ATTACHMENT B - SUMMARY OF PERMITTED POINT SOURCES IN THE FLATHEAD LAKE BASIN

Summary of Permitted Point Sources in the Flathead Lake Basin

June 27, 2013

Public Review Draft

U.S. Environmental Protection Agency
Montana Operations Office
10 West 15th Street, Suite 3200
Helena, MT 59601

Revision History

Document Name	Revision	Release Date	Revisions
Summary of Permitted Point Sources in the Flathead Lake Basin – Stakeholder Review Draft	1.0	July 21, 2011	Draft sent to public entities that contributed data and information to the report.
Summary of Permitted Point Sources in the Flathead Lake Basin – Stakeholder Review Draft	2.0	September 28, 2011	Incorporated comments from stakeholders.
Summary of Permitted Point Sources in the Flathead Lake Basin – Stakeholder Review Draft	3.0	June 27, 2013	Updated with data through 2012. Reorganized by permit type.

CONTENTS

Tables

Figures

Abbreviations and Acronyms

BOD	biochemical oxygen demand
DEQ	Montana Department of Environmental Quality
DFWP	Montana Department of Fish, Wildlife and Parks
DO	dissolved oxygen
DMR	discharge monitoring reports
FCCHD	Flathead City-County Health Department
LCWSD	Lakeside County Water and Sewer District
MLWSD	Meadow Lake Water and Sewer District
MPDES	Montana Pollutant Discharge Elimination System
PCB	polychlorinated biphenyls
SCWSD	Somers County Water and Sewer District
TDS	total dissolved solids
TKN	total Kjeldahl nitrogen
TPN	total persulfate nitrogen
TSS	total suspended solids
U.S. EPA	U.S. Environmental Protection Agency
WTP	water treatment plant
WWTF	wastewater treatment facility
WWTP	wastewater treatment plant

Units of Measure

BTU	British thermal unit
°C	degrees Celsius
cfs	cubic foot per second
cfu	colony forming unit
gpd	gallons per day
lb/d	pounds per day
µS/cm	microsiemen per centimeter
mgd	million gallons per day
mg/L	milligrams per liter
mL	milliliters
NTU	Nephelometric turbidity units

Foreword

A series of brief technical reports have been prepared by the U.S. Environmental Protection Agency (EPA) in support of an effort by the Montana Department of Environmental Quality (DEQ) and EPA to establish Total Maximum Daily Loads (TMDLs) for nutrients and set up a water quality simulation model for the Flathead Basin. The series includes separate reports covering a broad range of topics including:

- Groundwater Quality and Hydrology
- Urban Stormwater Sources
- Point Source Discharges
- Agriculture/Irrigation
- Timber Harvest
- Forest Fires
- Roads
- Septic Systems
- Lakes and Reservoirs
- Existing and historic water quality in nutrient impaired waters

When combined, these technical reports are intended to define a preliminary conceptual understanding of the current water quality conditions relative to nutrients, sources of nutrients, and the ways in which water and nutrients are transported within the Flathead Lake basin. The information presented in this series of technical reports will be used to inform the modeling and TMDL processes.

It should be noted that the data and information presented in these reports reflects what was available at the time that the reports were published. It is acknowledged that in some cases, not all data could be compiled by the publication date. Additional information will be incorporated into the modeling and TMDL processes as it becomes available.

Executive Summary

Point sources (e.g., wastewater treatment plants, industrial facilities, fish hatcheries) are one of many potentially significant sources of pollutants within the Flathead Lake. The purpose of this technical report is to provide a summary of the extent and type of point sources that are located within the Flathead Lake basin. This report specifically focuses on the Montana Pollutant Discharge Elimination System (MPDES) permitted point sources, including those facilities covered under individual, general, and groundwater permits. Facilities or activities that are permitted to discharge stormwater are discussed in the context with other urban stormwater sources in the technical report titled, *Summary of Urban Stormwater Sources in the Flathead Lake Basin*.

There are 419 facilities in the Flathead Lake basin that are permitted to discharge wastewater to surface water or groundwater. Of the 419 permits, 275 are general MPDES permits for stormwater discharges. The facilities with individual permits consist of publicly owned water and wastewater treatment plants (WWTPs), industrial sites, fish hatcheries, and smaller privately owned treatment systems. Facilities with individual MPDES or Montana Groundwater Pollution Control System (MGWPCS) permits are summarized with their receiving waterbodies in Table 1.

Facility size (and design flow) varies from small package plants (e.g., Yellow Bay WWTP, with a design flow of 33,000 gallons per day) to large publically owned treatment plants (e.g., Kalispell WWTP, with a design flow of 5.4 million gallons per day). Permit limits vary for each facility and eight facilities have nitrogen or phosphorus permit limits.

Flow and water quality data were obtained from discharge monitoring reports (DMRs) and facility records to characterize the effluent. Based on the available data, the facilities that discharged the largest estimated loads of total phosphorus in 2012 were Whitefish WWTP (1,660 lbs/yr), Kalispell WWTP (1,318 lbs/yr), Columbia Falls WWTP (513 lbs/yr), and Bigfork Water and Sewer District WWTF (237 lbs/yr). Total nitrogen loads were estimated at 34 tons, 32 tons, 3.2 tons, 3.6 tons, respectively.

Nutrient loads from the four largest facilities varied over time based on technology upgrades and population growth. For example, upgrades to the Whitefish treatment plant in 1987 reduced total phosphorus loads from approximately 11,000 lbs/yr in 1986 to 1,800 lbs/yr in 1990. A brief analysis of trends at the four facilities (since the most recent plant upgrade) show generally increasing trends in flow, total phosphorus, and total nitrogen. For example, a comparison of the annual flow in the year following the most recent plant upgrade to the most recent annual flow indicates that they have increased at each plant (Kalispell WWTP by 34 percent; Whitefish WWTP by 4 percent; Columbia Falls WWTP by 3 percent; and Bigfork WWTF by 38 percent). Total phosphorus loads have similarly increased at the Kalispell and Columbia Falls WWTPs (43 and 52 percent, respectively).

Table 1. Individually permitted point sources in the Flathead Lake basin

Facility	Permit	Receiving waterbody
Bigfork Water and Sewer District WWTF	MT0020397	Flathead Lake
BNSF Railway KRY Site Petroleum Cleanup	MT0031739	Stillwater River
BN Whitefish Facility	MT0000019	Whitefish River
Columbia Falls Aluminum Company	MT0030066	Flathead River
Columbia Falls WWTP	MT0020036	Flathead River
Cove Creek Ridge Subdivision (TLW Properties LLC)	MTX000199	groundwater
Creston National Fish Hatchery	MT0031771 [a]	-- [a]
Crown Jewel Estates	MTX000200 [a]	groundwater
Donald G. Abbey, (aka Abbey Main House)	MT0030651	Flathead Lake
Ehrman Lease Subdivision	MTX000133 [b]	groundwater
FH Stoltze Land and Lumber Company	MTX000228 [b]	groundwater
Fox Hill Subdivision	MTX000173 [a]	groundwater
Gary Tallent (aka Tallent Home Project)	MT0031607 [b]	-- [b]
Glacier Gold, L.C.C.	MT0000999 [a]	-- [a]
Glacier International Airport Rental Car Facility Car Wash (FCA Rentals LLC)	MTX000220	groundwater
Glacier Ranch Subdivision	MTX000164	groundwater
Hungry Horse Wastewater Treatment Plant	MTX000193	groundwater
Hungry Horse Dam WWTP	MT0022578	South Fork Flathead River
International RV LLC (aka Paradise Pines RV Condominiums)	MTX000120 [b]	groundwater
John Collins Pool House	MT0031658	Whitefish Lake
Kalispell WWTP, city of	MT0021938	Ashley Creek
Kelsey Subdivision WWTF	MTX000155 [b]	groundwater
Kootenai Lodge Lake County Water and Sewer District	MTX000188	groundwater
Lake McDonald (Glacier National Park) WWTP	MT0030601	groundwater [c]
Meadow Dairy Gold	MTX000066	groundwater
Paradise Cove RV Condominium Community	MTX000183 [b]	groundwater
Plum Creek Manufacturing Facility	MTX000092	groundwater
Point of Pines Wastewater Treatment System	MTX000214	groundwater
Polson WWTP, city of	MT00020559	Flathead River
Stampede Packing Company (aka Meat Production Inc.)	MTX000100	groundwater
Whitefish WTP, city of	MT0030414	unnamed reservoir [d]
Whitefish WWTP, city of	MT0020184	Whitefish River
Yellow Bay (Flathead Lake Biological Station) WWTP	MT0023388	Flathead Lake

Notes

aka = also known as; LLC = limited liability company; RV = recreational vehicle; WTP = water treatment plant; WWTF = wastewater treatment facility; WWTP = wastewater treatment plant.

a. Montana DEQ identified the permit as pending (i.e., no permit has been written and no previous permit was written that could be administratively continued).

b. Montana DEQ identified the permit as no longer necessary (e.g., the permit was terminated).

c. The Lake McDonald WWTP discharges to groundwater that is hydrologically connected to McDonald Creek and the Middle Fork Flathead River.

d. The Whitefish WTP discharges to an unnamed reservoir in an unnamed tributary to Whitefish Lake.

1.0 Introduction

This is one of a series of brief technical reports prepared in support of an effort by the Montana Department of Environmental Quality (DEQ) and U.S. Environmental Protection Agency (EPA) to establish Total Maximum Daily Loads (TMDLs) for nutrients, sediment, and temperature and set up a water quality simulation model for the Flathead Lake basin. Point sources (e.g., wastewater treatment plants, industrial facilities, fish hatcheries) are one of many potentially significant sources of pollutants within the Basin that will ultimately be considered in the modeling effort. The purpose of this technical report is to provide a summary of the extent and type of point sources that are within the Flathead Lake basin. This report specifically focuses on the Montana Pollutant Discharge Elimination System (MPDES) permitted point sources, including those facilities covered under individual or general MPDES permits. Permitted groundwater discharges, under the Montana Ground Water Pollution Control System (MGWPCS), are also discussed. Facilities or activities that are permitted to discharge stormwater are discussed in the context with other urban stormwater sources in the technical report titled, *Summary of Urban Stormwater Sources in the Flathead Lake Basin*. The information contained in this technical report will be used to inform the modeling and TMDL processes, which will ultimately be used to define, and put into context, at the watershed-scale, the potential significance of permitted point sources as a source of pollutants in the Flathead Lake basin.

This document presents a summary of available information and data for each permitted facility, including a brief characterization of each facility and an evaluation of water quality data. At the time of this report, there were 419 permitted facilities in the basin, 17 of which are covered by individual MPDES permits and 16 of which are covered by MGWPCS permits (Table 2). Summaries of the permit limits for total phosphorus, total nitrogen, and total suspended solids (TSS) are provided in Table 3, Table 4, and Table 5, respectively. The following sections discuss each permitted facility individually.

Table 2. Summary of the types of permits in the Flathead Lake basin

Permit	Number of permitees
Individual MPDES	17
Individual MGWPCS	16
General MPDES	
Non-stormwater	
Biosolids	6
CAFO	1
Construction dewatering	11
Disinfected waters	2
Fish farms	2
Pesticide	6
Petroleum cleanup	1
Stormwater	
Construction Activity	255
Industrial Activity	9
MS4	1
No Exposure	5
Montana Permits	
Section 308	11
Section 318	75
Facilities not covered by permits	6

Note: CAFO = concentrated animal feeding operation; MGWPCS = Montana Ground Water Pollution Control System; MPDES = Montana Pollutant Discharge Elimination System; MS4 = municipal separate storm sewer system.

Table 3. Facilities covered by individual MPDES permits with total phosphorus limits

Permitee (effective date)	Facility type	Receiving waterbody	Design flow (mgd)	Concentration (mg/L) [a]		Load (lb/d) [b]		
				Max.	30-d avg.	Max.	30-d avg.	Ann. avg.
Kalispell WWTP (9/1/2008)	public sewerage system	Ashley Creek	5.4	--	1.0	--	25.8	--
Whitefish WWTP (9/1/2008)	public sewerage system	Whitefish River	1.8	--	1.0	--	10.4	--
Bigfork WSD WWTF (8/1/2010)	public sewerage system	Flathead Lake	0.69	--	1.0	--	4.2	--
Columbia Falls WWTP (5/1/2010)	public sewerage system	Flathead River	0.550	--	1.0	--	4.6	--
Lake McDonald WWTP (1/1/2012)	public sewerage system	groundwater [c]	0.25	--	0.7	--	1.2	--
BN Whitefish Facility (11/1/2009)	railroads, line-haul operations	Whitefish River	0.096	1.0	--	0.6	--	--
Yellow Bay WWTP (7/1/2012)	industrial sewerage system	Flathead Lake	0.033	--	--	--	--	2.0
Hungry Horse Dam WWTP (11/1/2008)	public sewerage system	South Fork Flathead River	0.009	--	1.0 [d]	--	0.8 [d]	--

Notes
The table is sorted from top to bottom by design flow from largest to smallest.
mgd = million gallons per day; MPDES = Montana Pollutant Discharge Elimination System; WSD = water and sewer district; WWTP = wastewater treatment facility; WWTP = wastewater treatment plant.
a. Concentration limits, in milligrams per liter (mg/L) as phosphorus, for either a daily maximum (max.) or thirty-day average (30-d avg.).
b. Load limits, in pounds per day (lb/d), for a daily maximum (max.), thirty-day average (30-d avg.) or annual average (ann. avg.).
c. The Glacier National Park's Lake McDonald WWTP discharges to groundwater that is hydrologically connected to McDonald Creek and the Middle Fork Flathead River.
d. Limits only apply to outfall 001 at the Hungry Horse Dam WWTP.

Table 4. Facilities covered by individual MPDES permits with total nitrogen limits

Permitee (issue date)	Facility type	Receiving waterbody	Design flow (mgd)	Conc. (mg/L) [a]	Load (lb/d) [b]			
				30-d avg.	Max.	Wk. avg.	30-d avg.	Ann. avg.
Kalispell WWTP (9/1/2008)	public sewerage system	Ashley Creek	5.4	--	--	379	286	--
Whitefish WWTP (9/1/2008)	public sewerage system	Whitefish River	1.8	--	426		273	
Bigfork WSD WWTF (8/1/2010)	public sewerage system	Flathead Lake	0.69	--	--	52.2	42.1	--
Columbia Falls WWTP (5/1/2010)	public sewerage system	Flathead River	0.550	--	--	63.5	37.1	--
Lake McDonald WWTP (1/1/2012)	public sewerage system	groundwater [c]	0.25	7.0	--	--	11.7	--
BN Whitefish Facility (11/1/2009)	railroads, line-haul operations	Whitefish River	0.096	--	20		--	--
Yellow Bay WWTP (7/1/2012)	industrial sewerage system	Flathead Lake	0.033	--	--	--	--	154

Notes

The table is sorted from top to bottom by design flow from largest to smallest.

mgd = million gallons per day; MPDES = Montana Pollutant Discharge Elimination System; WSD = water and sewer district; WWTP = wastewater treatment facility; WWTP = wastewater treatment plant.

a. Concentration limits, in milligrams per liter (mg/L) as nitrogen, for a daily maximum (max.).

b. Load limits, in pounds per day (lb/d), for a daily maximum (max.), weekly or seven day average (wk. avg.), thirty-day average (30-d avg.) or annual average (ann. avg.).

c. The Glacier National Park's Lake McDonald WWTP discharges to groundwater that is hydrologically connected to McDonald Creek and the Middle Fork Flathead River.

