

**Town of Fort Peck
Public Water System
PWSID # MT0000218**

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

Date of Report: 2/25/04

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INTRODUCTION

This Delineation and Assessment Report was prepared by Perri P. May, Hydrogeologist in the Source Water Protection Program of the Montana Department of Environmental Quality (DEQ). The Town of Fort Peck's surface water intake for the public water supply (PWS) is located in McCone County, Montana, and a few miles southeast of the Town of Fort Peck. The DEQ PWS identification number, operator name, and operator number for the Fort Peck PWS appear on the title page of this report.

Purpose

This report is intended to meet the technical requirements for the completion of the source water delineation and assessment report for the Town of Fort Peck 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 Town of Fort Peck PWS operator in the identification of potential contaminant sources near the surface water intake and the need for a source water protection plan to protect the Town of Fort Peck area drinking water source. If the source water is determined to be highly susceptible to one or more potential contaminant sources, a source water protection plan detailing recommendations to manage or mitigate the impacts from potential contaminant sources may be warranted.

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 Town of Fort Peck public water supply. Information on land use and potential contaminant sources comes from a variety of sources including a preliminary land cover data layer produced by the United States Geological Survey (USGS), DEQ Public Water Supply files (including sanitary surveys), and other public sources of information. A web-based GIS application was also used to query and generate maps to support writing this report. This application is called the Source Water Protection Program Query System and is available at the following web address or URL:

<http://nris.state.mt.us/wis/swap/swapquery.asp>. The application was developed by the DEQ Source Water Protection Program (SWPP) and provides access to data from the U.S. EPA, DEQ, Montana Bureau of Mines and Geology (MBMG) and other sources.

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 ground-water or surface-water contamination in the area of the Town of Fort Peck are identified. Only potential sources of contamination in areas that contribute water to the identified drinking water sources are considered.

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

CHAPTER 1 BACKGROUND

The Community

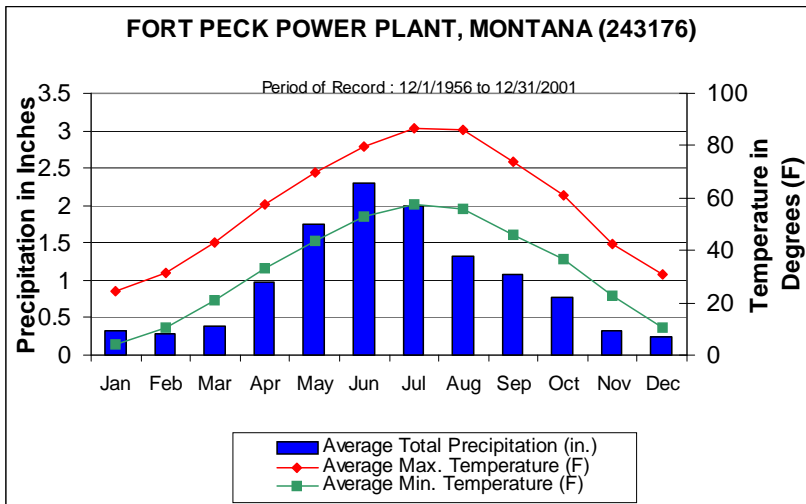
The Town of Fort Peck is located approximately ten miles southwest of the Fort Peck Indian Reservation in the southern area of Valley County ([Figure 1](#)). The town is situated on the northern shoreline of Fort Peck Reservoir, just west of the Fort Peck Dam and approximately six miles west of the Milk River confluence with the Missouri River. The U.S. Census Bureau estimates a 2000 population of 240 within the town of Fort Peck. The Fort Peck population has increased from 226 in 1990. Montana Route 117 connects Fort Peck with Nashua to the north and Montana Route 24 connects Fort Peck with Glasgow to the northwest.

Agriculture contributes significantly to the economy of Fort Peck. The largest Fort Peck industries in 2000 were services, 19.9 percent of earnings; farm, 16.2 percent; and state and local government, 15.0 percent. Of the industries that accounted for at least 5 percent of earnings in 2000, the slowest growing from 1999 to 2000 was farm, which decreased 24.2 percent; the fastest was federal civilian government (7.9 percent of earnings in 2000), which increased 10.0 percent (<http://www.bea.doc.gov/bea/regional/bearfacts>).

Within the boundaries of the Town of Fort Peck, residents obtain their drinking water from the municipal PWS. Fort Peck Rural County Water District purchases water from the Town of Fort Peck and distributes it to businesses and residents outside of the Town limits. The Town of Fort Peck municipal sewer system services all residents within town limits. Municipal wastewater discharges to a three-cell lagoon located northeast of town on the west bank of the Missouri River. Residents in areas outlying town limits utilize on-site septic systems for waste disposal.

Climate

Figure 2. Fort Peck Average Temperatures and Precipitation



The climate in the vicinity of Fort Peck is semi-arid. Based on Western Regional Climatic Center data for the December 1, 1956 to December 31, 2001 period of record, annual precipitation averages 11.75 inches. Monthly average precipitation ranges from 0.24 inches in December to 2.3 inches in June. Intense, localized thunderstorms commonly occur from May through July (Donovan, 1988). The annual mean snowfall in Fort Peck is 2.4 inches. Periodic drought cycles (as defined by moving annual precipitation averages less than 10 inches) occur in the region at approximately 10 to 20 year intervals. Evaporation rates are high, averaging

25 to 35 inches per year.

