

**Plum Creek Timber Ksanka Division
Public Water System**

MT0003320

**SOURCE WATER DELINEATION AND
ASSESSMENT REPORT**

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Executive Summary

The Plum Creek Timber Ksanka Division Saw Mill is located in Lincoln County approximately one-half mile southeast of the Town of Fortine. Drinking water for the Plum Creek Timber Ksanka Division Public Water System (PWS) is supplied by one well that is located in the NW¼ NW¼ NW¼ NW¼ of Section 31, Township 35 North, Range 25 West.

The Plum Creek Timber Ksanka Division Source Water Delineation and Assessment Report (SWDAR) has been prepared under the Federal Safe Drinking Water Act and the Montana Source Water Assessment Plan. The Department of Environmental Quality (DEQ) ensures that assessments are being completed for all public water systems in Montana. The purpose of these reports is to provide information so that the public water system operators, consumers, and community citizens can begin developing strategies to protect their source of drinking water. The information that is provided includes the identification of the areas 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 these potential sources pose to the water system.

Based on the well log it appears the Plum Creek Timber Ksanka Division PWS well is completed in glacial till inter-layered with sand and gravel lenses that are remnants of Paleozoic-aged stream channels. In accordance with the Montana Source Water Protection Program criteria (1999), the aquifer (source water) is considered to have a low sensitivity to potential contaminant sources. Sensitivity is defined as the relative ease that contaminants can migrate to source water through the natural materials.

Three types of source water protection management regions for Plum Creek Ksanka Division PWS were identified as part of this assessment. They are the Control Zone, Inventory Region, and the Recharge Region. Potential sources of contamination were identified within each of these three regions and the results are as follows:

- The Control Zone is delineated as a 100-foot radius around the well and all sources of potential contaminants should be excluded in this region. The goal of management in the Control Zone is to avoid introducing contaminants directly into the water supply's well or immediate surrounding areas. Significant potential contaminant sources that were identified within the Control Zone are industrial process areas associated with Plum Creek Timber Ksanka Sawmill.
- A 1,000-foot inventory region was delineated around the Plum Creek Timber Ksanka Division PWS Well because the source water appears to be contained in sand and gravel lenses confined within glacial till. The Inventory Region should be managed to prevent contaminants from reaching the well before natural processes reduce their concentrations. Significant potential contaminant sources that were identified in the Inventory Region include: multiple on-site septic systems, the maintenance area equipment wash down area, the fuel storage area

- The goal of management in the Recharge Region is to maintain and improve water quality over long periods of time or increased usage. The source of recharge to the aquifer appears to be from the Whitefish Mountains located to the east of the Plum Creek Timber Ksanka Division. Precipitation falling on exposed bedrock outcrops in the mountains percolates into bedrock underlying the glacial sediments which are the source of drinking water for this PWS. Upward or lateral flow of groundwater from the bedrock then recharges the inter-connected sand and gravel lenses in the glacial till. The following potential contaminant sources in addition to those already identified in the inventory region include: stormwater retention ponds in the log storage area, a Class III log waste landfill, areas of increased septic density due to private septic systems, and transportation routes (highways and railroad). These potential contaminant sources are not considered to be immediate threats to the Plum Creek Timber Ksanka Division PWS Well, but may influence long-term water quality.

Susceptibility is the potential for a public water supply to draw water contaminated by inventoried contaminant sources at concentrations that would pose concern.

Susceptibility is determined by considering the hazard rating for each potential contaminant source and the existence of barriers that decrease the likelihood that contaminated water will flow to the public water supply well intakes. 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. Plum Creek Timber Ksanka public water supply well has a high susceptibility to the on-site large capacity septic system and U.S. Highway 93.