Table 5. Facilities covered by individual MPDES permits with TSS limits

Permitee (issue date)	Facility type	Receiving waterbody	Design flow (mgd)	Concentration (mg/L) [a]			Load (lb/d) [b]		
				Max.	Wk. avg.	30-d avg.	Max.	Wk. avg.	30-d avg.
Kalispell WWTP (9/1/2008)	public sewerage system	Ashley Creek	5.4	--	15	10	--	388	259
Whitefish WWTP (9/1/2008)	public sewerage system	Whitefish River	1.8	--	45	30	--	469	313
Bigfork WSD WWTF (8/1/2010)	public sewerage system	Flathead Lake	0.69	--	33	22	--	188	125
Polson WWTP (1/1/2013)	public sewerage system	Flathead River	0.650	--	135	100	--	--	--
Columbia Falls WWTP (5/1/2010)	public sewerage system	Flathead River	0.550	--	45	30	--	206	138
Lake McDonald WWTP (1/1/2012)	public sewerage system	groundwater [c]	0.25	--	45	30	--	75	50
BN Whitefish Facility (11/1/2009)	railroads, line-haul operations	Whitefish River	0.096	30	--	--	16	--	--
Yellow Bay WWTP (7/1/2012)	industrial sewerage system	Flathead Lake	0.033	--	45	30	--	--	--
BNSF Railway KRY Site (9/1/2012)	petroleum cleanup	Stillwater River	0.025	11.3	--	--	--	--	--
Hungry Horse Dam WWTP (11/1/2008)	public sewerage system	South Fork Flathead River	0.009	--	45 [d]	30 [d]		2.25	1.5
Columbia Falls Aluminum Company (2/1/1999)	aluminum production	Flathead River	n/a	--	45 [e]	30 [e]	--	--	--

Notes

The table is sorted from top to bottom by design flow from largest to smallest.

mgd = million gallons per day; MPDES = Montana Pollutant Discharge Elimination System; n/a = not available (i.e., not reported); TSS = total suspended solids; WSD = water and sewer district; WWTP = wastewater treatment facility; WWTP = wastewater treatment plant.

a. Concentration limits, in milligrams per liter (mg/L), for a daily maximum (max.), weekly or seven day average (wk. avg.), or thirty-day average (30-d avg.).

b. Load limits, in pounds per day (lb/d), for a daily maximum (max.), weekly or seven day average (wk. avg.), or thirty-day average (30-d avg.).

c. The Glacier National Park's Lake McDonald WWTP discharges to groundwater that is hydrologically connected to McDonald Creek and the Middle Fork Flathead River.

d. Limits only apply to outfall 001 at the Hungry Horse Dam WWTP.

e. Limits only apply to outfall 005 at the Columbia Falls Aluminum Company.

2.0 Individual MPDES Permits

Seventeen facilities with individual MPDES permits are allowed to discharge effluent to surface waters in the Flathead Lake basin (Table 6). The surface water discharges are issued permits that begin with MT. Required monitoring data, in the form of discharge monitoring reports (DMR), were downloaded from ISIS and provided by U.S. EPA Region 8[1] for all of these facilities (hereafter cited as *U.S.EPA 2013b*). Additional data were provided by certain facilities. All available data are presented in this section. Facilities without current permits (see footnotes *a* and *b* in Table 6) are not further discussed.

Table 6. Individual MPDES permits in the Flathead Lake basin

Permit no.	Name
MT0000019	BN Whitefish Facility
MT0000999 [a]	Glacier Gold, L.C.C.
MT0020036	Columbia Falls WWTP
MT0020184	Whitefish WWTP
MT0020397	Bigfork Water and Sewer District WWTF
MT0020559	Polson WWTP
MT0021938	Kalispell WWTP
MT0022578	Hungry Horse Dam WWTP
MT0023388	Yellow Bay (Flathead Lake Biological Station) WWTP
MT0030066	Columbia Falls Aluminum Company
MT0030414	Whitefish WTP
MT0030601	Lake McDonald (Glacier National Park) WWTP
MT0030651	Donald G. Abbey (aka Abbey Main House)
MT0031607 [b]	Gary Tallent (aka Tallent Home Project)
MT0031658	John Collins Pool House
MT0031739	BNSF Railway KRY Site Petroleum Cleanup
MT0031771 [a]	Creston National Fish Hatchery

Notes
aka = also known as; BNSF = Burlington North Santa Fe; WTP = water treatment plant; WWTF = wastewater treatment facility; WWTP = wastewater treatment plant.
a. Montana DEQ identified the permit as pending (i.e., no permit has been written and no previous permit was written that could be administratively continued).
b. Montana DEQ identified the permit as no longer necessary (e.g., the permit was terminated).

For additional information, the Flathead City-County Health Department (FCCHD) has studied public WWTP and sewer system infrastructure and evaluated potential expansion of each sewer system. FCCHD published its findings in two reports:

- *Flathead County Wastewater Study* (FCCHD 2009)
- *Sewage Treatment in the Flathead Basin* (FCCHD 2012)

[1] Jason Gildea, U.S. EPA Region 8 Montana Operations Office, compiled DMR data for all permitted facilities in Flathead, Lake, and Missoula counties and compiled all available MPDES permits from DEQ for individually permitted facilities in the Flathead Lake basin.

2.1 Burlington Northern Whitefish Facility (MT0000019)

The Burlington Northern Santa Fe Rail Yard is in Whitefish, Montana just downstream of Whitefish Lake and near the Whitefish River (Figure 1). The facility operates a three-cell facultative settling pond treatment system that receives wastewater from the Roundhouse shop, track pans, a groundwater remediation system, and a stormwater collection system (DEQ 1999). The facility was upgraded in 1998 to improve treatment by adding a lagoon cell and increasing residence time throughout the system (DEQ 1999). The current design flow of the system is 0.096 mgd.

The treatment facility is permitted to discharge effluent to the Whitefish River from one outfall (#001; refer to Figure 1) (DEQ 1999, 2009). The most recent MPDES permit limits for the outfall are shown in Table 7. The permit also requires the pH of the effluent to remain between 6.0 and 9.0 standard units and there cannot be any visible foam, oil sheen, or floating solids in the effluent.

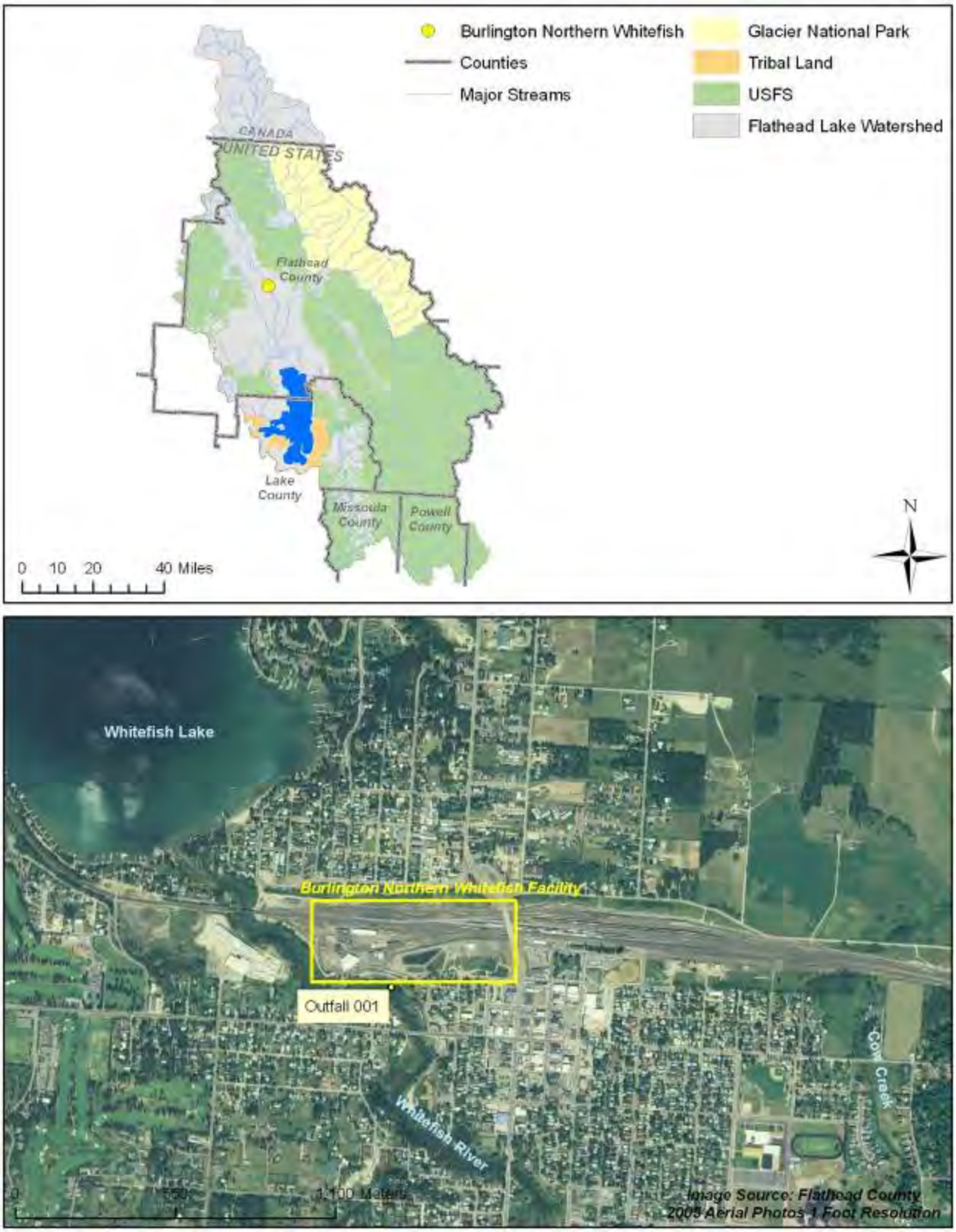


Figure 1. Burlington Northern Whitefish Facility and permitted outfall.

Table 7. Burlington Northern Whitefish Facility final permit limits

Constituent	Units	Maximum daily limit
BOD_5	mg/L	30
	lb/d	16
Cadmium (total recoverable)	mg/L	0.0018
Total Nitrogen	lb/d	20
Oil & Grease	mg/L	<10
Total Phosphorus	mg/L	1.0
	lb/d	0.6
TSS	mg/L	30
	lb/d	16

Source: DEQ 2009
Note: BOD_5 = five day biological oxygen demand; lb/d = pounds per day; mg/L = milligrams per liter; TSS = total suspended solids.

Table 8 summarizes the available effluent water quality data for outfall #001, which were obtained from ICIS (U.S. EPA 2013b). The average effluent flow from 2000 to 2012 was 0.0928 cfs, with an average total phosphorus concentration of 0.0261 mg/L and an average total nitrogen concentration of 0.86 mg/L.

Table 8. Burlington Northern Whitefish Facility data summary

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	4/10/2000	9/18/2009	23	0.178	0.01	0.95
BOD, 5-day, 20 °C	4/10/2000	9/18/2009	23	4.41	1	10
Flow rate (cfs)	4/10/2000	10/3/2012	36	0.0928	0.00303	0.543
Nitrogen (total) (mg/L)	4/10/2000	9/18/2009	23	0.86	0.28	2.71
NO2NO3 (total as N) (mg/L)	4/10/2000	9/18/2009	23	0.145	0.005	1.78
Phosphorus (total) (mg/L)	4/10/2000	9/18/2009	23	0.0261	0.005	0.08
Temperature (°C)	4/10/2000	9/18/2009	22	16.2	3.33	25
TKN (total as N) (mg/L)	4/10/2000	9/18/2009	23	0.712	0.11	2.39
TSS (mg/L)	4/10/2000	9/18/2009	23	2.95	0.5	5.5

Source of data: ICIS (U.S. EPA 2013b)
Notes
DMR records from ICIS are monthly averages.
avg. = average (arithmetic mean); BOD = biological oxygen demand; C = Celsius; cfs = cubic feet per second; lb/d = pounds per day; max. = maximum; mg/L = milligrams per liter; min. = minimum; N = nitrogen; NO2NO3 = nitrite plus nitrate; P = phosphorus; TKN = total Kjeldahl nitrogen; TSS = total suspended solids.

2.2 Columbia Falls WWTP (MT0020036)

The City of Columbia Falls operates a wastewater treatment facility near the Flathead River just downstream of the City (Figure 2). The facility serves a population of approximately 4,000 people located in and around Columbia Falls (Figure 3), including the Meadow Lake Water and Sewer District (MLWSD) that serves a mostly seasonal population (FCCHD 2009, 2012).

Until 1980, the city used an aerated lagoon for wastewater treatment. A new facility was built in 1980 on the same site. Secondary treatment was added in 1984, and a tertiary phosphorus removal facility was added in 1988.[2] The facility uses alum in a flocculating clarifier for phosphorus removal (FCCHD 2009). In 2001, the facility added a sophisticated Supervisory Control and Data Acquisition (SCADA) system[3], a dissolved air flotation thickener (DAFT), and a belt filter press; tripling of the digester capacity and rehabilitation of the sludge storage basin.

In 2009, the city performed another major upgrade of the facility including the following: upgrade and modernization of the pretreatment building; convert the existing aeration basin to a flow equalization basin; construct a new bioreactor tank; upgrade the aeration supply equipment; and convert effluent disinfection from chlorine dosing to ultraviolet means. There were also improvements to the existing SCADA system. The bulk of the new construction was a 750,000 gallon bioreactor, consisting of two anaerobic basins, two anoxic basins, and one long aeration basin cordoned off into three separate zones. Biological nutrient removal is accomplished through the use of the new basins, largely negating the need for the tertiary phosphorus removal facility[4]. The design flow of the facility increased from 0.55 mgd to 0.62 mgd. The average daily flow in 2011 was 0.406 mgd (FCCHD 2012).

Columbia Falls operates eight lift stations. MLWSD owns and operates three lift station and its own collection system (FCCHD 2012). In 1985, the MLWSD lift station began operation (FCCHD 2009). Under the current agreement, the Columbia Falls WWTP will accept and treat up to 35 million gallons per year from MLWSD, which may not exceed a rate of 80,000 gpd (FCCHD 2012). In 2009, approximately 12 percent[5] of Columbia Falls WWTP treatment capacity was used for the Meadow Lake Sewer District (0.043 mgd or 0.350 mgd) (FCCHD 2009).

The WWTP is permitted to discharge effluent to the Flathead River from one outfall (#001) (DEQ 2010a). The most recent MPDES permit limits for the outfall are shown in Table 9. Additionally, the permit also requires the pH of the effluent to remain between 6.0 and 9.0 standard units and there cannot be any visible foam, oil sheen, or floating solids in the effluent. The permit also requires an 85 percent reduction in TSS and BOD_5 and for there to be no acute toxicity. The concentration of total residual chlorine cannot exceed 0.5 mg/L in any individual sample.

[2] Hugh Robertson, operator, Columbia Falls WWTP, personal communication, June 2, 2008.
[3] The term SCADA refers to centralized systems that monitor and control entire industrial sites.
[4] Hugh Robertson, operator, Columbia Falls WWTP, personal communication, September 19, 2011.
[5] Columbia Falls WWTP treated 0.350 mgd and 0.043 mgd was from the Meadow Lake County Sewer District.

Figure 2. Columbia Falls WWTP permitted outfall.

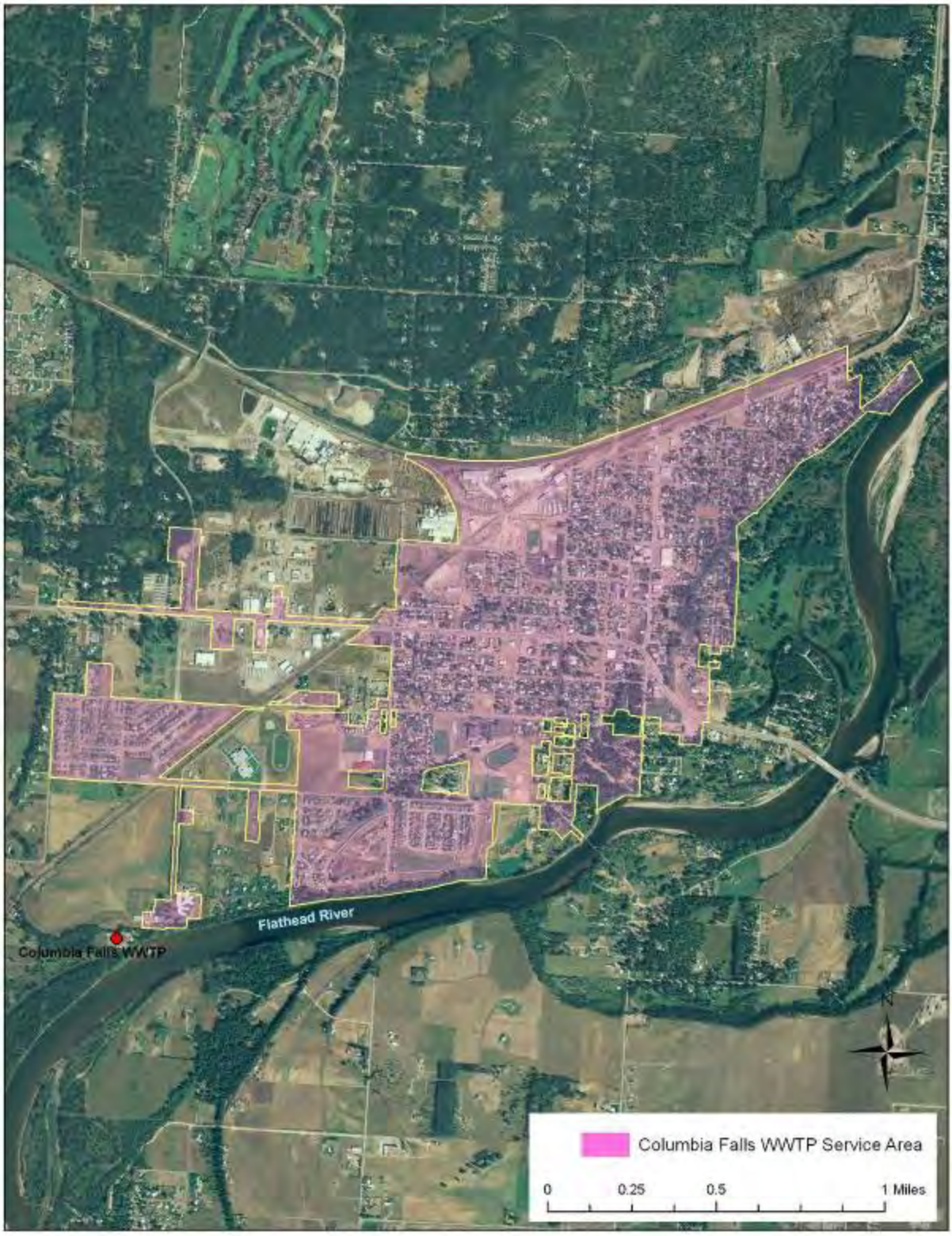


Figure 3. Columbia Falls WWTP service area.