Geographic Setting

Fort Peck is located in the Great Plains physiographic province of North America (Rocky Mountain Association of Geologists, 1972), and the glaciated central ground-water region of the United States (Heath, 1984). The elevation of Fort Peck is approximately 2200 feet above mean sea level. The town is situated on the west bank of the Missouri River floodplain, approximately six miles east of the Milk River confluence with the Missouri, and directly northwest of the Fort Peck Dam ([Figure 1](#)). The Missouri River valley is approximately 1.5 miles wide in the vicinity of Fort Peck.

The glaciated topography in the vicinity of the town exhibits relatively low relief, typically less than 100 feet over several miles (Donovan, 1988). The town of Fort Peck is built on a broad, poorly defined bench, which is capped by glacial deposits and dissected by several intermittent drainages. The topography to the east and west of Fort Peck along the shoreline of Fort Peck Reservoir exhibits more pronounced relief, and is densely dissected by intermittent and ephemeral drainages ([Figure 1](#)).

The town of Fort Peck is located in the Prairie Elk-Wolf watershed. The U.S. Geological Survey hydrologic unit code for this watershed is 10060001. The intake for the Town of Fort Peck is located in the Fort Peck Reservoir watershed located south of town. The U.S. Geological Survey hydrologic unit code for watershed within which the intake located is 10040104. The Missouri River drainage is oriented east - west near Fort Peck downstream of the dam, with a flow direction to the east. Missouri River tributaries in this area are generally oriented north-northwest to south-southeast, with flows directed south or north towards the Missouri mainstem.

Geology

This section provides an overview of the geology and hydrology of the area in the vicinity of Fort Peck. The geology of the area can be used to determine the locations, boundaries, and hydraulic properties of local aquifers. An understanding of hydrogeologic conditions also provides an explanation for the sensitivity of local aquifers and surface waters to potential contamination sources.

The town of Fort Peck is situated on a broad bench of Wisconsin glacial deposits situated west of the Missouri River floodplain (Jensen and Varnes, 1964; [Figure 3a](#) and [Figure 3b](#)). Quaternary alluvium blankets the broad Missouri River valley and major Missouri River tributaries in the vicinity of the town. Upper Cretaceous Bearpaw shale underlies the Quaternary alluvium, colluvium, and glacial deposits exposed at the ground surface. The Missouri River has incised through this formation, which is exposed in outcrops along the Fort Peck Reservoir shoreline, in some areas along the edge of the Missouri River floodplain, and in tributary drainages north and south of the river (Jensen and Varnes, 1964; [Figure 3a](#) and [Figure 3b](#)).

Four major glacial advances occurred in Montana during the Pleistocene Epoch (10,000 – two million years ago) (Alden, 1932; Simon et al., 1999). Ice covered the northern third of the state during the maximum extent of the glacial advance. Prior to glaciation, the ancestral Missouri River flowed north around the Bearpaw Mountains and occupied the course of the present Milk River. Approximately 50,000 to 70,000 years ago, advancing ice blocked the river near the present town of Big Sandy, diverting the flow to the south into its current channel.

The Missouri River has exhibited varied and complex channel dynamics since the early Pleistocene (Simon et al., 1999). At numerous locations, ice diverted the flow for both long and short durations, and sometimes re-routed the channel. During glacial recessions, the addition of glacial meltwater to runoff volumes and glacial reworking of till and fluvial deposits resulted in the increased transport and deposition of coarser-

grained sediments and a higher rate of deposition than has occurred since. As a result, the older alluvium in the lower portion of the post-glacial Missouri River deposits is coarser-grained.

The modern Missouri River valley comprises interbeds of alluvium, lacustrine, and glaciofluvial silt, sand, clay, and gravel sediments (Donovan, 1988). Preglacial and glacial deposits are unconsolidated and extremely heterogeneous, varying in thickness from 30 to 100 feet (Hopkins and Tilstra, 1966). Silts and clays are exposed at ground level in most areas, and depths to water-bearing lenses of sands, sandy clay, or gravelly sand are not consistent (Hopkins and Tilstra, 1966). The Missouri River alluvium in the vicinity of Fort Peck contains significant vertical and horizontal variations in bedding (Simon et al, 1999). Individual stratigraphic horizons range in thickness from one inch to four feet, and all are lenticular in shape. Generally, the upper horizons of the alluvial deposits are finer-grained than the lower horizons.

General Description of the Source Water

The Fort Peck source water is obtained through the penstocks in the Fort Peck Dam. The 15-foot diameter penstock intakes are located approximately 2.5 miles southeast of the town of Fort Peck, on the eastern end of the dam's retention structure (Figure 4). The penstock intake depth is 200 feet below the maximum pool elevation of the reservoir, which is 2250 feet above mean sea level (Jensen and Varnes, 1964).

Fort Peck Dam is the largest hydraulic earth-filled dam in the world (<http://www.now.usace.army.mil>). The Fort Peck dam underwent construction from 1933 until 1937 (<http://wintermt.com>). The dam is 3.8 miles in length. The Fort Peck Reservoir is 134 miles in length, 220 feet in maximum depth, and is surrounded by 1520 miles of shoreline (<http://www.now.usace.army.mil>). The reservoir has a storage capacity of 18.7 million acre-feet of water. A total watershed area of 10,200 miles drains into the reservoir.