The costs associated with contaminated drinking water are high. Developing an approach to protect that drinking water resource will reduce the risks of a contamination event occurring. In this report, we have summarized the local geology and other issues as they pertain to the quality of your drinking water source. We have identified the area we believe to be most critical to preserving your water quality (the Inventory Region). We have identified several potential sources of contamination within the areas of interest. In addition, we provide you with recommendations (i.e., Best Management Practices) regarding the proper use and practices associated with some common potential contamination sources. We believe public awareness and active involvement by the PWS staff are powerful tools for protecting your drinking water. The information in this report will help you increase public awareness about the relationship between land use activities and drinking water quality. Refer to the figures within the document to better understand the spatial relationship of the area. The susceptibility of the PWS to the significant potential contaminant sources is discussed in Table 6.

INTRODUCTION

This Source Water Delineation and Assessment Report (SWDAR) was prepared for the Plum Creek Timber Ksanka Division Public Water System (PWS) located in Lincoln County. Carolyn DeMartino, a Water Quality Specialist, with the Montana Department of Environmental Quality (DEQ) completed the SWDAR. .

Purpose

The primary purpose of this source water delineation and assessment report is to provide information that helps the Plum Creek Timber Ksanka Division PWS protect its drinking water source. 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 Plum Creek Timber Ksanka Division Public Water System (PWS), as required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 (Public Law 104-182). The Montana Source Water Protection Program is intended to be a practical and cost-effective approach to protect public drinking water supplies from contamination.

Limitations

This report was prepared to determine the susceptibility of the Plum Creek Timber Ksanka Division PWS Well to significant potential contaminant sources; and is based on published information, data obtained from the well log, and from those persons familiar with the Plum Creek Timber Ksanka PWS. The terms “drinking water supply” or “drinking water source” refers specifically to the Plum Creek Timber Ksanka PWS well. Only potential sources of contamination in areas that contribute water to the drinking water source (aquifer) are considered.

The term “contaminant” is used in this report to refer to constituents for which maximum contaminant 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 be significant health threats.

CHAPTER 1 BACKGROUND

Plum Creek Timber Ksanka Division Sawmill

The Plum Creek Timber Ksanka Division PWS (PWS ID# MT0003320) is located in Lincoln County along U.S. Interstate 93 ([Figure 1](#)). The PWS consists of one active well ([Figure 2](#)) and a distribution system that provides drinking water through three active service connections.

DEQ public water supply records indicate the system serves 100 year-round employees. The water system for Plum Creek Timber Ksanka Division is classified by the DEQ as a non-transient non-community water supply because it serves more than 25 of the same users each day, but the users are not residents.

The Plum Creek Timber Ksanka Division utilizes septic systems to treat and dispose of sanitary wastes. The septic tanks and drainfields are buried.

Geographic Setting and Climate

Plum Creek Timber Ksanka Division is located east of the Salish Mountains and west of the Whitefish Mountains adjacent to the Kootenai National Forest. Deep Creek flows to the east of the Plum Creek Timber Ksanka Division facility. The elevation in the Plum Creek Timber Ksanka Division is approximately 2,978 feet above mean sea level.

Climate data for the Fortine area/ Plum Creek Timber Ksanka Division is based on the nearest weather station at Fortine. The annual average maximum temperature is 82 °F. in July and the annual average minimum temperature is 11.5 °F in January. Average annual precipitation (rainfall) in the Fortine/ Plum Creek Timber Ksanka Division area is 16.88 inches. Monthly average precipitation ranges from 0.99 inches in February to 2.47 inches in June. Most of the precipitation falls in the months of November, December, and January. Average annual snowfall in the area is 50.1 inches. See Table 1 for a summary of the climate data.

[Figure 1](#). Vicinity Map for the Plum Creek Timber Ksanka Division PWS

[Figure 2](#). Plum Creek Timber Ksanka Division PWS Well Location

Table 1. FORTINE 1 N, MONTANA (243139)

Period of Record Monthly Climate Summary

Period of Record : 3/ 1/1906 to 12/31/2005

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	28.5	36.2	45.6	57.1	66.3	73.2	82.4	80.8	70.1	56.2	39.2	30.4	55.5
Average Min. Temperature (F)	11.5	16.0	22.6	28.9	35.5	42.1	44.9	43.0	36.3	29.4	22.7	15.9	29.1
Average Total Precipitation (in.)	1.34	0.99	1.01	1.10	1.86	2.47	1.37	1.32	1.38	1.21	1.42	1.42	16.88
Average Total SnowFall (in.)	13.2	8.6	5.9	1.8	0.3	0.0	0.0	0.0	0.1	1.1	7.0	12.1	50.1
Average Snow Depth (in.)	6	5	2	0	0	0	0	0	0	0	1	3	1

Percent of possible observations for period of record.