Table 9. Columbia Falls WWTP final permit limits

Constituent	Units	Average monthly limit [a]	Average weekly limit [b]	Maximum daily limit
$CBOD_5$	mg/L	25	40	--
	lb/d	115	183	--
Chlorine (total residual)	mg/L	0.23	--	0.29
E. Coli Bacteria, winter[c,d]	cfu/100 mL	630	1,260	--
E. Coli Bacteria, summer[c,d]	cfu/100 mL	126	252	--
Oil & Grease	mg/L	--	--	<10
Total Phosphorus	mg/L	1.0	--	--
	lb/d	4.6	--	--
TSS	mg/L	30	45	--
	lb/d	138	206	--
Total Nitrogen[e]	lb/d	37.1	63.5	--
Total Ammonia	mg/L	30.7	40.9	--

Source: DEQ 2010a

Notes

$CBOD_5$ = five day carbonaceous biological oxygen demand; cfu/100 mL = colony forming units per 100 milliliters; lb/d = pounds per day; mg/L = milligrams per liter; TSS = total suspended solids.

a. The average of the daily sample result values collected during a single month must not exceed this limit.

b. The average of the daily sample results values collected during a single week must not exceed this limit.

c. Winter is November 1 through March 31: summer is April 1 through October 31.

d. Report geometric means if more than one sample is collected in the reporting period.

e. Calculated as the sum of Nitrate+Nitrite as N and Total Kjeldahl Nitrogen concentrations.

Table 10, Table 11, and Table 12 summarize the available water quality data for outfall #001; data were obtained directly from the WWTP[6] and from ICIS (U.S. EPA 2013b). Data provided by the facility are summarized herein; ICIS data may be used to supplement facility data during model development. The average effluent flow from 2008 to 2013 was 0.504 cfs and average total phosphorus concentration from 2001 to 2013 was 0.339mg/L (no phosphorus data are available prior to 2001). Ammonia (NH_3) averaged 5.23 mg/L and nitrate averaged 2.28 mg/L. Average total nitrogen from 2010 to 2013 was 11.3 mg/L and TKN data averaged 5.01 mg/L from 2001 to 2013.

The city of Columbia Falls WWTP also has a permit (MTG650009) to land apply sewage sludge (Category 2A of Montana's general MPDES permit for biosolids). Sludge is generally land applied twice per year (April/May and September/October) at several locations, including the Flathead County Landfill, various sites near the Veteran's Facility, near Walsh Road, and the current site of the Columbia Falls Junior High School.[7]

[6] Records provided in Excel spreadsheets from Hugh Robertson on June 9, 2008 and February 21, 2013.

[7] Hugh Roberson, Columbia Falls WWTP, personal communication, August 19, 2008.

Table 10. Columbia Falls WWTP data summary - Effluent data from Columbia Falls WWTP

Constituent	Start date	End date	No. of Samples	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	3/2/1993	2/11/2013	388	5.23	0.012	33.2
BOD, 5-day, 20 °C (Tertiary)	6/2/2008	2/11/2013	487	3.65	0.08	13.9
Dissolved Oxygen	5/8/2010	2/19/2013	570	4.59	2.76	7.43
Flow rate (cfs)	6/1/2008	2/19/2013	1,725	0.504	0	1.15
Nitrate (total as N) (mg/L)	12/2/1991	6/12/2006	135	2.28	0.05	14.8
NO_2+NO_3 (total as N) (mg/L)	6/2/2008	2/11/2013	299	3.83	0.01	22
Phosphorus (total) (mg/L)	11/1/2001	2/11/2013	1,742	0.339	0	8.13
Temperature (°C)	6/1/2008	2/19/2013	1,725	13.8	4.2	21.8
TKN (total as N) (mg/L)	6/9/2008	2/11/2013	178	5.01	0.59	28.9
TSS (mg/L)	11/1/2001	2/18/2013	1,689	6.59	1.1	38.1

Source of data: Hugh Robertson, Columbia Falls WWTP, June 9, 2008 and February 21, 2013.
Notes
avg. = average (arithmetic mean); BOD = biological oxygen demand; C = Celsius; cfs = cubic feet per second; max. = maximum; mg/L = milligrams per liter; min. = minimum; N = nitrogen; NO_2+NO_3 = nitrite plus nitrate; TKN = total Kjeldahl nitrogen; TSS = total suspended solids.

Table 11. Columbia Falls WWTP data summary - Influent data from Columbia Falls WWTP

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
BOD, 5-day, 20 °C	6/2/2008	2/14/2013	974	312	93.8	563
Flow rate (cfs)	1/1/1990	2/19/2013	9,298	0.542	0	1.26
Phosphorus (total) (mg/L)	6/2/2008	2/11/2013	924	6.81	2.8	12.3
Temperature (°C)	6/2/2008	2/18/2013	968	14	7.8	22.2
TKN (total as N) (mg/L)	6/9/2008	2/4/2013	112	52.5	31.6	69.8
TSS (mg/L)	6/2/2008	2/18/2013	984	316	125	711

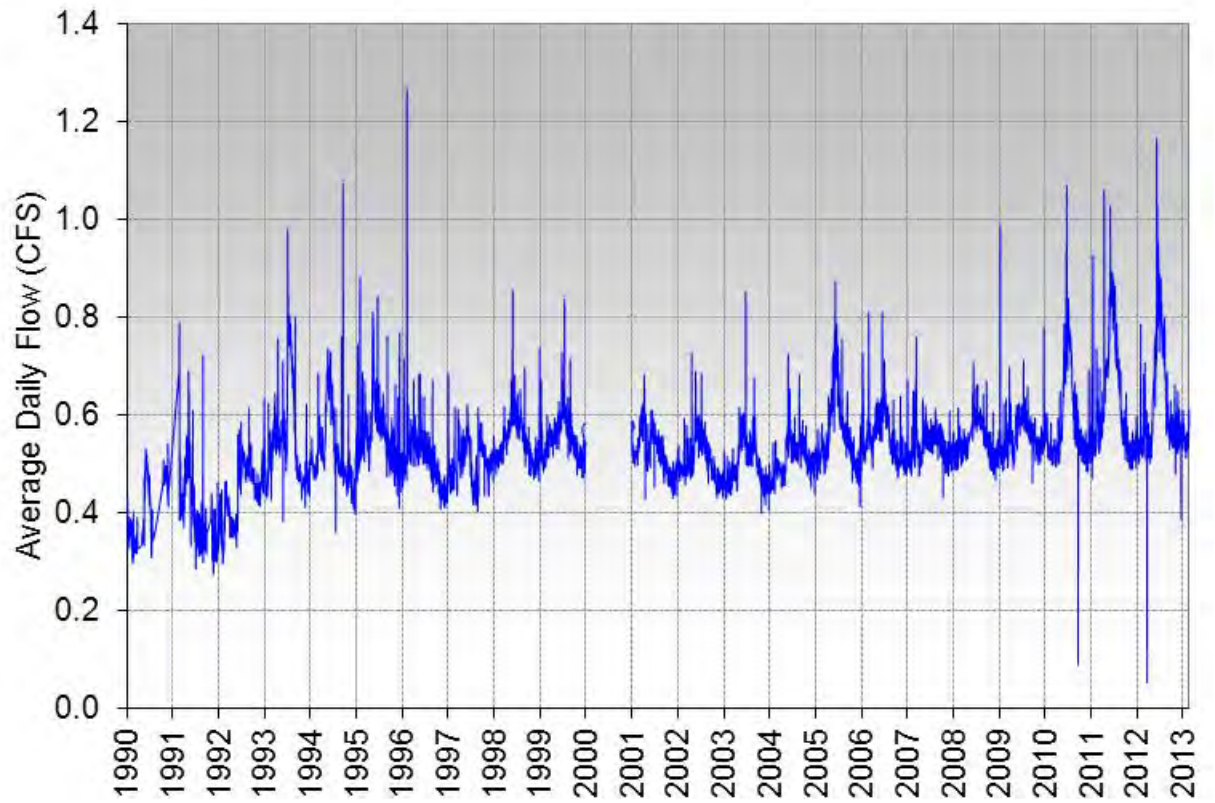
Source of data: Hugh Robertson, Columbia Falls WWTP, June 9, 2008 and February 21, 2013.
Note: avg. = average (arithmetic mean); BOD = biological oxygen demand; C = Celsius; cfs = cubic feet per second; max. = maximum; mg/L = milligrams per liter; min. = minimum; N = nitrogen; TKN = total Kjeldahl nitrogen; TSS = total suspended solids.

Table 12. Columbia Falls WWTP data summary - Data from ICIS

Constituent	Start date	End date	No. of Samples	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	6/18/2001	1/25/2013	140	3.96	0.02	29.1
CBOD, 5-day, 20 °C	6/18/2001	1/25/2013	140	2.87	2	6
Dissolved Oxygen	6/28/2010	1/25/2013	32	4.66	3.19	6.2
Flow rate (cfs)	6/18/2001	1/25/2013	140	0.317	0.207	0.574
Nitrogen (total) (mg/L)	6/28/2010	1/25/2013	32	11.3	4.39	50.8
NO_2+NO_3 (total as N) (mg/L)	6/18/2001	1/25/2013	140	3.44	0.1	14.8
Phosphorus (total) (mg/L)	6/18/2001	1/25/2013	140	0.365	0.024	1.68
TKN (total as N) (mg/L)	6/18/2001	1/25/2013	140	5	0.59	30.9
TSS (mg/L)	6/18/2001	1/25/2013	140	6.91	3	18.8

Source of data: ICIS (U.S. EPA 2013b).
Notes
DMR records from ICIS are monthly averages.
avg. = average (arithmetic mean); CBOD = carbonaceous biological oxygen demand; C = Celsius; cfs = cubic feet per second; max. = maximum; mg/L = milligrams per liter; min. = minimum; N = nitrogen; NO_2+NO_3 = nitrite plus nitrate; TKN = total Kjeldahl nitrogen; TSS = total suspended solids.

Figure 4 shows the average daily flows into the Columbia Falls WWTP between 2008 and 2013. Only influent flows were monitored before 2008; therefore, influent flow was used as a surrogate for effluent flow before 2008. Effluent flows ranged from 0 cfs to 1.15 cfs, and averaged 0.506 cfs. Influent flows ranged from 0.0513 cfs to 1.16 cfs, and averaged 0.427 cfs. A small increase in flows occurred between 1990 and 1995, and since then, flows appear to be increasing slightly.



Note: Influent flows from 1990 through 2007 were used as surrogates for effluent flows, which were not monitored during that time period.

Figure 4. Average daily flow at the Columbia Falls WWTP.

Total phosphorus loads have ranged from 0.007 lb/d to 26.47 lb/d and averaged 1.18 lb/d (Figure 5). Since 2001, gradually increasing loads have been observed in the facility effluent.

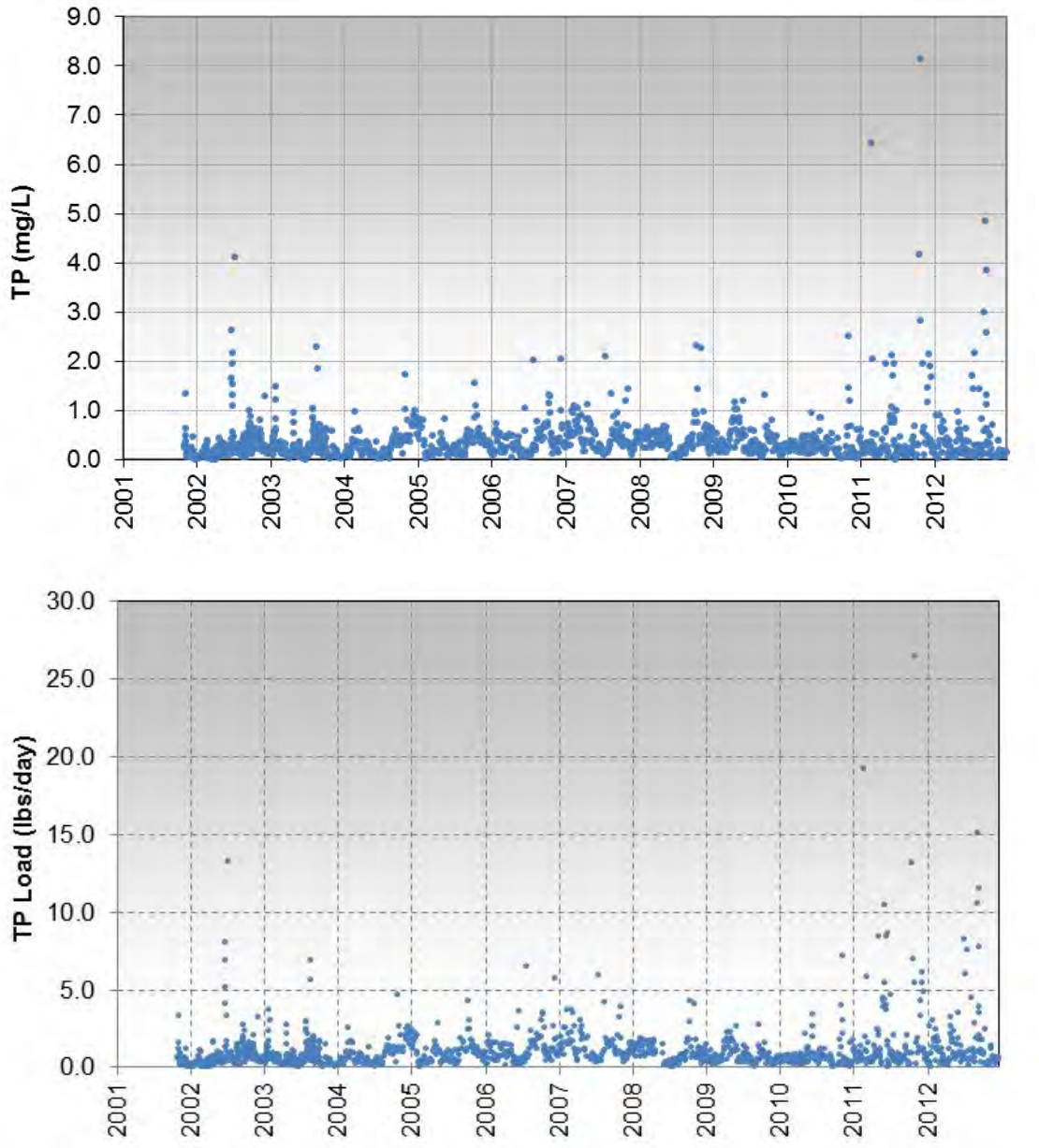


Figure 5. Total phosphorus at the Columbia Falls WWTP.