The Public Water Supply

The Town of Fort Peck PWS is classified as a community system under the Federal Safe Drinking Water Act, because the system serves at least 25 year-round residents through at least 15 service connections. The PWS services 240 residents via 112 active service connections.

Fort Peck Reservoir water is the primary water supply source. The source water is obtained through the Fort Peck Dam penstocks located on the east side of the dam (Figure 4), in Township 26 North, Range 41 East, Section 14. The latitude of the surface water intake location is 48.0072°N, and the longitude is – 106.3986°W. Water from the river undergoes treatment prior to delivery to the distribution system. Fort Peck recently upgraded their water treatment and distribution system to provide drinking water to residents in the Fort Peck Rural Water District in 2001. The District encompasses the town of Fort Peck as well as outlying areas. The current water system output is 1.0 million gallons per day, double the output of the original system (Midwest Assistance Program, 2002). The Side of the Road Trailer Park, a former community PWS with a surface water intake located in the Missouri River downstream of the Fort Peck Dam, hooked into the Town of Fort Peck on August 22, 2001. This PWS is no longer active.

Reservoir water is gravity fed into a dual train conventional treatment package plant (Midwest Assistance Program, 2002). Upon entrance to the plant, the water is treated with two cationic polymers, EC 462 Riverclear coagulant, and Percol LT 20 coagulant/filter aid. Backwash from the dual train package plant is drained to a backwash basin, and then pumped to a sewer lagoon for disposal (Midwest Assistance Program, 2002).

Following treatment in the package plant, the water goes through a chlorine contact basin and clearwell. Here the water undergoes full-time disinfection via exposure to chlorine gas. The water is pumped directly to a 1.3 million-gallon capacity concrete storage tank located below ground. From the storage tank, the water is pumped to through the distribution system, and to an above-ground 0.3 million-gallon storage tank for the Fort Peck Valley County Water District.

The town of Fort Peck obtains its drinking water from a surface water supply. As a result, the source water is classified as highly sensitive to contamination, in accordance with Montana Source Water Protection Program aquifer sensitivity criteria (1999). These criteria are discussed in the next chapter.

Water Quality

Public water systems must conduct routine monitoring for contaminants in accordance with Federal Safe Drinking Water Act requirements. Parameters such as coliform bacteria, lead, copper, nitrate, nitrite, volatile organic chemicals (including hydrocarbons and chlorinated solvents), inorganic chemicals (including metals), synthetic organic chemicals (including pesticides), and radiological contaminants must be sampled in community PWSs and non-community, non-transient PWSs in accordance with schedules specified in the Administrative Rules of Montana. Transient, non-community PWSs are required to conduct routine monitoring for pathogens (including coliform bacteria), nitrate, and nitrite. All contaminant concentrations detected in required samples must comply with numeric maximum contaminant levels (MCLs) specified in the Federal Safe Drinking Water Act.

Background Fort Peck Water Quality

Missouri River water quality samples were collected by the U.S.G.S. at the Missouri River near Fort Peck gaging station. Only the samples collected at this station over the past five years are reported in Table 1 below.

Table 1. Dissolved constituent concentrations in the Missouri River at the Missouri River below Fort Peck Dam U.S.G.S. gaging station (U.S. Geological Survey, NWIS, 2002)

Constituent	Sampling Dates (years)	Range of Dissolved Concentrations	MCL	MCLG	Secondary Standard
Discharge (cfs)	1980 - 1999	1,010 - 15,200	NA	NA	NA
Nitrite + Nitrate (as N) (mg/l)	1980 - 1987	≤ 0.10 - 0.11	NA	NA	NA
Nitrite (as N)	1985 - 1986	≤ 0.010	1 mg/l	1 mg/l	NA
Arsenic (ug/l)	1980 - 1987	3.0 – 5.0	0.05 mg/l	NA	NA
Cadmium (ug/l)	1980 - 1987	≤ 1.00 – 3.00	0.005 mg/l	0.005 mg/l	NA
Chromium (ug/l)	1980 - 1987	≤ 1.0 - 4.3	0.1 mg/l	0.1 mg/l	NA
Copper (ug/l)	1980 - 1987	1.0 – 15.0	NA	1.3 mg/l	1.0 mg/l
Iron (ug/l)	1980 - 1987	≤ 10 - 30	NA	NA	0.3 mg/l
Lead (ug/l)	1980 - 1987	≤ 1.00 – 16.0	TT Action Level = 0.015 mg/l	zero	NA

Table 1 (cont'd). Dissolved constituent concentrations in the Missouri River at the Missouri River below Fort Peck Dam U.S.G.S. gaging station (U.S. Geological Survey, NWIS, 2002)

Constituent	Sampling Dates (years)	Range of Dissolved Concentrations	MCL	MCLG	Secondary Standard
Manganese (ug/l)	1980 - 1987	≤ 1.0 - 20	NA	NA	0.05 mg/l
Selenium (ug/l)	1980 - 1987	≤ 1.0 – 2.0	0.05 mg/l	0.05 mg/l	NA
Fecal coliform, 0.7 UM-MF count/100 ml)	1980 - 1987	≤ 1 - >200	0.003 mg/l	0.003 mg/l	NA
Turbidity (NTU)	1980 - 1986	.4 - 13	1 NTU not to exceed 0.3 NTU in 95% of daily samples in any month	NA	NA
Mercury (ug/l)	1980 - 1987	≤ .1 - .70	0.002 mg/l	0.002 mg/l	NA