Max. Temp.: 95.9% Min. Temp.: 95.8% Precipitation: 96% Snowfall: 95.8% Snow Depth: 94.7%

Check [Station Metadata](#) or [Metadata graphics](#) for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

General Description of the Source Water

The Plum Creek Timber Ksanka Division PWS obtains water from one active well. Based on the well log, the well appears to be completed in glacial till inter-layered with sand and gravel lenses that are remnants of Paleozoic-aged stream channels. A copy of the Driller's Log is included in Appendix A.

The Public Water Supply

The Plum Creek Timber Ksanka Division PWS well supplies drinking to approximately 100 people through 3 active connections. According to the most recent sanitary survey, conducted on May 16, 2003, there is a water softener, booster pumps, and another captive air tank used for the boiler. An additional captive air tank, used as an expansion tank, is located in the saw mill. As these components are not part of the PWS they are not described in great detail for this report.

The Plum Creek Timber Ksanka Division PWS well was drilled to a depth of 160 feet below ground surface (bgs) and cased with 6-inch steel to 134 feet bgs on March 26, 1962 (Denver Fraser, Cadmus Inc., 2003). Although the well log itself, does not indicate a grout seal, static water level, or pumping water level; records at the pump house indicate that the static water level is 37 feet bgs. The well is equipped with a 5-horse power submersible pump that delivers approximately 30 gallons per minute. Two captive air tanks (Well -X-Trol WX302 and a WX-252) prevent excessive cycling of the pump. The pressure switch setting is set at a cut-in pressure of 70 psi and a cut-out pressure of 100 psi. It was explained that these high pressures were needed to supply water to the edger saw; however it was also stated that the edger saw now had a booster pump to supply additional pressure for that process. The visible distribution lines consist primarily

of galvanized pipe. The system also supplies water to a large boiler used at the mill. No backflow protection between the water system and the boiler was found during the 2003 sanitary survey. A site layout of the well and distribution system is included in Appendix B.

Recommendations made in the 2003 Sanitary Survey to improve the Plum Creek Timber Ksanka Division PWS have all been completed.

Water Quality

Every PWS is required to perform regular sampling of their water supply to detect any contamination. Because the Plum Creek Timber Ksanka Division PWS is classified as a non-transient non-community PWS water quality monitoring is conducted for the following parameters: 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.

Within the past five years there have been no coliform bacteria detections at the Plum Creek Timber Ksanka Division PWS. Nitrate plus nitrite as nitrogen detected in the water within the past five years ranged from 0.14 milligrams per liter (mg/L) to 0.15 mg/L. These concentrations are well below the EPA mandated Maximum Contaminant Level (MCL) of 10 mg/L.

CHAPTER 2 DELINEATION

The source water protection area, the land area that contributes water to the well for Plum Creek Timber Ksanka Division 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 the recharge region. The control zone, also known as the exclusion zone, is an area of at least 100-foot radius around the well. The inventory region is based on a 1,000-foot radius circle around the wellhead and represents the zone of contribution to the well. The recharge region represents the entire portion of the aquifer that contributes water to this well.

Hydrogeologic Setting

Glacial till containing inter-connected lenses of sand and gravel is the source of drinking water for the Plum Creek Timber Ksanka Division PWS. According to the Source Water Protection Program criteria (DEQ, 1999), located in Table 2, the aquifer supplying water to the Plum Creek Timber Ksanka PWS well is considered to have Low Source Water Sensitivity.