Typical of most lagoons, ammonia concentrations vary seasonally, and range from non-detect (recorded as "0" in the DMR records) to 43.6 mg/L with an average concentration of 5.1 (Figure 6). Ammonia loads have ranged from 0.03 lb/d to 129 lb/d and averaged 13.75 lb/d (ammonia concentrations reported as zero were excluded from the minimum and average calculations).

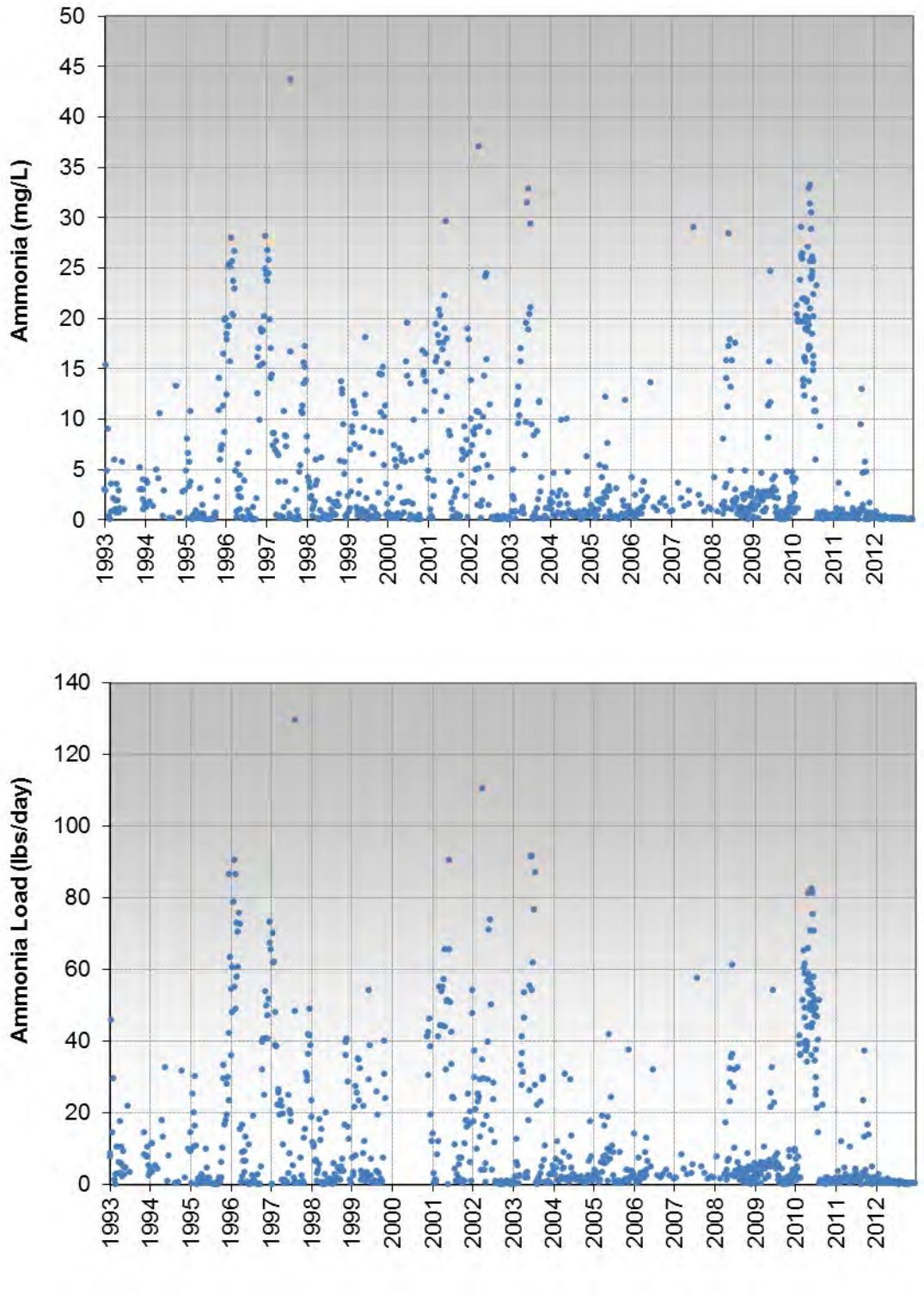


Figure 6. Ammonia at the Columbia Falls WWTP.

2.3 Whitefish WWTP (MT0020184)

The City of Whitefish operates a wastewater treatment facility composed of three partially mixed aerated lagoons that is near the Whitefish River just south of the city (Figure 7). The Whitefish WWTP serves the City of Whitefish and surrounding areas (Figure 8) and the WWTP serves 6,000 customers (FCCHD 2009). The City of Whitefish includes a considerable number of second and seasonal homes (FCCHD 2012). Under a 2002 agreement between the city of Whitefish and the Big Mountain Sewer District, which serves the Big Mountain Ski Resort, the Whitefish WWTP receives untreated wastewater from the Big Mountain Sewer District (FCCHD 2012).

The facility was built in 1960 and initially consisted of a series of facultative lagoons with an outfall to the Whitefish River.[8] Aeration was added to the lagoons in 1978, and phosphorus removal was added in 1987. After secondary treatment in the lagoons, a "flocculation clarifier further polishes the wastewater effluent, including the reduction of phosphorus" via alum (FCCHD 2009, p.7). In 2003, an upgrade to the aeration system provided for an increased design flow of 1.8 mgd.[9] In 2008 the WWTP began the process of upgrading the plant to construct headworks (mechanical screening) and add an additional phosphorus removal clarifier. Average daily flows are 0.75 mgd and the city of Whitefish has been repairing infrastructure and removing sum pump connections that may contribute to high peak flows (FCCHD 2012).

The Whitefish WWTP is permitted to discharge effluent to the Whitefish River from one outfall (#001) (DEQ 2007). The outfall consists of a pipe from the plant that discharges directly to the Whitefish River. The limits for the outfall are shown in Table 13. The permit also requires the pH of the effluent to remain between 6.0 and 9.0 standard units and there cannot be any visible foam, oil sheen, or floating solids in the effluent. The permit requires an 85 percent reduction in TSS and BOD_5 and for there to be no acute toxicity. Permit limits changed on July 1, 2011 to reflect winter and summer limits for *E. coli* as well as a new limit for total nitrogen.

[8] Greg Acton, Public Works Utilities Supervisor, City of Whitefish, personal communication, June 5, 2008.
[9] Ibid.

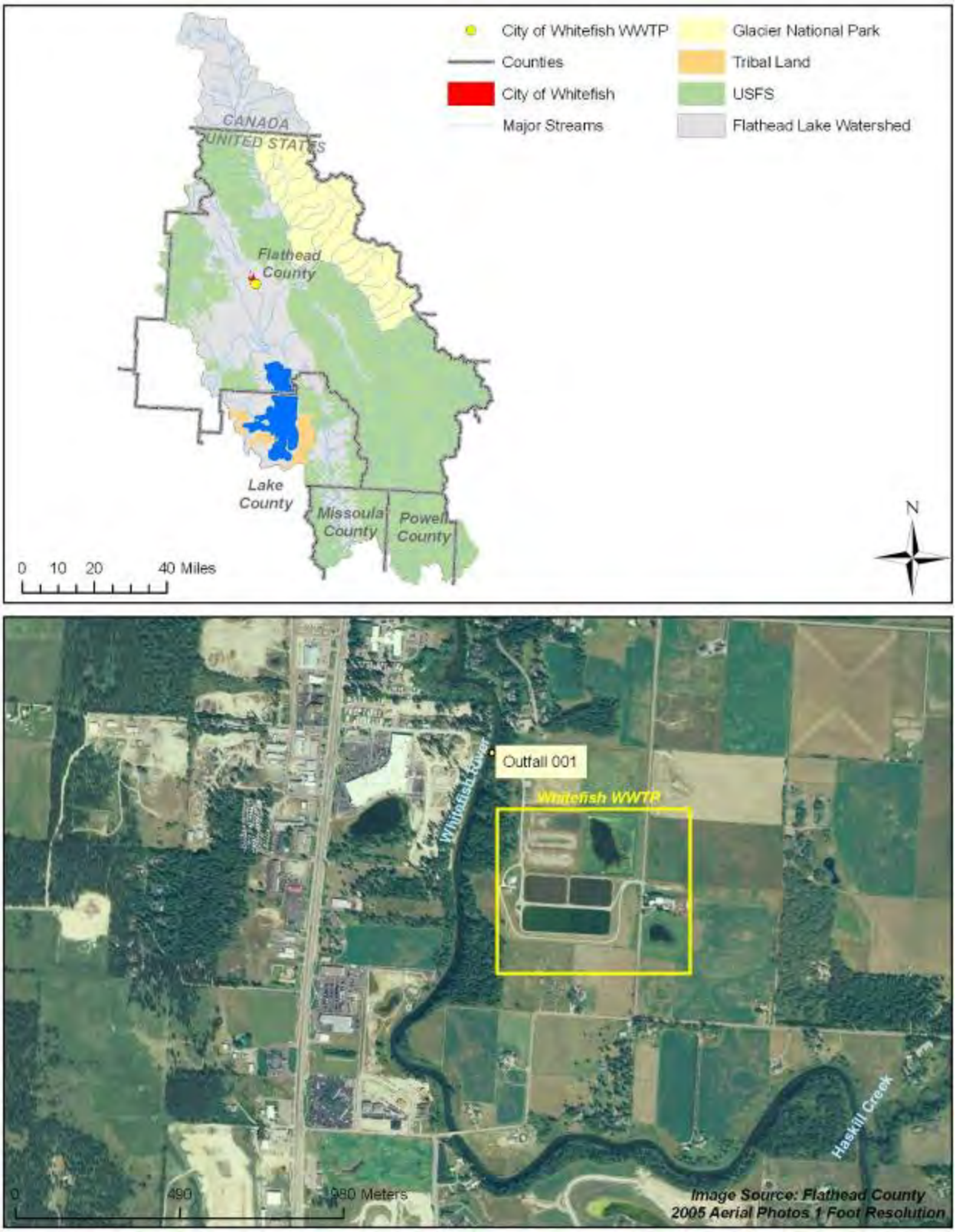


Figure 7. Whitefish WWTP permitted outfall.

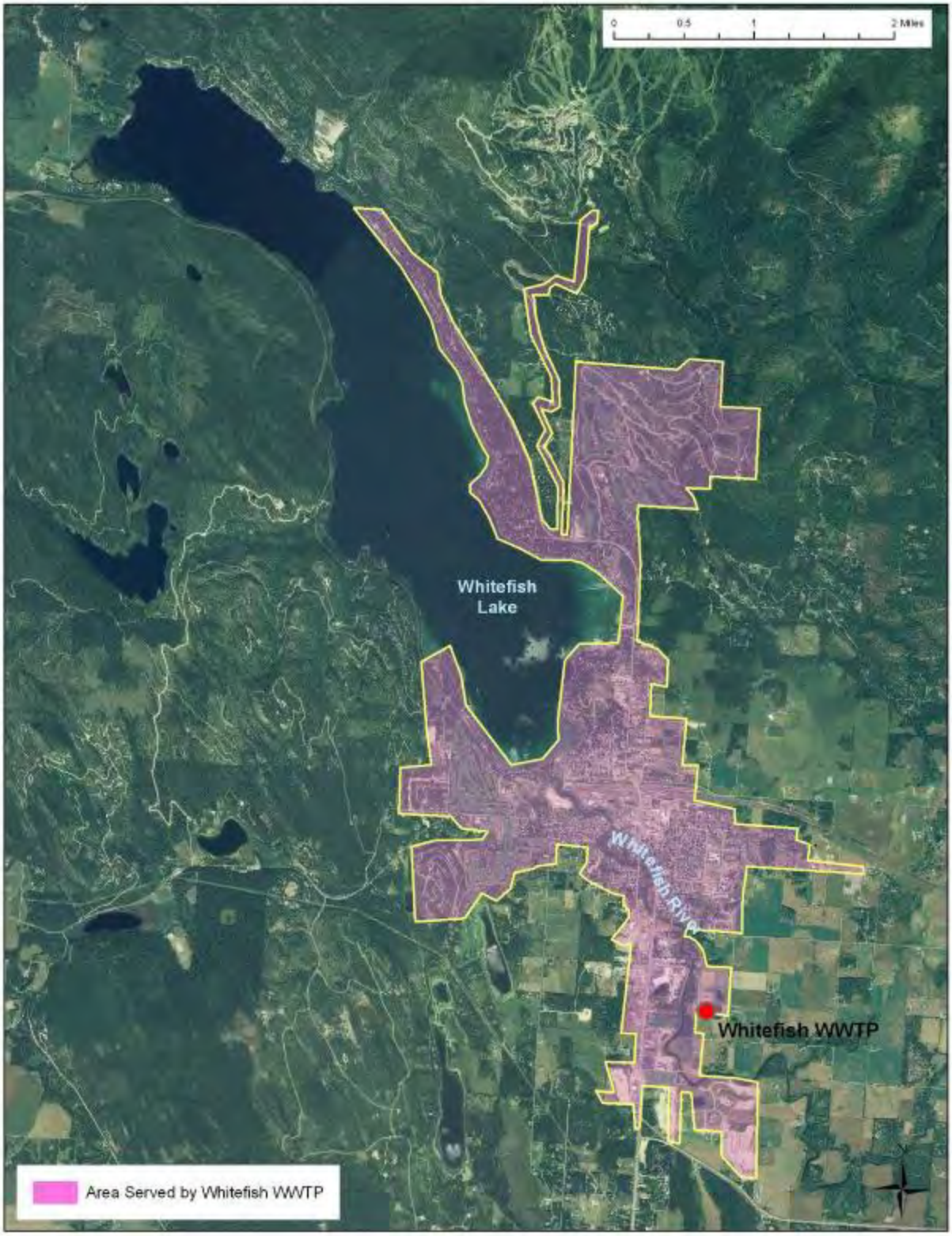


Figure 8. Whitefish WWTP service area.

Table 13. Whitefish WWTP final permit limits

Constituent	Units	Average monthly limit [a]	Average weekly limit [b]	Maximum daily limit
BOD_5	mg/L	30	45	--
	lb/d	255	382	--
Chlorine (total residual)	mg/L	0.011	--	0.019 L
E. Coli Bacteria, winter[c,d]	cfu/100 mL	630	--	1,260
E. Coli Bacteria, summer[c,d]	cfu/100 mL	126	--	252
Oil & Grease	mg/L	--	--	10
Total Phosphorus	mg/L	1.0	--	--
	lb/d	10.4		--
TSS	mg/L	30	45	--
	lb/d	313	469	--
Total Nitrogen[e]	lb/d	273	--	426

Source: DEQ 2007a
Notes
BOD_5 = five day biological oxygen demand; cfu/100 mL = colony forming units per 100 milliliters; lb/d = pounds per day; mg/L = milligrams per liter; TSS = total suspended solids.
a. The average of the daily sample result values collected during a single month must not exceed this limit.
b. The average of the daily sample results values collected during a single week must not exceed this limit.
c. Winter is November 1 through March 31: summer is April 1 through October 31.
d. Report geometric means if more than one sample is collected in the reporting period.
e. Calculated as the sum of Nitrate+Nitrite as N and Total Kjeldahl Nitrogen concentrations.

The facility is required to monitor the water quality of its effluent (outfall #001). Table 14, Table 14, and Table 15 summarize the available water quality data for outfall #001; data were obtained directly from the WWTP[10] and from ICIS (U.S. EPA 2013b). Data provided by the facility are summarized herein; data from ICIS may be used to supplement facility data during model development. The average effluent flow from this period (1981-2008) was 1.24 cfs, with an average total phosphorus concentration of 0.772 mg/L and an average total nitrogen concentration of 36.4 mg/L.

The Whitefish WWTP also has a permit (MTG650059) to store and treat sewage sludge onsite; no land application occurs.[11]

[10] Records provided as a series of Excel spreadsheets for 1984 through 2008 from Greg Acton on June 4, 2008. Records for 2009 through 2012 provided by Greg Acton on February 12, 2013.
[11] Greg Acton, Public Works Utilities Supervisor, City of Whitefish, personal communication, August 14, 2008.