*E = estimated value

The State of Montana classifies the Fort Peck Reservoir and the segment of the Missouri River from the Fort Peck Dam to the Milk River confluence as B-2 surface water bodies. B-2 waters are considered suitable for drinking, culinary and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supplies pursuant to the Administrative Rules of Montana 17.30.624. The Fort Peck Reservoir is included on Montana’s 303(d) of water-quality impaired water bodies. DEQ has determined that drinking water use is not supported, and contact recreation use is partially supported. The probable causes of impairment have been identified as lead, mercury, metals, and noxious aquatic plants. The probable sources of impairment have been identified as agriculture, resource extraction, abandoned mining, atmospheric deposition and debris and bottom deposits.

The segment of the Missouri River from the Fort Peck Dam to the Milk River confluence is included on Montana’s 303(d) of water-quality impaired water bodies. DEQ has determined that aquatic life and cold water fishery beneficial uses are partially supported on this segment, and agriculture, contact recreation, and industrial uses are fully supported. The probable causes of impairment for this segment have been identified as flow alteration, other habitat alterations, riparian degradation, and thermal modifications. The probable sources of impairment have been identified as hydromodification and flow regulation/modification.

The State of Montana classifies the segment of the Missouri River from the Milk River confluence to the North Dakota border as a B-3 surface water. B-3 waters are considered suitable for drinking, culinary and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and propagation of non-salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supplies pursuant to the Administrative Rules of Montana 17.30.625. The segment of the Missouri River from the Poplar River confluence to the North Dakota border appears on the Montana 2000 303(d) list as only partially supporting a warm water fishery and aquatic life uses, while fully supporting drinking water, agricultural, and recreational uses. The probable causes of impairment to warm water fishery and aquatic life support uses are identified by DEQ as flow alteration and thermal modifications due to upstream impoundments and flow regulation/modification.

Town of Fort Peck PWS Water Quality

Within the past five years, no positive fecal coliform samples were collected during routine contaminant monitoring. No MCL exceedances were noted for any other constituents monitored over the past five years.

CHAPTER 2 DELINEATION

The source water protection area, the land area that contributes water to the Town of Fort Peck public water supply surface water intake, is delineated in this chapter. The purpose of delineation is to map the source of Fort Peck's drinking water and to define areas within which to prioritize source water protection efforts.

Source water protection areas for surface water sources are subdivided into spill response and watershed regions, each with separate management goals. The spill response region encompasses an area upstream of the Fort Peck PWS in which contaminants can be drawn into the intake with little lag time. The watershed region encompasses a portion of the Fort Peck Reservoir watershed area upstream of the Fort Peck PWS.

Hydrogeologic Conditions

The Missouri River flows east from Fort Peck Reservoir to Fort Peck. The river flow at Fort Peck is controlled by releases from Fort Peck dam. As a result, mean monthly Missouri flows gaged by the USGS near Fort Peck reflect an inverted hydrograph, with relatively higher flows released in August and September, and lower flows released in April, May, and June (Shields et al., 2000).

Snowmelt, direct precipitation, surface runoff, and lateral inflow from alluvial and bedrock aquifers contribute to flow in the Missouri River in the vicinity of Fort Peck, and water to the Fort Peck Reservoir. The Missouri loses water to infiltration through the riverbed to underlying or adjacent aquifers, evapotranspiration, and water withdrawals. Fort Peck Reservoir loses water to releases through the dam, other water withdrawals, infiltration through the bottom of the reservoir to underlying or adjacent aquifers, and evapotranspiration. Water in the Missouri River and the Fort Peck Reservoir originates from numerous tributary drainages as far away as the Madison, Jefferson, and Gallatin headwaters in the southwestern area of Montana. Along the Missouri River's course, flows are altered by numerous irrigation diversions and hydroelectric dams.

Donovan (1988) states that the flow of water within alluvial aquifers in the Missouri River valley is principally controlled by river stage. When pumped, wells finished in close proximity to the river induce river water to flow into the aquifer. Furthermore, he states that high-yield municipal wells finished in Missouri River alluvium and located proximal to the river induce significant infiltration. This hydraulic connection is indicated by generally lower total dissolved solids (TDS) concentrations in wells near the river than those located farther away from the river. These wells have higher TDS concentrations indicative of local ground water (Donovan, 1988).

Using DEQ Source Water Protection Program criteria for ranking aquifer sensitivity (Table 2), Fort Peck source water is considered highly sensitive to contamination. The sensitivity ranking is a result of the surface water source for the Fort Peck PWS.

Table 2. Source water sensitivity criteria (DEQ, 1999).

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)

Conceptual Model and Assumptions

If spilled or discharged directly into the downstream end of Fort Peck Reservoir or in the immediate surrounding area upstream of the Fort Peck dam penstock intakes, contaminants may reach the surface water intake before plant operators can close it. Contaminants derived from sources farther removed from the penstock intakes throughout the watershed may be flushed into tributaries and subsequently into the reservoir during spring snowmelt or storm events, or may infiltrate aquifers which discharge to the reservoir via hydraulic connections.