Table 2. Source Water Sensitivity
High Source Water Sensitivity Surface water and GWUDISW Unconsolidated Alluvium (unconfined) Fluvial-Glacial Gravel Terrace and Pediment Gravel Shallow Fractured or Carbonate Bedrock
Moderate Source Water Sensitivity Semi-consolidated Valley Fill sediments Unconsolidated Alluvium (semi-confined)
Low Source Water Sensitivity Consolidated Sandstone Bedrock Deep Fractured or Carbonate Bedrock Semi-consolidated Valley Fill Sediments (confined)

Recharge to the aquifer is most likely from upward or lateral flow of groundwater from the bedrock underlying the glacial sediments.

Well Information

A summary of the well construction is presented in Table 3.

Table 3. Source Well Information for Plum Creek Timber Ksanka Division	
Information	Well 1 - 1962 Chip Loading
PWS Source Code	WL002
Well Location (T, R, Sec.)	T. 35 N., R. 25 W., Section 31 NW ¹ / ₄ NW ¹ / ₄ NW ¹ / ₄ NW ¹ / ₄ (BBBB)
Latitude/ Longitude	48.7597/ -114.8875
MBMG #	191545
Water Right #	C021937-00
Date Well was Completed	Mach 23, 1962
Total Depth (feet)	160
Screened Interval	N/A Open hole
Static Water Level (feet)	37
Pumping Water Level (feet)	Unknown
Drawdown (feet)	Unknown
Test Pumping Rate (gpm)	45
Specific Capacity (gpm/ftΔs)	Unknown

Methods and Criteria

Methods and criteria for delineating source water protection areas are specified in the Montana Source Water Protection Program (DEQ, 1999). A control zone, an inventory region, and recharge region have been identified for the Plum Creek Timber Ksanka PWS well. Due to the extent of the Recharge region it is discussed in the text but not mapped.

Delineation Results

A 100-foot control zone was delineated around the Plum Creek Timber Ksanka Division PWS well ([Figure 3](#)). Because water within the inter-connected sand and gravel lenses in the glacial till appears to be confined a 1,000-foot inventory region was delineated for Well 1 ([Figure 4](#)). The source of recharge to the aquifer appears to be from the Whitefish Mountains located to the east of the Plum Creek Timber Ksanka Division. Precipitation falling on exposed bedrock outcrops in the mountains percolates into bedrock underlying the glacial sediments. Upward or lateral flow of groundwater from fractures in the bedrock then recharges the inter-connected sand and gravel lenses in the glacial till.

Figure 3. Plum Creek Timber Ksanka Division PWS Well Control Zone Region

Figure 44. Plum Creek Timber Ksanka Division PWS Well Inventory Region

Limitations

The inventory region was delineated using the simplified approach of a 1,000-foot fixed radius. The delineation was completed using conservative assumptions to help ensure that the inventory zone reflects the actual area where contamination to the Plum Creek Timber Ksanka Division PWS Well may occur. Contaminant transport rates and concentrations will vary depending on the physical and chemical characteristics of the aquifer and the contaminants. The amount of recharge from the underlying bedrock is unknown.

CHAPTER 3 INVENTORY

The inventory for Plum Creek Timber Ksanka Division PWS focuses on all activities in the Control Zone, certain sites or land use activities in the Inventory Region, and major land uses and large facilities in the Recharge Region. The most significant potential contaminants in Plum Creek Timber Ksanka Division PWS Inventory Region include: potential contaminant sources related to the operation of the facility (VOCs, SOCs), nitrates and pathogens from the large capacity on-site septic system, hazardous chemical spills on US Highway 93, and a former leaking underground storage tank site.

Inventory Method

Significant potential contaminant sources in the source water management areas were inventoried to assess the susceptibility of the well to contamination, and to provide a foundation for source water protection planning. The inventory for the Plum Creek Timber Ksanka Division PWS 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 the Plum Creek Timber Ksanka Division PWS well focuses on all activities in the control zone, certain types of facilities and land uses in the inventory region, and general land uses and large facilities in the Recharge Region. Information about 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

Inventory Results/Control Zone

The land contained within the control zone for the well is owned by the Plum Creek Timber Ksanka Division. Significant potential contaminant sources within the control zone include the haul roads and the proximity of large equipment and trucks to the well.