Table 14. Whitefish WWTP data summary - Influent data from Whitefish WWTP

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	12/6/2011	12/27/2012	52	23	6	45
BOD, 5-day, 20 °C	7/1/2008	12/28/2012	699	254	9	689
NO_2+NO_3 (total as N) (mg/L)	6/26/2012	10/2/2012	5	0.24	0.01	0.60
TKN (total as N) (mg/L)	11/20/2012	12/27/2012	5	40.8	33.6	47.8
TSS (mg/L)	7/1/2008	12/28/2012	700	211	26	1,150

Source of data: Greg Acton, Public Works Utilities Supervisor, City of Whitefish, February 12, 2013.
Note: avg. = average (arithmetic mean); BOD = biological oxygen demand; max. = maximum; mg/L = milligrams per liter; min. = minimum; N = nitrogen; NO_2+NO_3 = nitrite plus nitrate; TKN = total Kjeldahl nitrogen; TSS = total suspended solids.

Table 15. Whitefish WWTP data summary - Effluent data from Whitefish WWTP

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	1/1/1984	12/26/2012	551	16.8	0	36
BOD, 5-day, 20 °C	1/1/1984	12/26/2012	474	7.82	2	37
Dissolved Oxygen	1/1/2008	12/25/2012	255	6.07	0.22	13.3
Flow rate (cfs)	1/1/1981	12/1/2008	300	1.24	0	3.12
Nitrogen (total) (mg/L)	1/1/1992	12/26/2012	433	36.4	0	4,930
NO_2+NO_3 (total as N) (mg/L)	5/1/1992	12/26/2012	409	16.2	0	4,900
Orthophosphate (as P) (mg/L)	5/4/2010	12/25/2012	123	0.346	0.12	1.76
Phosphorus (total) (mg/L)	1/1/1984	12/26/2012	498	0.772	0.1	7.4
Temperature (°C)	7/2/2008	12/25/2012	251	10.5	0.1	24
TKN (total as N) (mg/L)	5/1/1992	12/26/2012	410	22	0	1160
TSS (mg/L)	1/1/1984	12/26/2012	475	12.3	0.5	100

Source of data: Greg Acton, Public Works Utilities Supervisor, City of Whitefish, June 4, 2008 and February 12, 2013.
Note: avg. = average (arithmetic mean); BOD = biological oxygen demand; C = Celsius; cfs = cubic feet per second; max. = maximum; mg/L = milligrams per liter; min. = minimum; N = nitrogen; NO_2+NO_3 = nitrite plus nitrate; P = phosphorus; TKN = total Kjeldahl nitrogen; TSS = total suspended solids.

Table 16. Whitefish WWTP data summary - Data from ICIS

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	7/29/1996	1/18/2013	197	16.3	0.13	36
BOD, 5-day, 20 °C	7/29/1996	1/18/2013	197	8.26	2	28
Conduit Flow (cfs)	7/29/1996	1/18/2013	199	1.35	0.345	3.2
Nitrogen (total) (mg/L)	7/29/1996	1/18/2013	197	22.3	0.15	38
NO_2+NO_3 (total as N) (mg/L)	7/29/1996	1/18/2013	197	3.58	0.005	24.7
Phosphorus (total) (mg/L)	7/29/1996	1/18/2013	198	0.473	0.16	1.69
Temperature (°C)	8/27/2008	1/18/2013	54	10.4	0.1	23.3
TKN (total as N) (mg/L)	7/29/1996	1/18/2013	197	18.8	1.19	37.9
TSS (mg/L)	7/29/1996	1/18/2013	197	11.4	4	46

Source of data: ICIS (U.S. EPA 2013b).
Notes
DMR records from ICIS are monthly averages.
avg. = average (arithmetic mean); BOD = biological oxygen demand; C = Celsius; cfs = cubic feet per second; max. = maximum; mg/L = milligrams per liter; min. = minimum; N = nitrogen; NO_2+NO_3 = nitrite plus nitrate; P = phosphorus; TKN = total Kjeldahl nitrogen; TSS = total suspended solids.

Figure 9 shows the average daily effluent flow from January 1981 through December 2013. Flows have increased slightly over time, with an average flow of 1.0 cfs in 1981, an average flow of 1.3 cfs in 2007, and an average flow of 1.5 cfs in 2012.

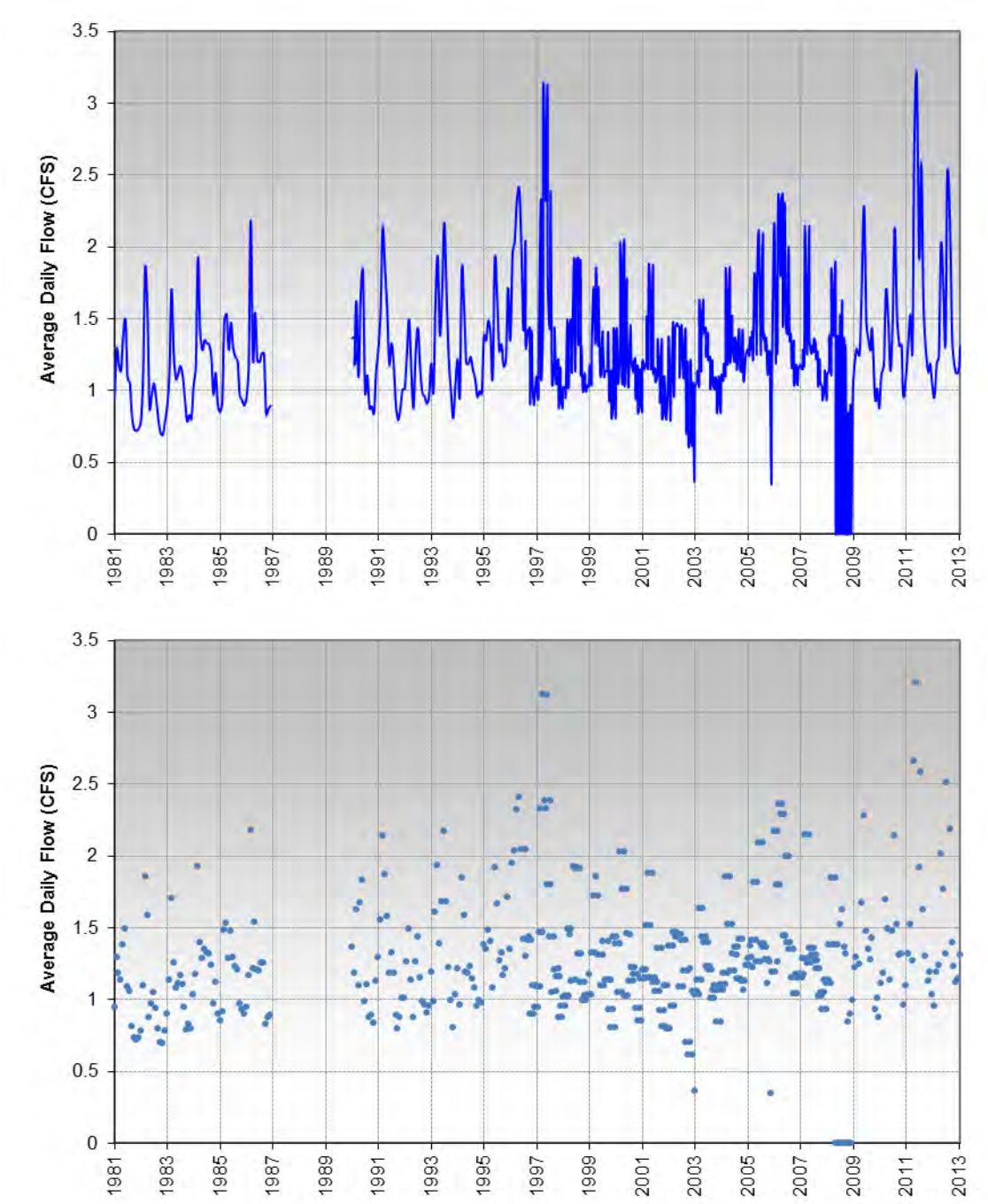


Figure 9. Average daily flow from the city of Whitefish WWTP.

Prior to 1986 plant upgrades, total phosphorus concentrations were much higher than current levels, and ranged from 3.1 to 7.4 mg/L (Figure 10). Since 1990, after the addition of phosphorus removal, the effluent total phosphorus concentrations have ranged from 0.1 mg/L to 4.79 mg/L with an average concentration of 0.50 mg/L (Figure 10). Total phosphorus loads since 1990 ranged from 0.69 lb/d to 59.7 lb/d and averaged 3.7 lb/d. The reduction in total phosphorus loads following the installation of phosphorus removal was approximately 90 percent. Since 1990, it appears that the total phosphorus loads, on average, have remained relatively constant.

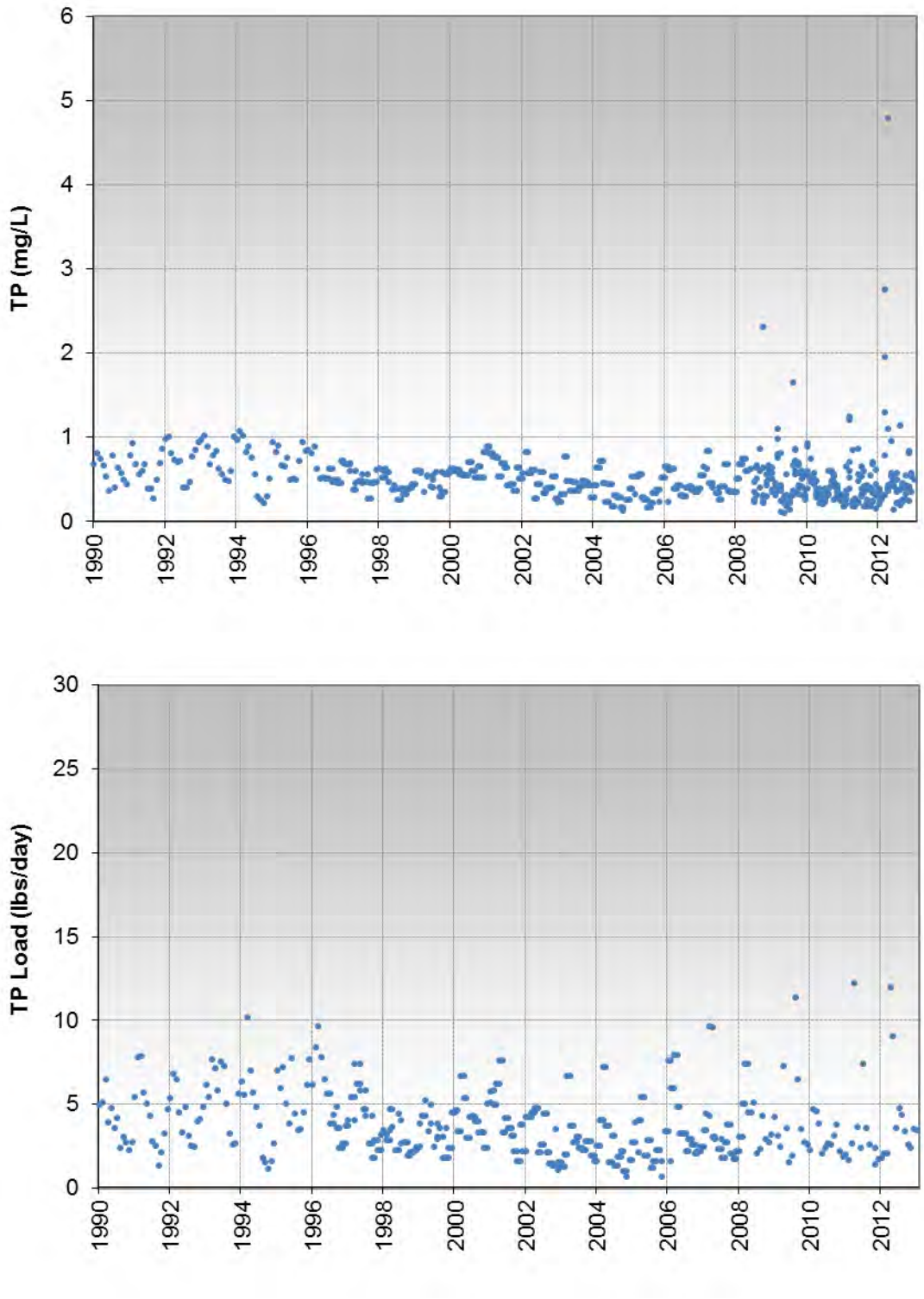
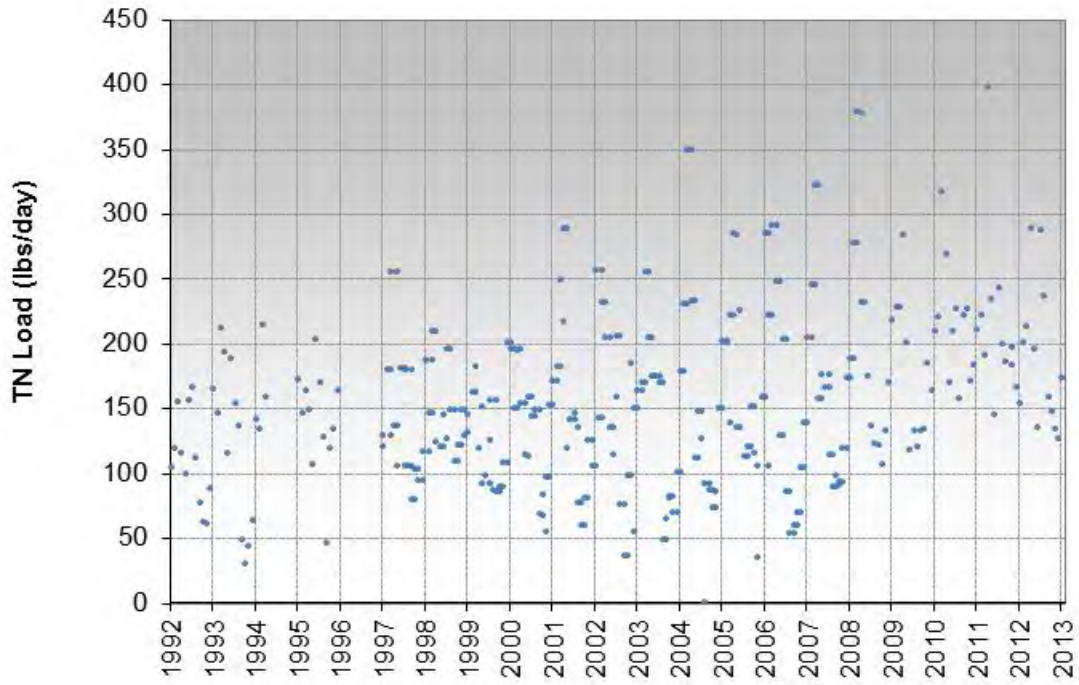


Figure 10. Total phosphorus at the Whitefish WWTP.

Nitrogen concentrations and loads appear to slightly increase between 1992 and 2013 (Figure 11), although the cause of this increase is unknown. Typical of most lagoon treatment systems, concentrations fluctuate seasonally and range from 0.15 mg/L to 38.87 mg/L.



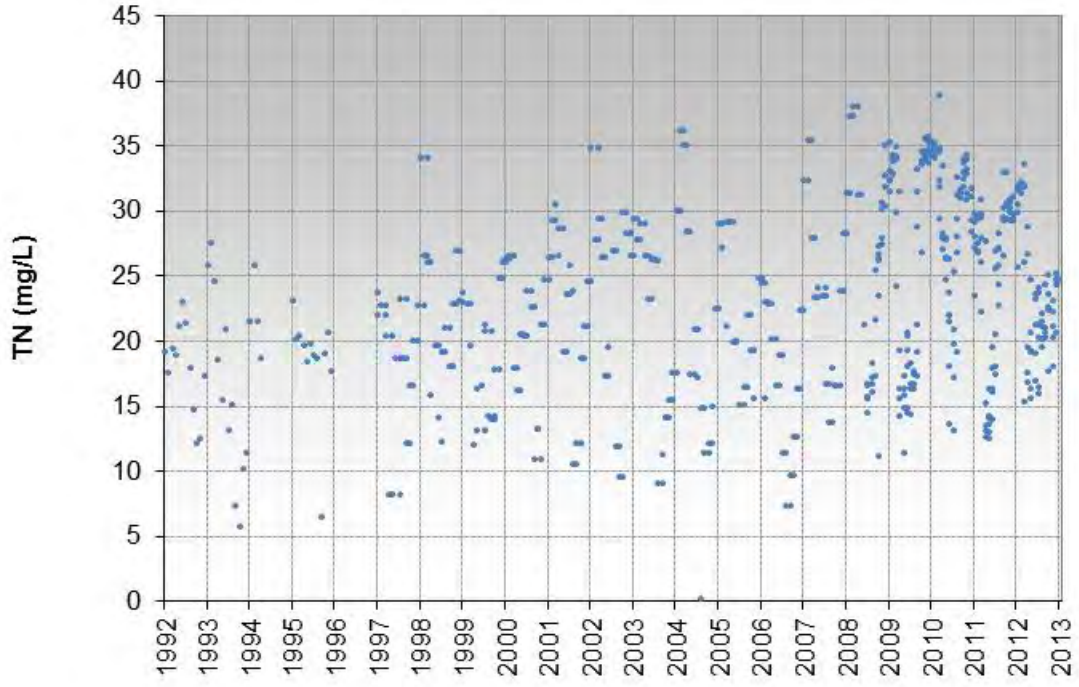


Figure 11. Total nitrogen at the Whitefish WWTP.[12]

[12] Data from 1996 are not displayed in the charts, as there appears to have been a plant upset with concentrations exceeding 1,000 mg/L for two months.

