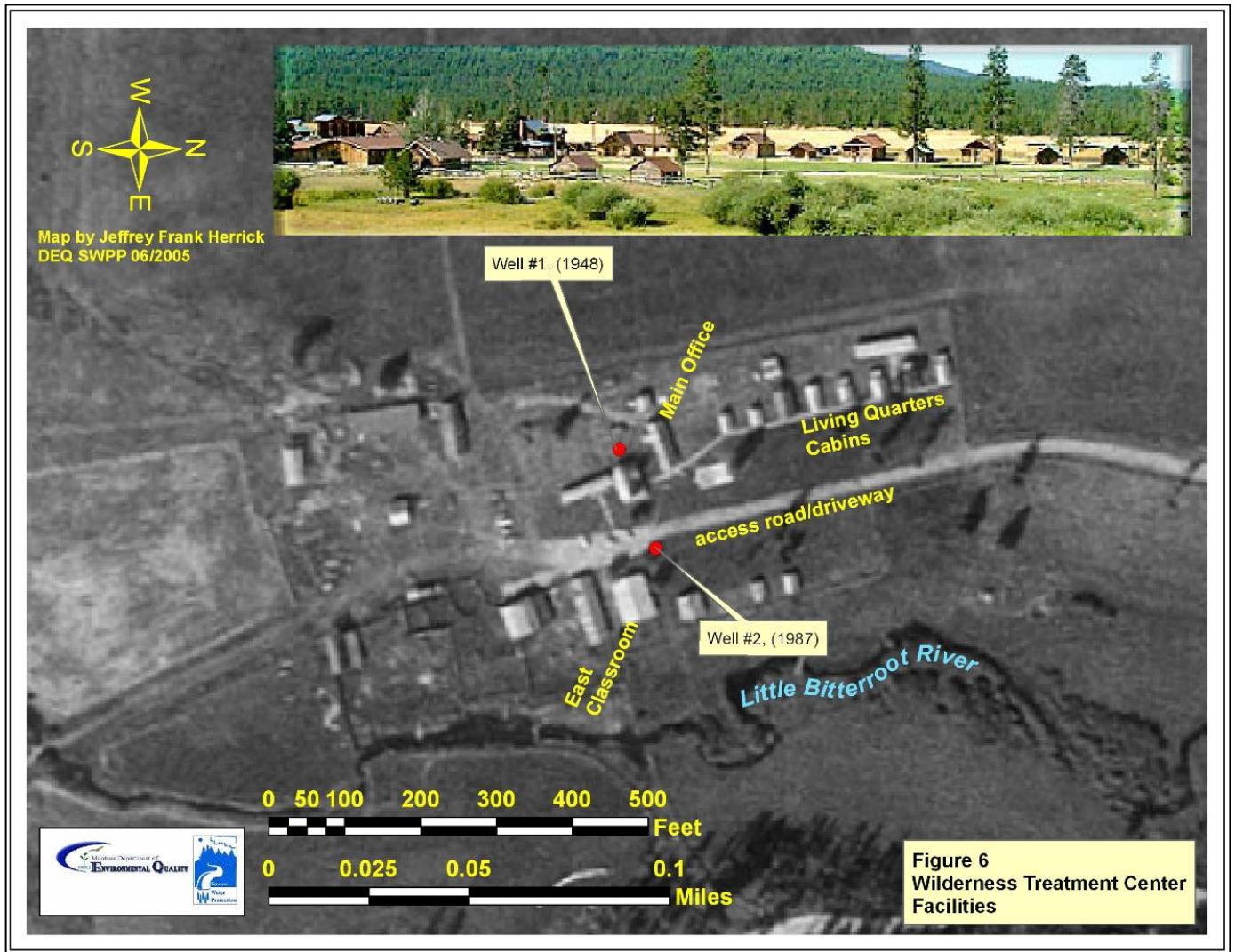


Figure 7. Geologic Map

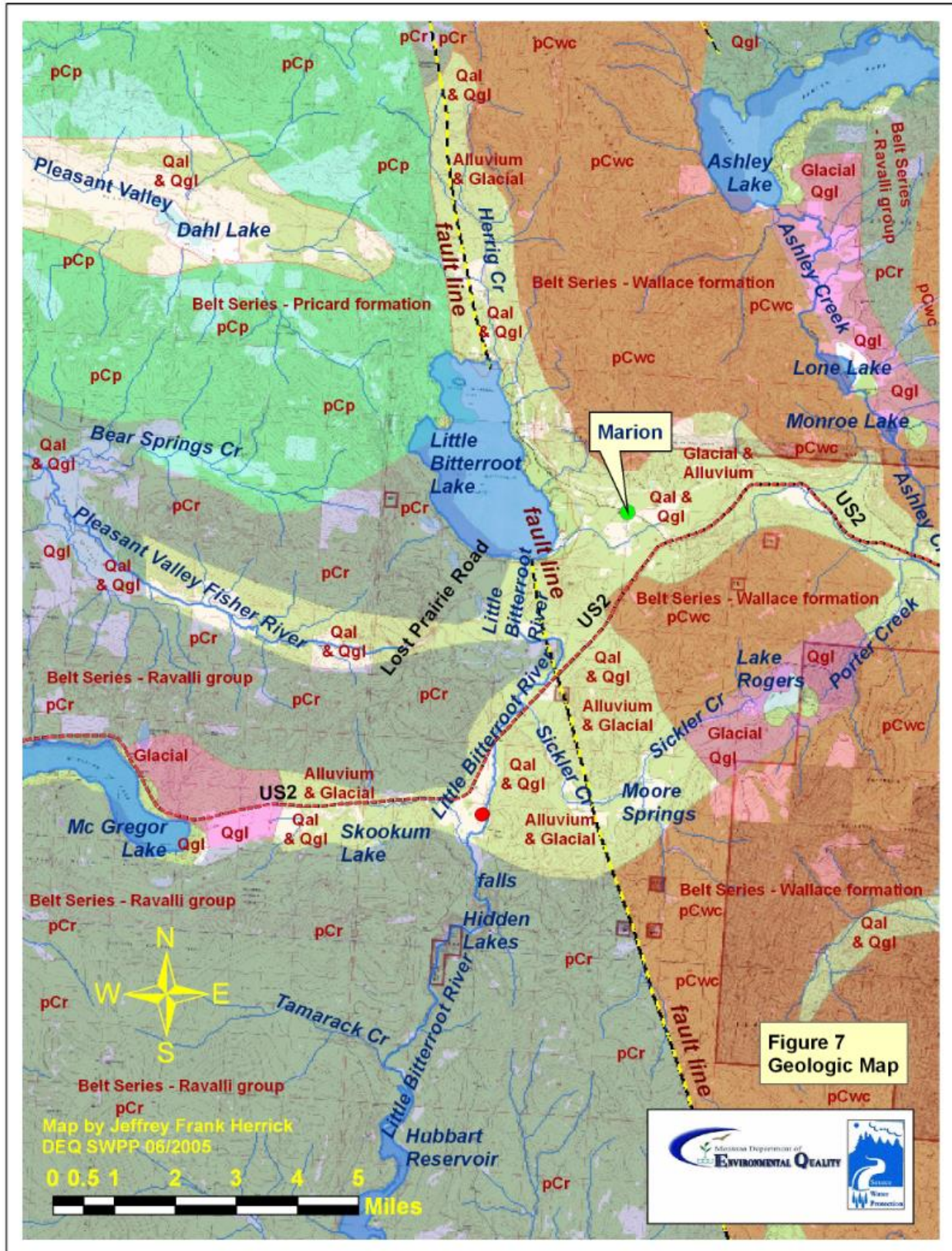
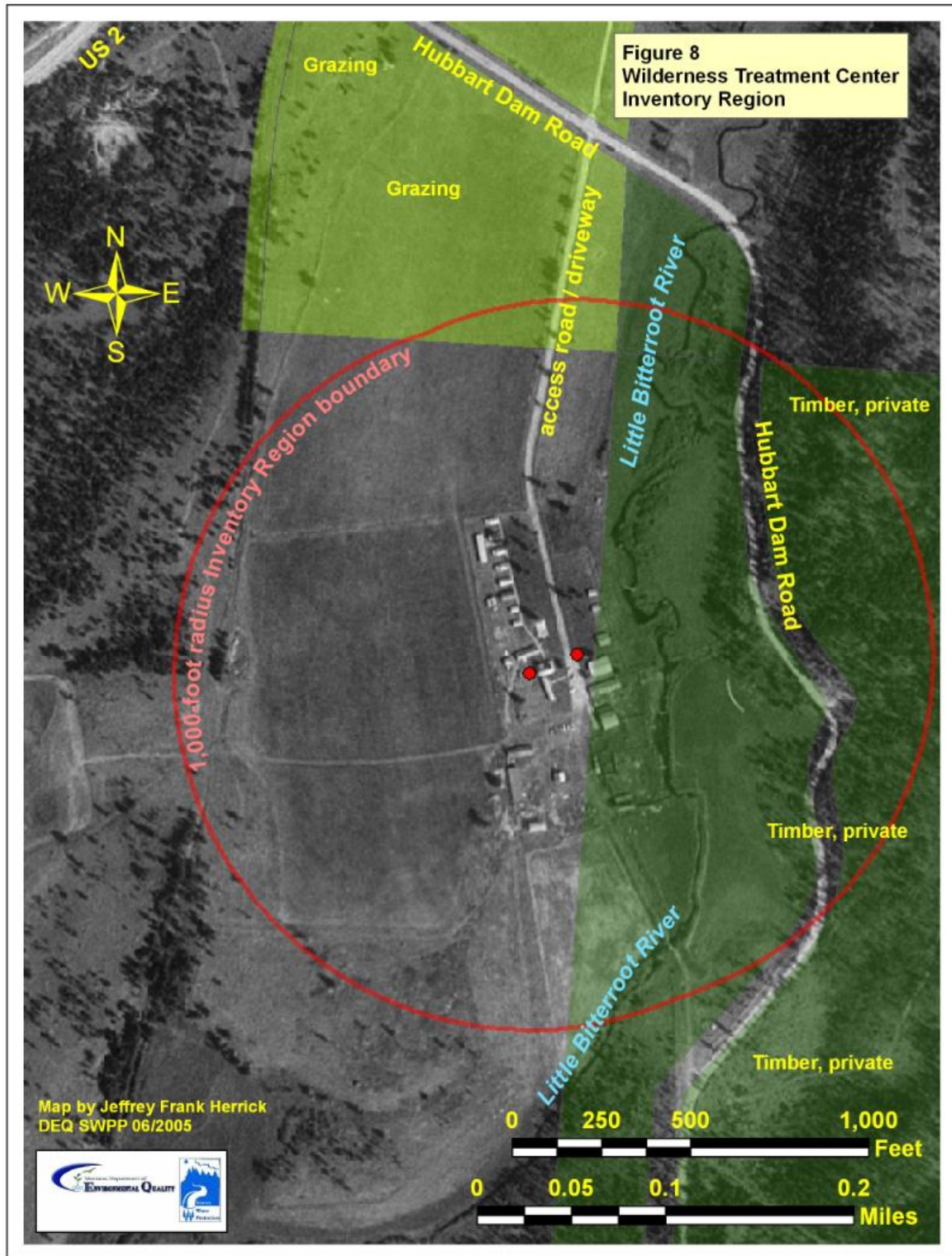


Figure 8 Inventory Region



Appendices available upon request

Appendix B

DEQ PWS's Database Output

Appendix C

Sanitary Survey &
Other Correspondence

Appendix D

Area Wells Map
Lithologic Logs for Area Wells
Underground Fuel Storage Tanks List

Appendix E

Concurrence Letter