Inventory Results/Inventory Region

Land use within the Plum Creek Timber Ksanka Division PWS Well Inventory Region is predominantly covered by forest land and the saw mill owned by the Plum Creek Manufacturing, Inc. Overall, septic density in the inventory region is low. The most significant potential contaminant sources to the PWS well are listed in Table 4.

Table 4. Significant Potential Contaminant Sources in the Plum Creek Timber Ksanka Division PWS Well Inventory Region

Significant Potential Contaminant Source	Contaminants	Hazard
Multiple On-site Septic Systems	Nitrates and pathogens	If not properly operated and maintained untreated effluent may enter into and impact area groundwater
Maintenance Area Equipment Wash Down	VOCs, metals	If wash water containing contaminants were to flow onto the ground surface it may cause contaminants to migrate into area groundwater
Fuel and Oil Storage Building (#1 & #2 Diesel, gasoline)	VOCs	Fuel spills due to improper handling or overfilling may impact area groundwater
U.S. Highway 93	VOCs, SOCs, and other hazardous chemicals transported on the highway	Spills due to traffic accidents could allow hazardous materials to migrate into area groundwater
Former Leaking UST Site	VOCs	Historic fuel spill residuals in soil may migrate into and impact area groundwater
Storm Water Settling/ Retention Ponds	VOCs, nitrate, and other hazardous chemicals used at the saw mill	Contaminants contained in storm water run off may migrate into area groundwater

Inventory Results/Recharge Region

The recharge region is the whole area that contributes water to a PWS well. Potential contaminant sources located within the recharge region include: wastes associated with areas of moderate to high septic system density; UST/ Leaking UST sites where releases of petroleum may occur or have already occurred; and transportation corridors, where traffic accidents or railroad accidents, may result in the release of large volumes of hazardous materials.

Inventory Limitations

Not every source of contamination to the Plum Creek Timber Ksanka PWS well has been identified. Consideration was limited to significant potential contaminant sources within the inventory region. Additionally, sources of contaminants that are not regulated for were not inventoried or assessed. No site inspection was performed, and the inventory was developed from available sources of information, including DEQ files and NRIS. The potential contaminant sources described in the inventory are identified from readily

available information. Consequently, unregulated activities or unreported contaminant releases may have been overlooked.

Inventory Update

To make this SWDAR a useful document in the upcoming years, the 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 (5) years to ensure the SWDAR remains current.

CHAPTER 4 SUSCEPTIBILITY ASSESSMENT

Susceptibility is the potential for a public water supply to draw water contamination by inventoried sources at concentrations that would pose concern. Susceptibility is assessed in order to prioritize potential sources for management actions by local entities, in this case the Plum Creek Timber Ksanka Division PWS well.

The goal of the Source Water Management is to protect the source water by 1) controlling activities in the control zone, 2) managing significant potential contaminant sources in the Inventory Region, and 3) ensuring that land use activities in the Recharge Region pose minimal threat to the source water. Management priorities within the Inventory Region are determined by ranking the significant potential sources identified in the previous chapter according to susceptibility.

Susceptibility is determined by considering the hazard rating for each potential contaminant source and the existence of barriers that decrease the likelihood the contaminated water will flow to the well (see Table 5). Barriers can be anything that decreases the likelihood that contaminated water will flow to the Plum Creek Timber Ksanka Division PWS well.

Table 5. Relative Susceptibility to Specific Contaminant Sources as Determined by Hazard and the Presence of Barriers

	High Hazard	Moderate Hazard	Low Hazard
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

Proximity or density of significant potential contaminant sources; and the nature of their contaminants determines hazard (Table 6). Point source hazard is also dependent on the health effects associated with potential contaminants. Hazard ratings for non-point sources are assigned based on criteria listed in Table 6 for septic systems, sanitary sewers, and cropped agricultural land.

Table 6. Hazard of potential contaminant sources associated with proximity to a PWS well or intake or density within a PWS inventory or spill response region.