Delineation Results

Spill Response Region

A modified ½ mile-radius circle was utilized to delineate the spill response region. The region extends 1/2 mile into Fort Peck Reservoir from the penstock intake location ([Figure 4](#)). The ½ mile radius circle was modified along the shoreline of the reservoir to follow the ridgelines dividing the areas within which surface waters drain away from the reservoir, and the areas within which surface waters drain into the reservoir. The region was also modified to incorporate the road that parallels the top of the Fort Peck Dam. The spill response region boundaries were not modified to incorporate ground-water contributions to the PWS, because the ground-water inputs from Bearpaw shale within the inventory were considered negligible. The Bearpaw shale seldom transmits or yields significant quantities of ground water in this region (Perry, 1934).

Watershed Region

The watershed region for the Fort Peck PWS encompasses a portion of the Fort Peck Reservoir watershed upstream of the Town of Fort Peck surface water intake ([Figure 5](#)). The boundaries of three smaller scale 11-digit HUCs (hydrologic unit codes, or watersheds) located immediately upstream of the Fort Peck Dam penstock intakes within the enormous Fort Peck Reservoir watershed were used to delineate the watershed region.

Limiting Factors

The delineations for the Fort Peck PWS spill response region and watershed region are based on fixed-distance and watershed mapping. The spill response region represents an approximation of the distance required for contaminants to reach the surface water intake with little lag time. Numerous assumptions are associated with these Source Water Protection Program (SWPP) criteria for spill response region delineations. Contaminant transport rates and concentrations will vary depending on river and reservoir flow conditions, ground water flux into the river and reservoir, contributions from overland flow, soil types, slope, characteristics of riparian vegetation, the extent of riparian vegetation buffer zones, the extent and duration of contamination, contaminant solution density, adsorption, mechanical dispersion, biological transformation, dilution, molecular diffusion, adsorption, precipitation, oxidation, complexation, and volatilization. As a result, some areas within the spill response region may be more conducive to contaminant transport than others, and should be designated as higher priority areas for source water protection efforts.

CHAPTER 3

INVENTORY

An inventory of potential sources of contamination was conducted to assess the susceptibility of the Fort Peck PWS to contamination, and to identify priorities for source water protection planning. These inventories were conducted within the delineated spill response and watershed regions. The inventory for the Town of Fort Peck PWS focuses on facilities that generate, use, store, transport, or dispose potential contaminants, and on land types on which potential contaminants are generated, used, stored, transported, or disposed. Additionally, the inventory identifies potential sources of all primary drinking water contaminants and *Cryptosporidium*. Only significant potential contaminant sources were selected for detailed inventory. [The significant contaminants posing potential threats to the Town of Fort Peck PWS include nitrate, pathogens, herbicides, and pesticides.] The inventory for the Fort Peck PWS also focuses on all activities in the spill response region, as well as general land uses and large potential contaminant sources in the watershed region.

Inventory Method

Available 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.

Step 2: 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: A business phone directory was consulted to identify businesses that generate, use, or store chemicals in the inventory region. Equipment manufacturing and/or repair facilities, printing or photographic shops, dry cleaners, farm chemical suppliers, and wholesale fuel suppliers were targeted by Standard Industrial Codes.

Step 5: Major road and rail transportation routes were identified.

Step 6. 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:

- | | |
|--|---|
| 1) Large quantity hazardous waste generators | 8) Wastewater lagoons or spray irrigation |
| 2) Landfills | 9) Septic systems |
| 3) Hazardous waste contaminated sites | 10) Sewered residential areas |
| 4) Underground storage tanks | 11) Storm sewer outflows |
| 5) Major roads or rail transportation routes | 12) Floor drains, sumps, or dry wells |
| 6) Cultivated cropland | 13) Abandoned or active mines |
| 7) Animal feeding operations | |

Inventory Results/Spill Response Region

Land covers within the spill response region for the Town of Fort Peck PWS include open water, grassland/herbaceous, evergreen forest, woody wetlands, shrubland, and transportation ([Figure 6](#)). Predominant land covers in the region include open water (62%), grasslands/ herbaceous (16.1%), evergreen forest (12%), and woody wetlands (5.1%) ([Figure 6](#)). There is no cultivated cropland within the spill response region.

Low septic densities occupy the entire spill response region. The Fort Peck municipal sewer system is located well outside of the spill response region within another watershed. The Fort Peck wastewater treatment system discharges to a lagoon located on the west bank of the Missouri River downstream of the Fort Peck Dam and the PWS surface water intake. Main breaks or leaking connections in the system do not pose a threat to the PWS. No concentrated animal feeding operations are located in the spill response region, but grazing is permitted on the Charles M. Russell National Wildlife Refuge. The entire area of the spill response region is located on the wildlife refuge.

Spills of fertilizers, pesticides, volatile organic compounds (VOCs), and synthetic organic compounds (SOCs) could occur along the Montana Route 24, which crosses the dam within the spill response region ([Figure 4](#)). Numbers on the spill response region map ([Figure 4](#)) identify the locations of potential contaminant sources, and correspond to Map ID numbers in Tables 3, 4, 5 and 6.

Table 3. Potential contaminant sources in the spill response region for the Town of Fort Peck PWS.