2.4 Bigfork Water and Sewer District WWTF (MT0020397)

The Bigfork Water and Sewer District operates a wastewater treatment facility (WWTF) that is near the confluence of the Swan River and Flathead Lake (Figure 12). The Bigfork Water and Sewer District WWTF serves the unincorporated community of Bigfork (refer to Figure 13) and includes 13 lift stations and approximately 1, 200 connections[13]. Bigfork is a summer recreational area with one-third of the housing units identified as seasonal, recreational, or occasional use (FCCHD 2012).

The original facility was constructed in 1965. A new facility was constructed in 1987 and consists of a tertiary advanced wastewater treatment system with a synthetic media filter, chemical precipitation for phosphorus removal, and ultraviolet disinfection.[14] The current design flow is 0.50 mgd, but the average flow was approximately 0.215 mgd in 2012[15]. In 2012, this facility installed improvements, including a new headworks building, and a membrane bioreactor system, described as follows:

> The Membrane Bioreactor system consists of biological treatment of carbonaceous material and nitrogen using activated sludge, chemical treatment for phosphorus, and membrane filtration to separate the solids from the liquid producing a very high quality effluent. The membranes have a nominal pore size of 0.4-microns allowing the effluent to consistently achieve turbidity within drinking water standards of 0.3 NTU or less. The Effluent is treated with Ultraviolet Disinfection prior to discharge.[16]

The WWTF is permitted to discharge effluent to Flathead Lake from one outfall (#001) (DEQ 2001). The most recent MPDES permit limits for the outfall are shown in Table 16. Additionally, the permit also requires the pH of the effluent to remain between 6.0 and 9.0 standard units and there cannot be any visible foam, oil sheen, or floating solids in the effluent. The permit also requires an 85 percent reduction in TSS and BOD_5 and for there to be no acute toxicity. The concentration of oil and grease cannot exceed 15 mg/L in any individual sample.

[13] Julie Spencer, operator, Bigfork Water and Sewer District, personal communication, June 14, 2013.
[14] Julie Spencer, operator, Bigfork Water and Sewer District, personal communication, May 21, 2008.
[15] Julie Spencer, operator, Bigfork Water and Sewer District, personal communication, June 14, 2013.
[16] Julie Spencer, operator, Bigfork Water and Sewer District, personal communication, June 14, 2013.

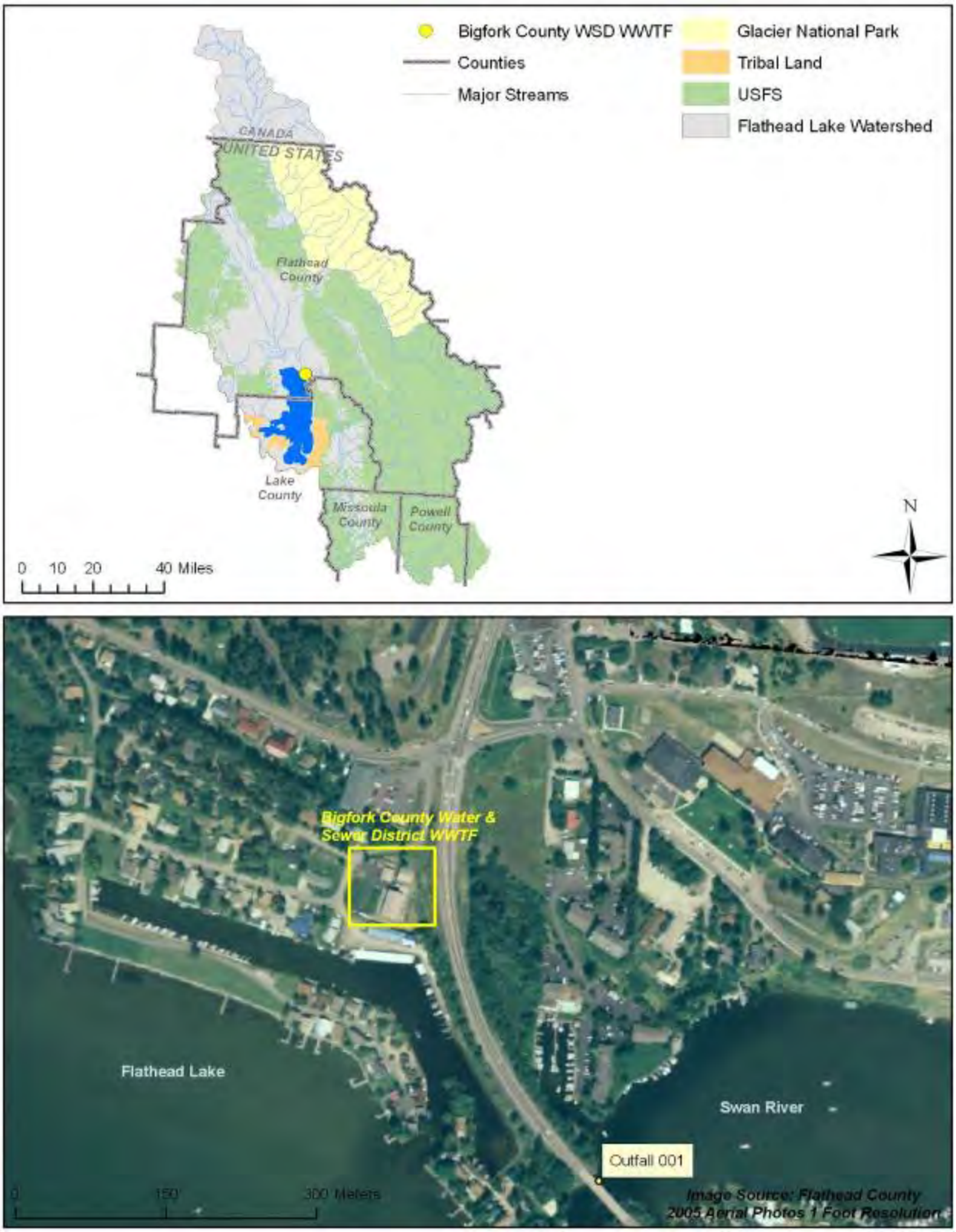


Figure 12. Bigfork Water and Sewer District WWTF permitted outfall.

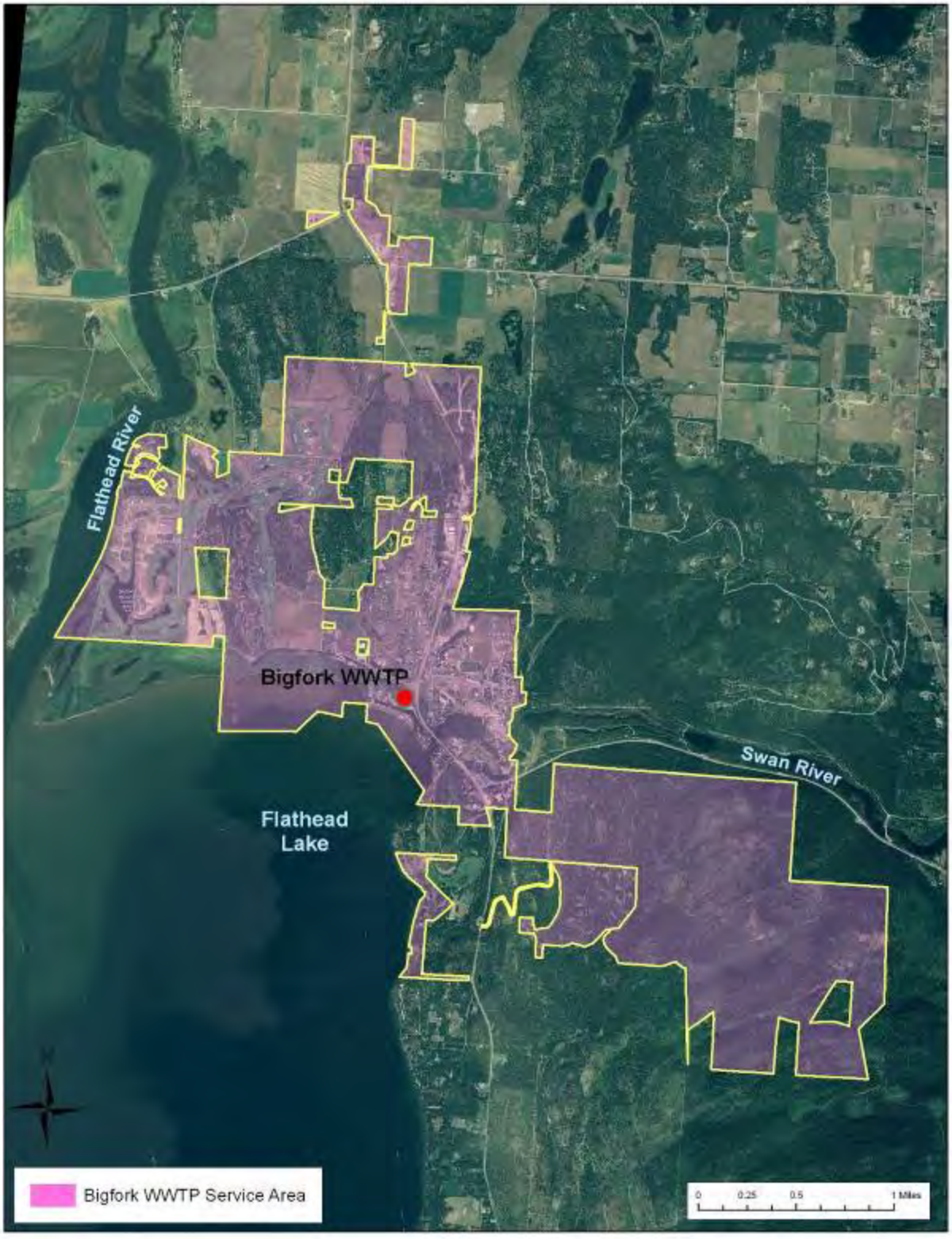


Figure 13. Bigfork Water and Sewer District WWTF service area.

Table 17. Bigfork Water and Sewer District WWTF permit limits

Constituent	Units	Concentration	
		7-day average	30-day average
$CBOD_5$	mg/L	45	30
TSS	mg/L	45	30
Total Phosphorus	mg/L	--	1.0
Fecal Coliform bacteria [a]	cfu/100mL	100	50

Source: DEQ 2001b
Notes
$CBOD_5$ = five-day carbonaceous biological oxygen demand; cfu/100mL = colony forming unit per 100 milliliters; mg/L = milligrams per liter; TSS = total suspended solids.
a. The fecal coliform bacteria limits apply from the period beginning April 1 and ending October 31.

Table 17 and Table 18 summarize the available water quality data for outfall #001; data were obtained directly from the WWTF[17] and from ICIS (U.S. EPA 2013b). Data provided by the WWTF are summarized herein; ICIS data (summarized in Table 18) may be used to supplement facility data during model development. The average effluent flow from 1993-2013 was 0.342 cfs, with an average total phosphorus concentration of 0.242 mg/L and an average total nitrogen concentration of 15.7 mg/L.

The Bigfork Water and Sewer District also has a permit (MTG650020) to land apply sewage sludge. The sludge is moved to an off-site sludge storage facility during the months of March to November and is eventually disposed of via subsurface injections (FCCHD 2009). Since 1997, the sludge has been injected to 317 acres of farmland at 384 Farm Road in Somers, Montana (Figure 14).[18]

Table 18. Bigfork Water and Sewer District WWTF data summary - Data from Bigfork Water and Sewer District WWTF

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	11/1/1995	1/31/2013	240	0.326	0	6.72
Ammonia (total as N) (mg/L) (lab)	8/5/2010	1/3/2013	32	0.666	0.02	3.16
BOD, 5-day, 20 °C	3/4/2010	1/24/2013	272	40.2	1	540
BOD, 5-day, 20 °C (BFWS)	3/1/2012	1/31/2013	140	0.726	0.1	2.3
Dissolved Oxygen	8/5/2010	1/31/2013	129	7.49	5.16	8.86
Flow rate (cfs)	1/1/1993	1/31/2013	2,927	0.342	0.0928	0.823
Nitrogen (total) (mg/L)	3/1/1993	1/29/2013	254	15.7	0	33.2
NO_2+NO_3 (total as N) (mg/L)	11/1/1995	1/29/2013	241	15.2	0.25	28.7
Phosphorus (total) (mg/L)	1/1/1993	1/31/2013	329	0.242	0.01	1.43
Temperature (°C)	6/1/2008	1/31/2013	1,704	16.5	10.3	23
TKN (total as N) (mg/L)	11/1/1995	1/29/2013	232	1.21	0	18.1
TSS (mg/L)	3/4/2010	1/31/2013	413	1.75	0.05	7.8

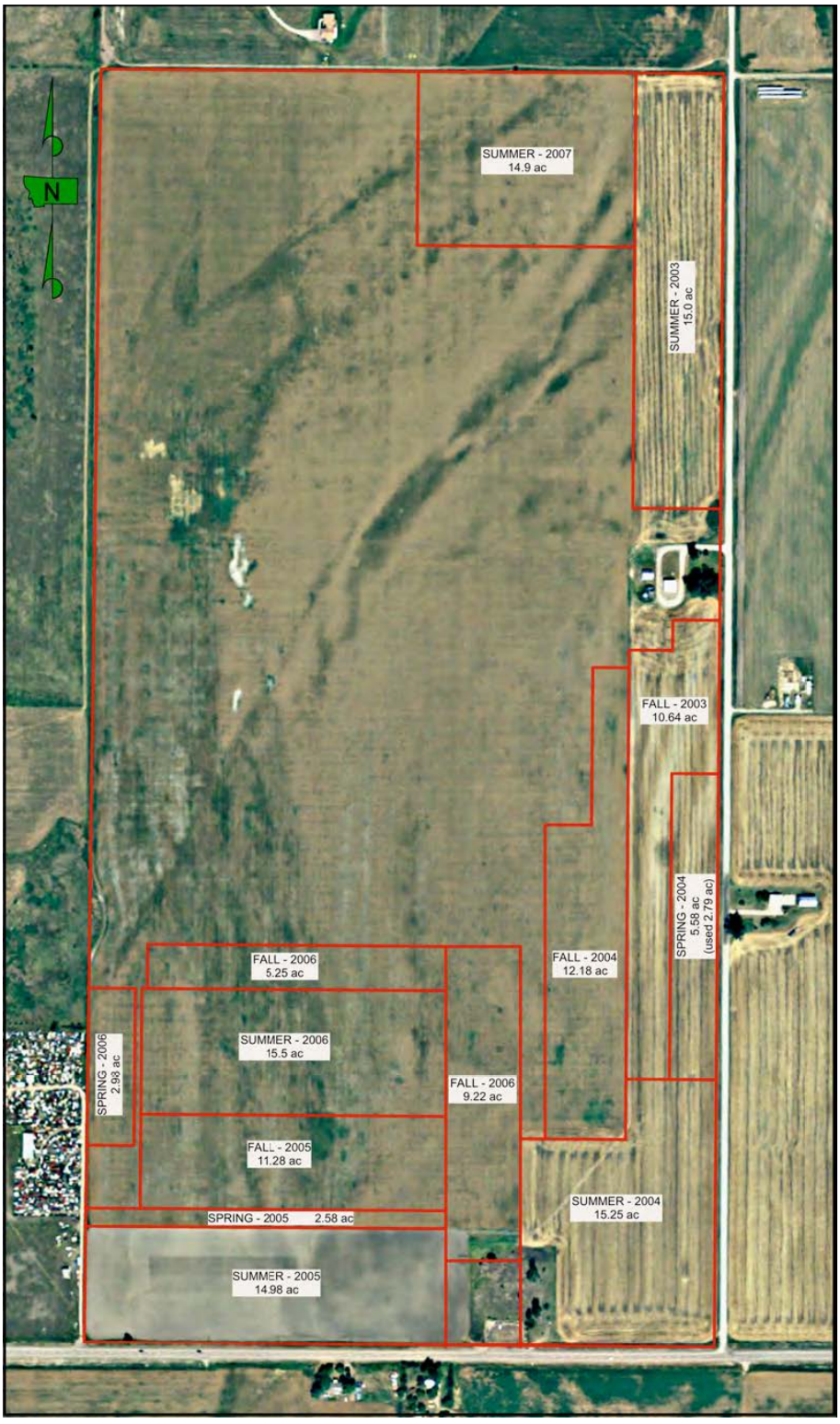
Source of data: Julie Spencer, operator, Bigfork Water and Sewer District, personal communication, February 21, 2013.
Note: avg. = average (arithmetic mean); BOD = biological oxygen demand; C = Celsius; cfs = cubic feet per second; max. = maximum; mg/L = milligrams per liter; min. = minimum; N = nitrogen; NO_2+NO_3 = nitrite plus nitrate; P = phosphorus; TKN = total Kjeldahl nitrogen; TSS = total suspended solids.