Contaminant Source Type		High Hazard	Moderate Hazard	Low Hazard
SURFACE WATER	Point Sources of Nitrate or Microbes	Potential for direct discharge to source water	Potential for discharge to groundwater hydraulically connected to source water	Potential contaminant sources in the watershed region
	Point Sources of VOCs, SOCs, or Metals	Potential for direct discharge of large quantities from roads, rails, or pipelines	Potential for direct discharge of small quantities to source water	Potential for discharge to groundwater hydraulically connected to source water
WELLS	Point Sources of All Contaminants (Unconfined)	Within 1-year TOT	1 to 3 years TOT	Over 3 years TOT
	Point Sources of All Contaminants (Confined)	PWS well is not sealed through the confining layer	Well(s) in the inventory region other than the PWS well are not sealed through the confining layer	All wells in the inventory region are sealed through the confining layer
LAND	Septic Systems	More than 300 per sq. mi.	50 – 300 per sq. mi.	Less than 50 per sq. mi.
	Municipal Sanitary Sewer (% land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region
	Cropped Agricultural Land (% land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region

Table 7 identifies the individual hazard ratings for significant potential contaminant sources and each associated contaminant in the Plum Creek Timber Ksanka Division PWS Well Inventory Region.

Table 7. Hazard of significant potential contaminant sources for the Plum Creek Timber Ksanka Division PWS Well Inventory Region				
Significant Potential Contaminant Sources	Map Figure	Contaminants	Hazard	Hazard Rating
Multiple On-site Septic Systems	----	Nitrates and pathogens	Untreated effluent from malfunctioning tanks, piping, or drain field leaching into area groundwater	High

Table 7. Hazard of significant potential contaminant sources for the Plum Creek Timber Ksanka Division PWS Well Inventory Region				
Significant Potential Contaminant Sources	Map Figure	Contaminants	Hazard	Hazard Rating
Maintenance Area Equipment Wash Down	Figure 4	VOCs, metals	If wash water containing contaminants were to flow onto the ground surface it may cause contaminants to migrate into area groundwater	High
Fuel and Oil Storage Building (#1 & #2 Diesel, gasoline)	Figure 4	VOCs	Fuel spills due to improper handling or overfilling may impact area groundwater	High
Former Leaking UST Site	Figure 4	VOCs	Historic fuel spill residuals in soil may migrate into and impact area groundwater	High
U.S. Highway 93	Figure 4	VOCs, SOCs, and other hazardous chemicals transported on the highway	Spills due to accidents could allow hazardous materials to migrate into area groundwater	High
Storm Water Settling/ Retention Ponds	Figure 4	VOCs, nitrate, and other hazardous chemicals used at the saw mill	Contaminants contained in storm water run off may migrate into area groundwater	High

Susceptibility ratings are presented individually for each significant potential contaminant source and each associated contaminant. The susceptibility of each well to each potential contaminant source is assessed separately. Table 8 identifies the susceptibility assessment results for each significant potential contaminant source in the Plum Creek Timber Ksanka Division PWS Well Inventory Region.

Table 8. Susceptibility assessment for significant potential contaminant sources in the Plum Creek Timber Ksanka Division PWS Well Control Zone and Inventory Region

Contaminant Source	Contaminant	Hazard	Hazard Rating	Barriers	Susceptibility	Management Recommendations
Multiple On-site Septic Systems	Nitrates and pathogens	Untreated effluent from malfunctioning tanks, piping, or drain field leaching into area groundwater	High	None	Very High	Continue to properly operate and maintain the on-site septic systems
Maintenance Area Equipment Wash Down	VOCs, metals	If wash water containing contaminants were to flow onto the ground surface it may cause contaminants to migrate into area groundwater	High	Storm Water Pollution Prevention Plan (SWPPP) in place; wastewater is stored in a concrete holding area till it is filtered and reused as wash water	Moderate	Continue to use Best Management Practices to ensure wash water does not flow off of the concrete wash pad and onto the ground surface; update SWPPP as needed
Fuel and Oil Storage Building (#1 & #2 Diesel, gasoline)	VOCs	Fuel spills due to improper handling or overfilling may impact area groundwater	High	Containment berms around fuel storage tanks and the oil storage building; SWPPP in place	Moderate	Continue to inspect berms to ensure that no fuel leaks have occurred; update SWPPP as needed
Former Leaking UST Site	VOCs	Historic fuel spill residuals in soil may migrate into area groundwater	High	Remediation conducted; natural biodegradation in soil; spill site now inactive	Moderate	Periodically check the site for soil staining to ensure there are no fuel residuals remaining in the soil
U.S. Highway 93	VOCs, SOCs, agricultural chemicals, and other hazardous materials	Spills due to accidents could allow contaminants to migrate into area groundwater	High	Emergency responders available; training of local responders	Moderate	Prepare an emergency response plan that can be implemented if a spill were to occur and threaten the PWS well