Source	Address Or Map ID Number	Potential Contaminants	Hazard
Grazing on CMR National Wildlife Refuge	1	pathogens, nitrate	surface runoff into reservoir
Montana Route 24	2	Pesticides, fertilizers, VOCs, SOCs	Spills, storm water runoff into reservoir

Table 4. Significant potential contaminant sources in the spill response region for the Town of Fort Peck PWS.

Source	Address Or Map ID Number	Potential Contaminants	Hazard
Grazing on CMR National Wildlife Refuge	1	pathogens, nitrate	surface runoff into reservoir
Montana Route 24	2	Pesticides, fertilizers, VOCs, SOCs	Spills, storm water runoff into reservoir

Inventory Results/Watershed Region

The watershed region for the Fort Peck PWS encompasses three fifth code hydrologic units in the Fort Peck Reservoir watershed ([Figure 5](#)). Predominant land covers in the watershed region include grasslands/herbaceous (63.2%), open water (25.7%), and shrubland (4.5%) ([Figure 7](#)). Herbicides and fertilizers utilized on cultivated cropland in the recharge region do not constitute significant potential contaminant

sources. The Fort Peck municipal sewage lagoon, located approximately 0.5 miles outside of the spill response region, does not pose a hazard to the PWS because it is located downstream of the Fort Peck Dam and in another watershed. No permitted confined animal feeding operations are located in the watershed region.

Five oil and gas wells are located in the watershed region (Figure 5). All of the wells are development or test wells, and are not currently utilized for oil or gas production. As a result, these wells are not considered significant potential contaminant sources.

The Fort Peck Marina, located approximately two miles west of the Fort Peck Dam, may constitute a significant potential contaminant source within the watershed region (Figure 5).

Table 5. Potential contaminant sources in the watershed region for the Town of Fort Peck PWS.

Source	Address Or Map ID Number	Potential Contaminants	Hazard
Cultivated Cropland	See Figure 7	Fertilizers, pesticides, pathogens, nitrate	Spills, over application, surface runoff into reservoir
Gas and Oil Wells	3	Total Dissolved Solids, Petroleum Hydrocarbons	Migration of brine wastewater into shallow ground water discharging to surface water; surface runoff to surface water
Fort Peck Marina	4	Petroleum Hydrocarbons	Spills directly into reservoir, surface runoff into reservoir

Table 6. Significant potential contaminant sources in the watershed region for the Town of Fort Peck PWS.

Source	Address Or Map ID Number	Potential Contaminants	Hazard
Cultivated Cropland	See Figure 7	Fertilizers, pesticides, pathogens, nitrate	Spills, over application, surface runoff into surface water
Fort Peck Marina	4	Petroleum Hydrocarbons	Spills directly into reservoir, surface runoff into reservoir

Inventory Update

The certified operators of the Fort Peck PWS should update the inventory every year. Changes in land uses or potential contaminant sources should be noted and additions made as needed. The complete inventory should be submitted to DEQ every five years to ensure re-certification of the source water delineation and assessment report.

Inventory Limitations

The extent of the potential contaminant source inventory is limited in several respects. The inventory is based on data readily available through state documents, published reports, and GIS data. Documentation may not be readily available on some potential sources. As a result, all potential contaminant sources may not have been identified. In some instances, inadequate location information precluded the inclusion of potential sources in the inventory.

CHAPTER 4

SUSCEPTIBILITY ASSESSMENT

Susceptibility of Fort Peck's source water is determined by two factors: the potential of a contaminant reaching the intake and the resulting health hazard. Susceptibility is assessed in order to prioritize potential pollutant sources in the spill response region in order to guide management actions undertaken by local entities, in this case the Town of Fort Peck and Valley County.

The goal of source water management is to protect the source water, manage significant potential contaminant sources in the spill response region, and ensure that land use activities in the watershed region pose minimal threats to the source water. Management priorities in the spill response region are determined by ranking the significant potential contaminant sources identified in the previous chapter according to susceptibility. Alternative management approaches that could be pursued by Fort Peck PWS owners and operators to reduce susceptibility are also included in this section of the report.

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 reach the PWS intake (Table 7). The hazard presented by point sources of contaminants in Fort Peck's spill response region depends on whether contaminants can discharge directly to the Fort Peck Reservoir. Point source hazard is also dependent on the health affects associated with potential contaminants (Table 8). Hazard ratings for nonpoint sources are assigned based on criteria listed in Table 9 for septic systems, sanitary sewers, and cropped agricultural land. Barriers can be anything that decreases the likelihood that contaminated water will reach Fort Peck's surface water intake. Examples of barriers include: a vegetated riparian area, protective forest management practices, and dilution.

Table 7. Susceptibility to potential contaminant sources based on 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

Table 8. Hazard of potential contaminant sources for the Fort Peck public water system.

	High Hazard	Moderate Hazard	Low Hazard
Point Sources of All Contaminants	Potential for direct discharge to source water	Potential for discharge to GW that is hydraulically connected to SW	Potential contaminant sources within the watershed
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 % of region	20 to 50 % of region	Less than 20 % of region
Cropped Agricultural Land (% land use)	More than 50 % of region	20 to 50 % of region	Less than 20 % of region

Susceptibility ratings are presented individually for each significant potential contaminant source and each associated contaminant (Table 9). The susceptibility of each well to each potential contaminant source is assessed separately.