[17] Records provided in Excel spreadsheets from Julie Spencer on February 21, 2013.
[18] Julie Spencer, operator, Bigfork Water and Sewer District, personal communication, August 14, 2008.

Table 19. Bigfork Water and Sewer District WWTF data summary - Data from ICIS

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	9/6/2001	1/11/2013	81	0.37	0	3.16
BOD, 5-day, 20 °C	9/6/2001	1/11/2013	137	1.8	0.23	22
Dissolved Oxygen	9/8/2010	1/11/2013	29	7.45	5.69	8.6
Flow rate (cfs)	9/6/2001	1/11/2013	138	0.21	0.11	0.38
Nitrogen (total) (mg/L)	1/4/2001	1/11/2013	80	17.8	6.44	28
NO_2+NO_3 (total as N) (mg/L)	9/6/2001	1/11/2013	80	16.7	5.5	27
Phosphorus (total) (mg/L)	9/6/2001	1/11/2013	137	0.205	0.04	0.84
TKN (total as N) (mg/L)	9/6/2001	1/11/2013	77	0.98	0.11	6.44
TSS (mg/L)	9/6/2001	1/11/2013	137	3.18	0.1	23

Source of data: ISIS (U.S. EPA 2013b)
Notes
DMR records from ICIS are monthly averages.
avg. = average (arithmetic mean); BOD = biological oxygen demand; C = Celsius; cfs = cubic feet per second; max. = maximum; mg/L = milligrams per liter; min. = minimum; N = nitrogen; NO_2+NO_3 = nitrite plus nitrate; P = phosphorus; TKN = total Kjeldahl nitrogen; TSS = total suspended solids.



Source: Julie Spencer, operator, Bigfork County Water and Sewer District WWTF

Figure 14. Bigfork Water and Sewer District WWTF sludge injection sites.

From 1993 through 2004 flow at the plant was only reported on the first of the month; flows ranged from 0.11 cfs to 0.51 cfs and averaged 0.27 cfs (Figure 15). Since 2004, flows have been reported daily; they ranged from 0.09 cfs to 0.82cfs and averaged 0.34 cfs. There appears to be a slight increase in flows from 1993 to 2013.

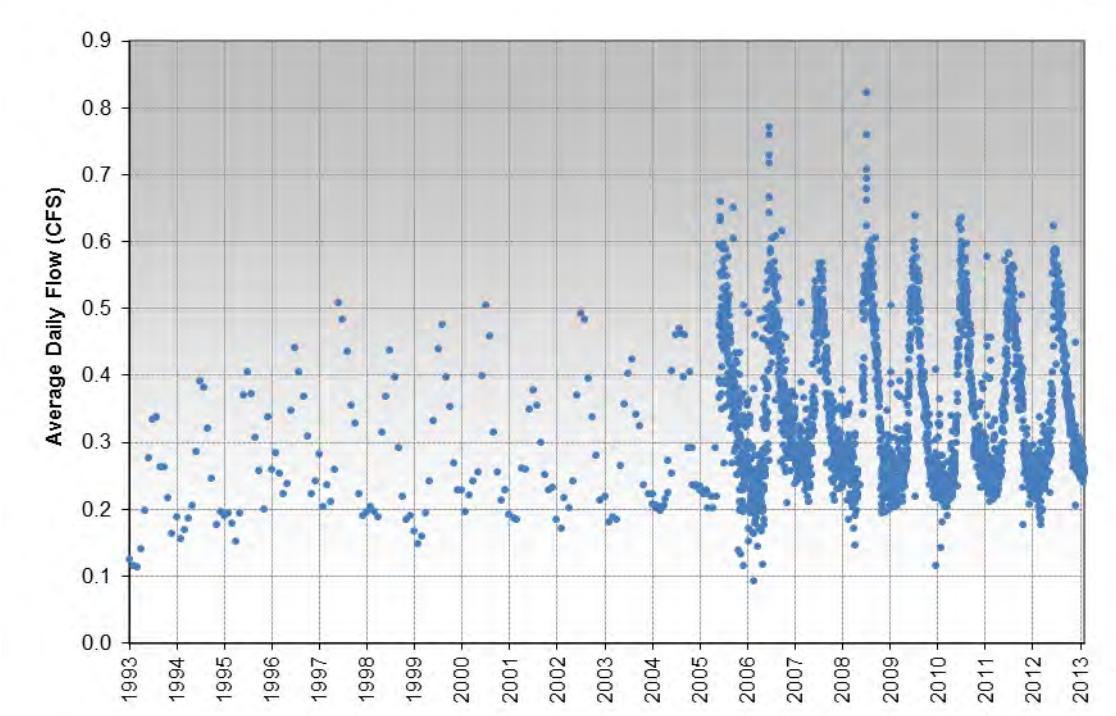


Figure 15. Average daily flow from the Bigfork Water and Sewer District WWTF.

Concentration and load varied over the period of record (1993-2013), and do not show any apparent temporal trends, though data from 2012 include several higher concentrations (Figure 16). Total phosphorus loads ranged from 0.02 lb/d to 2.31 lb/day and averaged 0.39 lb/day.

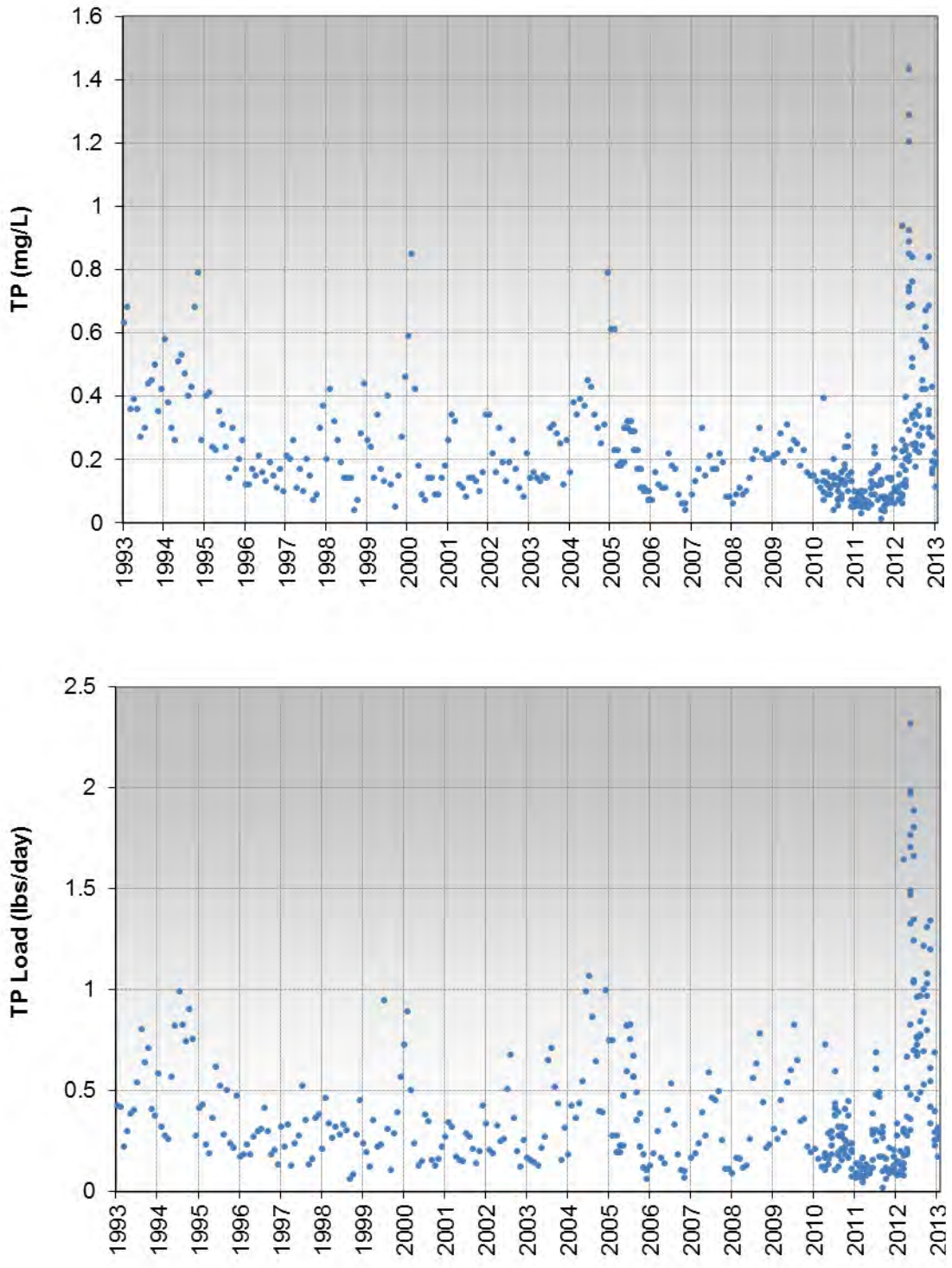


Figure 16. Total phosphorus from the Bigfork Water and Sewer District WWTF.

Figure 17 shows the total nitrogen concentrations and loads from 1995 through 2012. There appears to be a slight increasing trend in total nitrogen loads from 1995 to 2010, which is likely due to the slight increase in flow observed in the effluent; loads decreased from 2010 levels in 2011-2013. The range of concentrations has remained relatively stable over the period of record with a slight decrease in recent years.

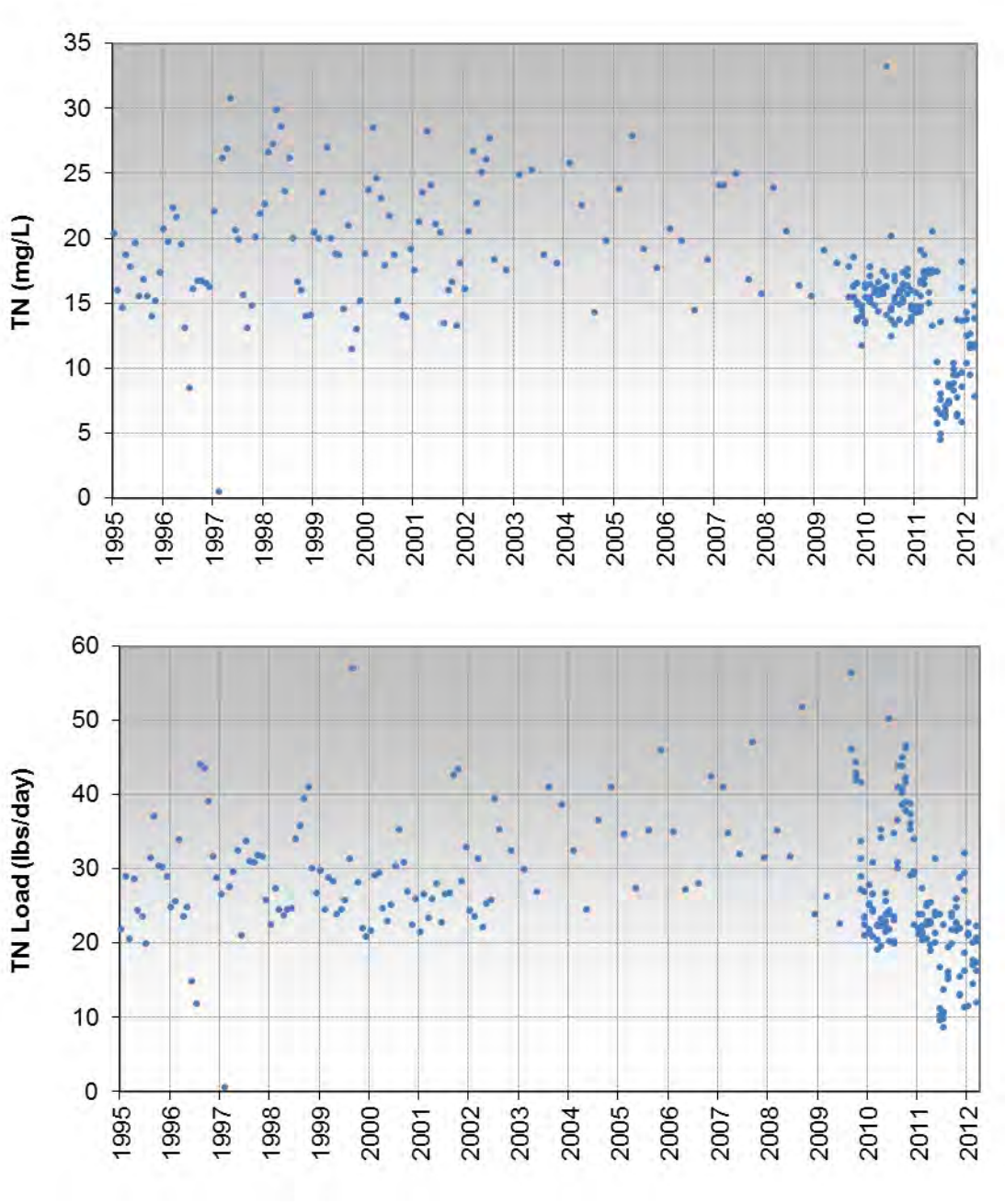


Figure 17. Total nitrogen from the Bigfork Water and Sewer District WWTF.

2.5 Polson WWTP (MT0020559)

The City of Polson operates a wastewater treatment facility that is at the south end of Flathead Lake near the Flathead River (Figure 18). It serves the city of Polson and the surrounding area and serves a population of approximately 5,000 people.

When originally built, the facility consisted of a 2-cell lagoon treatment system.[19] The WWTP was upgraded to a 4-cell lagoon system in 1981, and the aeration system was upgraded in 2001. Currently, the tapered multi-call aerated lagoon systems is composed of three aeration lagoons and one polishing lagoon (FCCHD 2012); the design flow of the system is 0.650 mgd.

The WWTP is permitted to discharge effluent to the Flathead River from one outfall (#001) (U.S. EPA 2007b). The outfall is on the Flathead River between Flathead Lake and Kerr Dam. The most recent MPDES permit limits for the outfall are shown in Table 19. Additionally, the permit also requires the pH of the effluent to remain between 6.0 and 9.0 standard units and states that there shall be no discharge of floating solids or visible foam in other than trace amounts, nor shall there be a discharge which causes a visible sheen in the receiving waters. The permit requires that the concentration of oil and grease, from any single sample, should not exceed 10 mg/L.

[19] Ash Walker, Assistant Water and Sewer Superintendent, City of Polson, personal communication, August 14, 2008.