Table 8. Susceptibility assessment for significant potential contaminant sources in the Plum Creek Timber Ksanka Division PWS Well Control Zone and Inventory Region

Contaminant Source	Contaminant	Hazard	Hazard Rating	Barriers	Susceptibility	Management Recommendations
Storm water Settling/Retention Ponds	VOCs, nitrate, and other hazardous chemicals used at the saw mill	Contaminants contained in the storm water runoff may migrate into area groundwater	High	DEQ permitted facility; have a Storm Water Pollution Prevention Plan in place	Moderate	Continue to maintain pond and keep in compliance with the storm water discharge permit

Susceptibility Results

The susceptibility results for each significant potential contaminant source and their associated contaminants are identified as follows:

Multiple On-Site Septic Systems - Hazard is ranked high for potential contamination from the on-site septic systems as they are most likely located the Plum Creek Timber Ksanka Division PWS Well Inventory Region. Also, the well log does not contain any well seal information. Overall, the susceptibility of the well to contamination is very high as no barriers to contamination were identified.

Maintenance Area Equipment Wash Down – Hazard is ranked high as the wash down area is located within the inventory region; and the well log does not contain any well seal information. Overall, the susceptibility of the well to the equipment wash down area is moderate as multiple barriers to contamination were identified.

Fuel and Oil Storage Building – Hazard is ranked high as the fuel and oil storage building are located within the inventory region; and the well log does not contain any well seal information. Overall, the susceptibility of the well to the fuel storage area and oil storage building is moderate as multiple barriers to contamination were identified.

Former Leaking UST Site – Hazard is ranked high for the former leaking UST site as it is in the inventory region. Overall, the susceptibility of the well to the leaking UST is moderate as multiple barriers to contamination were identified.

U.S. Highway 93 – Hazard is ranked high for the highway as it is located in the inventory region and the well log does not contain any well seal information. Overall, the susceptibility of the well to the highway is moderate as multiple barriers to contamination were identified.

Storm Water Settling/ Retention Ponds – Hazard is ranked high for the ponds as they located in the inventory region and the well log does not indicate any well seal information. Overall, the susceptibility of the well to the storm water settling/ retention ponds is moderate as multiple barriers to contamination were identified.

Management Recommendations

The Plum Creek Timber Ksanka Division PWS Source Water Delineation and Assessment Report was prepared to assist the PWS operator and employees of this facility to better understand their PWS. The Plum Creek Timber Ksanka Division PWS report provides information concerning the well that supplies water to the PWS, identifies the control zone, inventory region, and the recharge region, and within each of these protection areas identifies the significant potential contaminants that may impact the PWS drinking water source. Also provided in the table are recommendations regarding how the potential contaminants could be managed to prevent impacts in the vicinity of

the Plum Creek Timber Ksanka Division PWS well. If these management recommendations are implemented, they too may be considered additional barriers to specific sources and contaminants. Also, if more well information is provided, especially concerning the well seal and pumping water level, this will reduce the initial hazard rating and in turn will reduce the overall susceptibility of the Plum Creek Timber Ksanka Division PWS Well to each significant potential contaminant source listed.

Management recommendations fall into the following categories:

Sewage disposal system maintenance and leak detection – Proper operation and maintenance of the large capacity on-site septic system will reduce the susceptibility of the Plum Creek Timber Ksanka Division PWS well to contamination from this potential contaminant source.