Susceptibility Assessment Results

The Town of Fort Peck source water is minimally susceptible to contamination from the grazing on the Charles M. Russell Wildlife Refuge, Montana Route 24, the Fort Peck Marina, and cultivated cropland (Table 9). Table 9 displays the susceptibility assessment results for the Town of Fort Peck PWS surface water intake. The town's intake is susceptible to a limited number of contaminants, including pathogens, nitrates, fertilizers, pesticides, and petroleum hydrocarbons. Tables 3, 4, 5, and 6 list all potential contaminant sources identified in the spill response and watershed regions for the Fort Peck PWS.

The susceptibility results for each significant potential contaminant source identified follow:

Montana Route 24– The potential hazard imposed by pesticides, fertilizers, VOCs and SOCs originating from Montana Route 24 is moderate. The railway poses a moderate hazard because there is limited potential for a spill originating on the road to directly discharge into the Missouri River upstream from Fort Peck's surface water intake. The susceptibility of the Fort Peck PWS to pesticides, fertilizers, VOCs and SOCs originating from this source is low. Multiple barriers identified for this source include dilution in the Fort Peck Reservoir and the limited traffic utilizing this route as a transportation corridor.

Agricultural lands – The potential hazard imposed by pathogens and nitrate originating from agricultural lands is moderate. Cropped agricultural lands occupy 35% of the spill response region, and 46% of the watershed, falling between 20% and 50% of the total areas of the regions, respectively. The susceptibility of the intake to these agricultural sources of nitrate and pathogens is also moderate due to the presence of a single barrier. Adequate dilution is provided by the Missouri River to reduce water quality impacts to nonsignificant levels.

Fort Peck Marina – The potential hazard imposed by pathogens and nitrate originating from the Fort Peck Marina is low. Potential does exist for direct discharge of motorboat petroleum hydrocarbons into the Fort Peck Reservoir at this location, but the marina is located approximately four miles west of the spill response region. Any petroleum spills at the location of the marina would likely be significantly diluted in the Fort Peck Reservoir prior to reaching the Fort Peck surface water intake at the penstocks.

Grazing on Charles M. Russell National Wildlife Refuge – The potential hazard imposed by pathogens and nitrate originating from grazing on the Charles M. Russell National Wildlife Refuge is low. Grazing poses a low hazard because it will not likely result in concentrated discharges of animal waste and associated pathogens and nitrates into Fort Peck Reservoir or shallow glacial aquifers in the vicinity of the reservoir.

Table 9. Susceptibility assessment for significant potential contaminant sources in the spill response and watershed regions for the Town of Fort Peck PWS surface water intake.

Source	Contaminant	Map ID Number	Hazard	Hazard Rating	Barriers	Susceptibility	Management Recommendations
Montana Route 24	Pesticides, fertilizers, VOCs, SOCs	2	Spills, storm water runoff into reservoir	Moderate	Dilution; Limited traffic on this rural route	Low	Maintain preparedness of local emergency personnel through active training
Cultivated Cropland	Fertilizers, pesticides, pathogens, nitrate	See Figure 7	Spills, over application, surface runoff	Low	Dilution	Low	Educate landowners on the proper handling, storage, and disposal of pesticides and fertilizers; utilization of agricultural best management practices
Fort Peck Marina	Pathogens, nitrate	4	Spills directly into reservoir, surface runoff into reservoir	Low	Dilution	Low	Maintain preparedness of local emergency personnel through active training; utilize waste recycling and minimization
Grazing on CMR National Wildlife Refuge	pathogens, nitrate	1	Surface runoff into reservoir	Low	Dilution	Low	Implementation of grazing rotation best management practices (BMPs), focusing on reservoir riparian zones

Management Recommendations

Management recommendations are included in the susceptibility table for the Fort Peck PWS (Table 9). If these management recommendations are implemented, they may be considered additional barriers that will reduce the susceptibility of Fort Peck’s intake to specific sources and contaminants.

Management recommendations fall into the following categories:

- Agricultural best management practices
- Stormwater management
- Education
- Emergency Response Plan

Agricultural best management practices (BMPs) – BMPs that address application and mixing of fertilizer and pesticides are a viable alternative to prohibition of their use. BMPs are generally voluntary but their implementation can be encouraged through education and technical assistance. BMPs may also be utilized to minimize surface runoff and soil erosion on cultivated fields, and to minimize riparian vegetation impacts from grazing.

Stormwater management – Stormwater planning should address source and drainage control. Source control can be accomplished through educational programs focusing on residential and commercial

chemical use, disposal, and recycling. Drainage control and pollutant removal can be accomplished through the use of vegetated detention basins at outfall locations.

Education - Educational workshops provided to the general public by the city, county, or state promote safe handling and proper storage, transport, use, and disposal of hazardous materials. Ongoing training provided to designated emergency personnel will promote the efficiency and effectiveness of emergency responses to hazardous material spills. Likewise, educational workshops provided to rural homeowners will promote the proper maintenance and replacement of residential septic systems. The EPA and the State of Montana can provide educational materials on these topics.

Emergency Response Plan - An Emergency Response Plan should be compiled and adopted by the Town of Fort Peck and Valley County. The effectiveness of this response plan will be maximized if it is updated on an annual basis to reflect changes in emergency contacts, emergency numbers, and resources available within the county to respond to an emergency situation, such as a hazardous material spill.