Storm Water Management. Storm Water planning should address potential contaminant sources and drainage control. Potential contaminant source control can be accomplished through employee training concerning use, disposal, and recycling. The Plum Creek Timber Ksanka Division does have a Storm Water Pollution Prevention Plan in place and it addresses potential contaminant sources and drainage control.

Education. Educational workshops provided to the employees by the company, county, or state will promote the safe handling and proper storage, transport, use, and disposal of hazardous materials. Ongoing training provided to the Plum Creek Timber Ksanka Division employees promotes the efficiency and effectiveness of emergency responses to hazardous material spills.

Emergency Response Plan. If an emergency response plan does not already exist the Plum Creek Timber Ksanka Division may want to consider developing a plan. The plan would identify the procedures that the water operator and other emergency personnel should follow in the event that there is a contaminant release in the vicinity of the well and an imminent threat that the contaminant(s) would reach the PWS well. Coordination with local, county, and state emergency response personnel would greatly benefit the plan. The emergency response plan should be updated annually to reflect changes in emergency contacts, phone numbers, and resources available within the Towns of Fortine and Eureka, or Lincoln County to respond to an emergency situation that may impact the Plum Creek Timber Ksanka Division PWS.

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Glossary

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

Alkalinity. The capacity of water to neutralize acids.

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

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

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

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

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

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

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

Community. A town, neighborhood or area where people live and prosper.

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 ground water 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 ground water flow systems.

Inventory Region. A source water management area for ground water systems that encompasses the area expected to contribute water to a public water supply within a fixed distance or a specified three year ground water 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 – Ground Water Information Center (MBMG/GWIC). The database of information on all wells drilled in Montana, including stratigraphic data and well construction data, when available.

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

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

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

Nonpoint-Source Pollution. Pollution sources that are diffuse and do not have a single point of origin or are not introduced into a receiving stream from a specific outlet. Examples of nonpoint- source pollution include agriculture, forestry, and run-off from city streets. Nonpoint sources of pollution, such as the use of herbicides, can concentrate low levels of these chemicals into surface and/or ground waters 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 ground water. 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 ground water 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 ground water 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*

Appendices

Appendix A: Well Log

Montana Bureau of Mines and Geology
 Ground-Water Information Center Site Report
 PLUM CREEK TIMBER KSANKA DIVISION

[Plot this site on a topographic map](#)
[View Hydrograph for this Site](#)
[View Water Quality for this Site](#)

Location Information

GWIC Id: 191545	Source of Data: LOG
Location (TRS): 35N 25W 31 BBBB	Latitude (dd): 48.7597
County (MT): LINCOLN	Longitude (dd): -114.8875
DNRC Water Right: C021937-00	Geomethod: NAV-GPS
PWS Id: 03320002	Datum: NAD27
Block:	Altitude (feet): 2978.00
Lot:	Certificate of Survey:
Addition:	Type of Site: WELL

Well Construction and Performance Data

Total Depth (ft): 160.00	How Drilled:
Static Water Level (ft):	Driller's Name: MCCLARTY
Pumping Water Level (ft):	Driller License: WWC165
Yield (gpm): 45.00	Completion Date (m/d/y): 3/23/1962
Test Type: BAILER	Special Conditions:
Test Duration:	Is Well Flowing?:
Drill Stem Setting (ft):	Shut-In Pressure:
Recovery Water Level (ft):	Geology/Aquifer: 112DRFT
Recovery Time (hrs):	Well/Water Use: PUBLIC WATER SUPPLY
Well Notes:	

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information¹

From	To	Dia	Wall Thickness	Pressure Rating	Joint	Type
0.0	134.0	7.0				23 LB STEEL

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information¹

From	To	Dia	# of Openings	Size of Openings	Description
134.0	160.0	7.0			OPEN HOLE

Lithology Information

From	To	Description
0.0	0.5	TOPSOIL
0.5	3.0	CLAY
3.0	50.0	SANDY CLAY
50.0	69.0	COARSE SAND
69.0	107.0	SAND GRAVEL AND WATER
107.0	160.0	SAND GRAVEL AND CLAY

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 B: Site Layout and Sanitary Survey

Appendix C: Concurrence Form