The Town of Fort Peck PWS operator, the Town administration, and the Valley County administration should consider these management recommendations. Should contamination reach the town's intake, the City and County will likely need to work cooperatively to address remediation or relocation of the Fort Peck PWS source. Editorial contributions from the Fort Peck PWS operator and the Town of Fort Peck administration have been solicited and incorporated into this report.

Monitoring Waivers

Monitoring Waiver Requirements

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

Use Waivers

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

Susceptibility Waivers

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

investigation for the use of organic chemicals. Shallow groundwater sources under the direct influence of surface water (GWUDISW) should use the same area of investigation as surface water systems; that is, the watershed area above the source, or a minimum fixed radius of 1.5 miles upgradient of the point of diversion. The purpose of the vulnerability assessment procedures outlined in this section is to determine which of the organic chemical contaminants are in the area of investigation.

Given the wide range of landforms, land uses, and the diversity of groundwater and surface water sources across the state, additional information is often required during the review of a waiver application. Additional information may include well logs, pump test data, or water quality monitoring data from surrounding public water systems; delineation of zones of influence and contribution to a well; Time-of-Travel or attenuation studies; vulnerability mapping; and the use of computerized groundwater flow and transport models. Review of an organic chemical monitoring waiver application will be conducted by DEQ's Public Water Supply Section and DEQ's Source Water Protection Program. Other state agencies may be asked for assistance.

Susceptibility Waiver for Surface Water

Shallow unconfined aquifers and surface water bodies are the most common source of usable groundwater in Montana. Unconfined aquifers and many surface water bodies are usually locally recharged by precipitation. In general, shallow groundwater flow gradients in unconfined aquifers reflect surface topography, and the residence time of water in the aquifer is comparatively shorter than for water in confined aquifers. Residence time in surface water bodies such as streams and narrow lakes is considered small, as the water moves through the system rather quickly. Water contained in large lakes and reservoirs may have variable residence times based on seasonal turnover, inversions, stagnant depths or reaches of the lake water, and throughput of water in the water body. Similar water chemistry often exists between shallow unconfined groundwater and surface water, and physical parameters and dissolved constituents can be an indicator of the hydraulic connection between groundwater and surface water. Consequently, unconfined aquifers can be susceptible to contamination by organic chemicals migrating from the ground surface to groundwater. Alternately, surface water bodies directly or indirectly receive a considerable percentage of their water from groundwater. Therefore, surface water can be susceptible to contamination by organic chemicals migrating from groundwater into the surface water.

The objective of the susceptibility waiver application is to assess the potential of organic chemical migration of contaminants into surface water that is used as a source. The general procedures make use of a combination of site-specific information pertaining to the location and construction of the water source development, monitoring history of the source, geologic/hydrologic characteristics of the source water, and chemical characteristics of the organic chemicals pertaining to their mobility and persistence in the environment. The area of contribution to the surface water body at the PWS intake must be defined and plotted. This should describe the water flow directions, stream discharge and velocity, residence time of water in the lake or reservoir (if the information is available). All surface bodies within a 1,000 feet of the PWS well(s) must be plotted. The Montana DEQ Source Water Protection Program typically will delineate and assess a larger (more conservative) area called a Spill Response Region that extends 1/2 mile downstream and approximately 10 miles upstream of the PWS surface water intake. It encloses the shoreline of any lakes along the length of the region. The width of the region extends 1/2 mile surrounding any lakes and on either side of the primary stream tributaries. Analytical monitoring history of the PWS intake should also be provided as part of the susceptibility waiver application.

Waiver Recommendation

Based on past monitoring results and the susceptibility assessment of the Fort Peck PWS intake, the Fort Peck PWS appears to be eligible for additional monitoring waivers. See Table 10 for the affect of identified potential contaminant sources on monitoring waiver eligibility for the Fort Peck PWS. Currently, Fort Peck has no monitoring waivers. Fort Peck may be eligible for a Phase II inorganic chemicals (barium, cadmium, chromium, flouride, mercury, and selenium) and a Phase V inorganics monitoring waiver (antimony, thallium, beryllium, and nickel), as well as volatile organics and semivolatile organics waivers. For further monitoring waiver consideration, the Fort Peck PWS should submit a letter to DEQ requesting additional monitoring waivers. The PWS also needs to provide additional information to DEQ regarding chemical use within the inventory region.

Table 10. Susceptibility assessment for significant potential contaminant sources in the spill response region for the Town of Fort Peck PWS surface water intake.

Source	Contaminant	Map ID Number	Susceptibility	Waiver Eligibility
Montana Route 24	Fertilizers, pesticides, SOCs, VOCs	2	Low	No or little affect on eligibility
Cultivated Cropland	Pesticides, fertilizers, VOCs, pathogens, nitrate	See Figure 7	Low	No or little affect on eligibility
Fort Peck Marina	Petroleum Hydrocarbons	4	Low	No or little affect on eligibility
Grazing on CMR National Wildlife Refuge	Nitrate, pathogens	1	Low	No affect on eligibility

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APPENDICES

APPENDIX A

PWS SITE PLAN

APPENDIX B

SANITARY SURVEY

APPENDIX C

CONCURRENCE LETTER