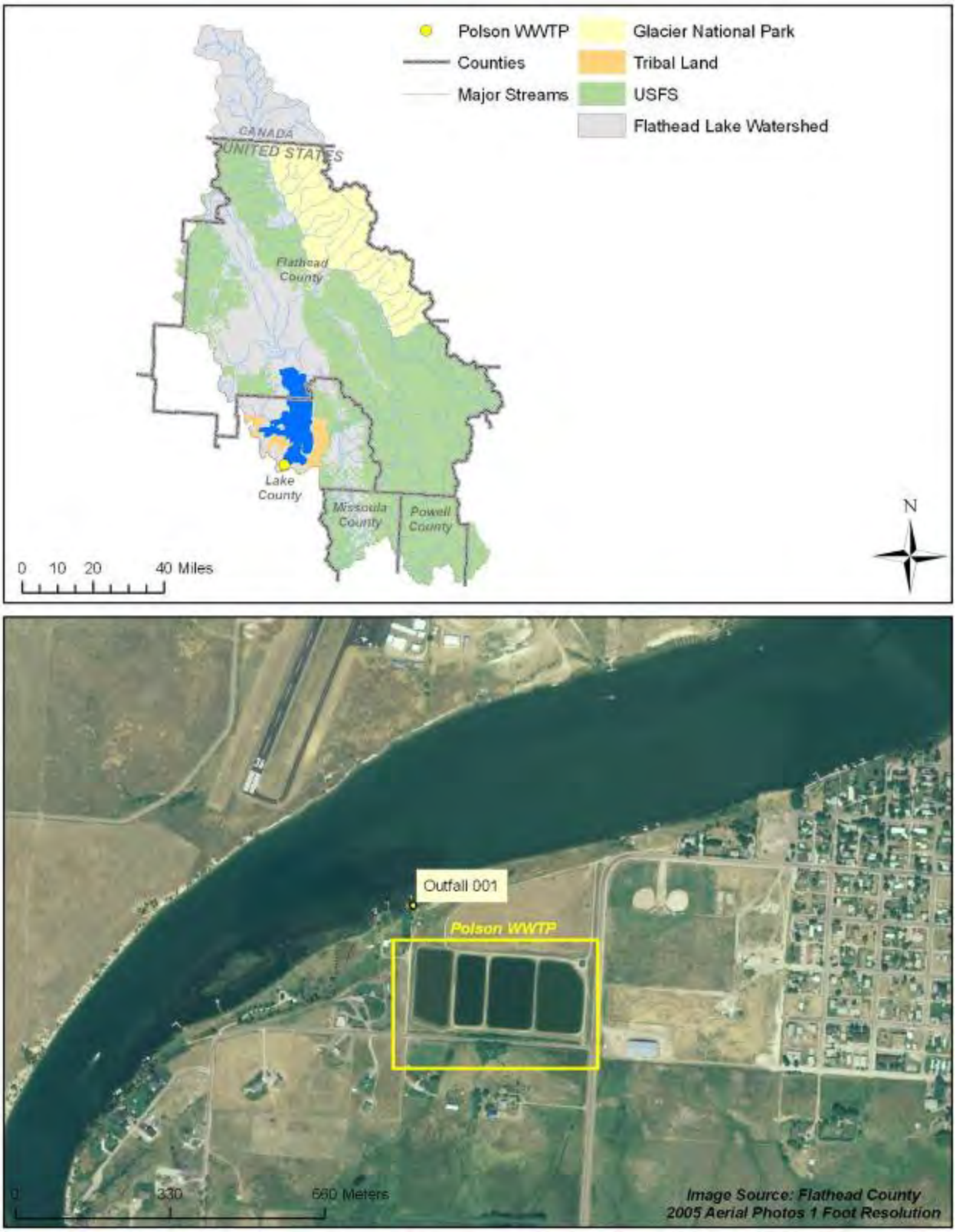


Figure 18. Polson WWTP permitted outfall.

Table 20. Polson WWTP permit limits

Constituent	Units	30-day average	7-day average
BOD_5	mg/L	30	45
E. coli [a]	cfu/100mL	126	252
Flow	mgd	0.650	--
TSS	mg/L	100	135

Source: U.S. EPA 2013
Notes
BOD_5 = five-day biological oxygen demand; cfu/100mL = colony forming units per 100 milliliters; mgd = million gallons per day; mg/L = milligrams per liter; TSS = total suspended solids.
a. The *E. coli* limits apply year round.

Table 20 and Table 21 summarize the available water quality data from outfall #001; data were obtained directly from the city of Polson (2000-2008) and from ICIS (U.S. EPA 2013b). The average effluent flow from ICIS during 2001 to 2013 was 0.751 cfs.

Table 21. Polson WWTP data summary - Data from Polson WWTP

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	3/31/2000	6/30/2006	66	11.6	0.02	32.7
Nitrate (total as N) (mg/L)	3/31/2000	6/30/2006	52	3.25	0.07	10.3

Source of data: Ash Walker, Assistant Water and Sewer Superintendent, City of Polson, August 14, 2008.
Note: avg. = average (arithmetic mean); max. = maximum; mg/L = milligrams per liter; min. = minimum; N = nitrogen.

Table 22. Polson WWTP data summary - Data from ICIS

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	3/13/2001	10/23/2008	61	11.7	0.02	32.7
BOD, 5-day, 20 °C	3/13/2001	1/18/2013	299	76.4	1.4	493
Flow (cfs)	4/13/2001	1/18/2013	123	0.751	0.499	1.24
Nitrate (total as N) (mg/L)	4/13/2001	10/23/2008	49	2.94	0.15	12.7
Nitrite (total as N) (mg/L)	4/13/2001	10/23/2008	51	2.93	0.15	12.7
TSS (mg/L)	3/13/2001	1/18/2013	232	42.1	2.51	135

Source of data: ISIS (U.S. EPA 2013b).
Notes
DMR records from ICIS are monthly averages.
avg. = average (arithmetic mean); BOD = biological oxygen demand; C = Celsius; cfs = cubic feet per second; max. = maximum; mg/L = milligrams per liter; min. = minimum; N = nitrogen; TSS = total suspended solids.

Figure 19 shows that the daily average flow from the Polson WWTP has ranged from 0.5 cfs to 1.2 cfs since 2000. No total phosphorus or total nitrogen data were available.

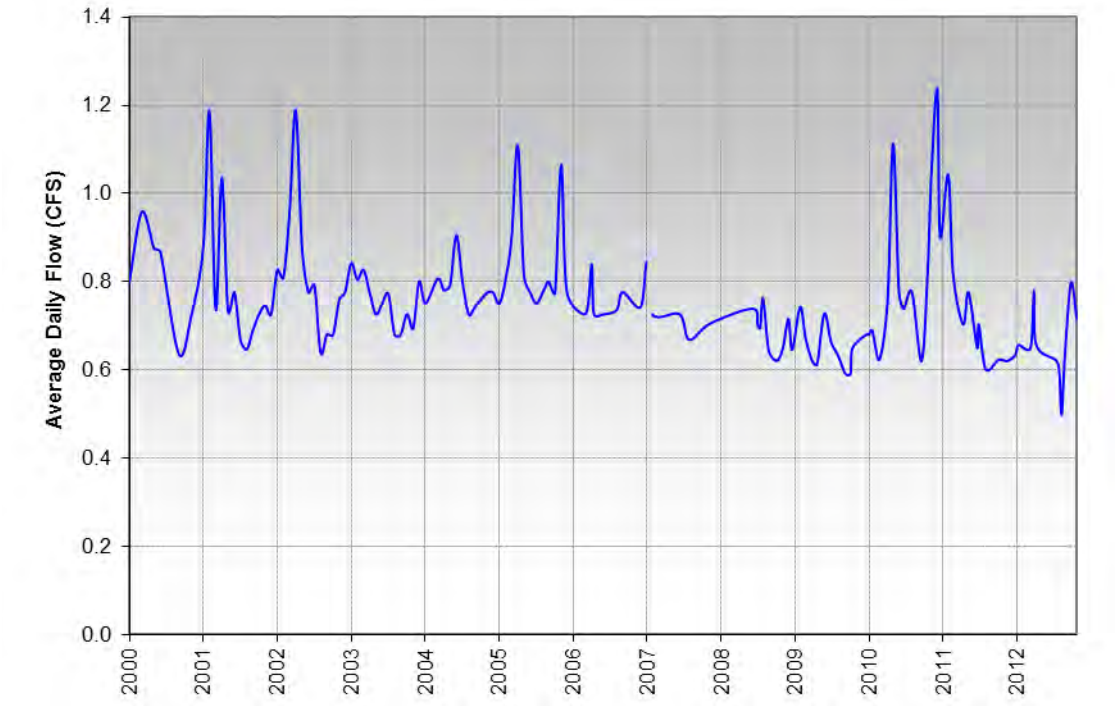


Figure 19. Average daily flow at the Polson WWTP.

Typical of lagoon treatment systems, ammonia concentrations from the Polson WWTP fluctuate seasonally and range from 0.02 to 32.70 mg/L. Figure 20 shows that since 2001, when the aeration system was upgraded, total ammonia concentrations and loads from the Polson WWTP were lowest from May/June through October/November of each year. Since 2002, peak loads ranged from 44.7 lb/d to 118 lb/d. There is no apparent trend in the data; the city of Polson did not provide data past 2006 for analysis, and the DMR data provided by U.S. EPA Region 8 does not include nutrients after 2008.

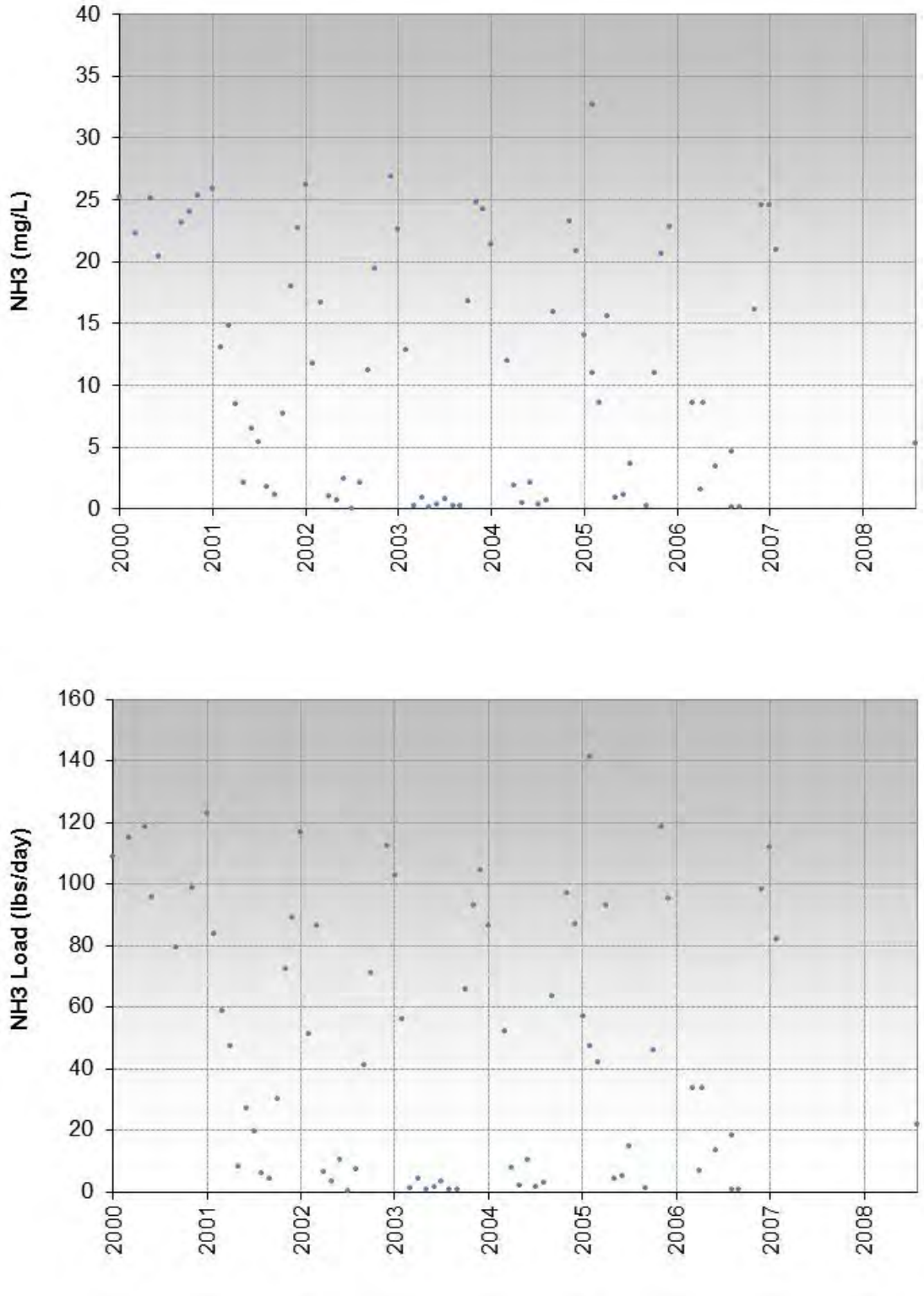


Figure 20. Ammonia from the city of Polson WWTP.

2.6 Kalispell WWTP (MT0021938)

The City of Kalispell operates an advanced wastewater treatment and biological nutrient removal facility that discharges to Ashley Creek (Figure 21). The original facility was built in 1974 and consisted of a simple biofilter process.[20] That facility was completely replaced in 1992 with a modified-University of Capetown biological nutrient removal process with a 3.1 mgd capacity[21]; the "biological removal treatment process with suspended growth" is used for phosphorus removal (FCCHD 2009, p. 5). Recently, the WWTP upgraded to a modified Johannesburg treatment system with a total capacity of 5.4 mgd capacity.[22]

The service area of the Kalispell WWTP is displayed in Figure 22, and the WWTP serves approximately 19,000 customers (FCCHD 2009). All properties within municipal boundaries are served by the Kalispell WWTP and new annexations are required to connect to the Kalispell sewer system.[23] The Kalispell WWTP is also contracted to treat wastewater from the Evergreen County Water and Sewer District through an inter-local agreement signed in 1990 (FCCHD 2009, 2012). The agreement expires in 2015 and the city of Kalispell and unincorporated community of Evergreen are in the process of negotiating a new agreement (as of June 2013)[24]. The agreement currently allows for the District to pump 0.682 mgd to the Kalispell WWTP (FCCHD 2009). In 2009, the Kalispell WWTP processed approximately 2.79 mgd, and 0.456 mgd of the 2.79 mgd was from the Evergreen County Waters and Sewer District (FCCHD 2009). Evergreen's average daily flow has increased slowly over time from 0.349 mgd in 1995 to 0.512 mgd in 2011 (FCCHD 2012).

The WWTP is permitted to discharge effluent to Ashley Creek from one outfall (#001) (DEQ 2008c) (Figure 21). Joni Emrick (plant manager) stated that, "when the flow leaves the sand filter/ultraviolet light treatment room, it flows by gravity to the re-aeration basin where fine bubble diffusers add air for a minimum 75 percent DO saturation. Then the water flows over a weir through a short pipe into Ashley Creek."[25]

Kalispell's MPDES permit (MT0021938) limits for its outfall on Ashley Creek are shown in Table 22. Additionally, the permit requires the pH of the effluent to remain between 6.0 and 9.0 standard units and there cannot be any visible foam, oil sheen, or floating solids in the effluent. The permit requires an 85 percent reduction in TSS and BOD_5 and for there to be no acute toxicity in the discharged effluent.

The Kalispell WWTP also has a permit (MTG650010) to dispose of sewage sludge. The majority of the sludge goes to Glacier Gold Compost, Inc. in Olney, Montana, where it is mixed with wood waste and sold as Glacier Gold Compost.[26] When Glacier Gold Compost Inc., cannot accept the sludge, the Flathead County Landfill will accept some sludge "during early morning hours before it is open to the public" (FCCHD 2009, p. 5).The occasional cleanings of the digester waste, approximately every 5 years, are land applied to a parcel of land south of the plant on EPA-City owned land (Category 2, Subcategory 2a of Montana's general MPDES permit for biosolids).

[20] Joni Emrick, plant manager, Kalispell WWTP, personal communication, August 15, 2008.
[21] Joni Emrick, plant manager, Kalispell WWTP, personal communication, April 30, 2008.
[22] Melee K. Valett, water quality specialist, DEQ – Permitting and Compliance Division – Water Protection Bureau – Water Quality Discharge Permits Section, personal communication, March 10, 2010.
[23] Rebekah Wargo, assistant civil engineer, city of Kalispell, personal communication, June 18, 2013.
[24] Curt Konecky, plant manager, Kalispell WWTP, personal communication, June 14, 2013.
[25] Joni Emrick, plant manager, Kalispell WWTP, personal communication, October 6, 2008.
[26] Joni Emrick, plant manager, Kalispell WWTP, personal communication, August 15, 2008.

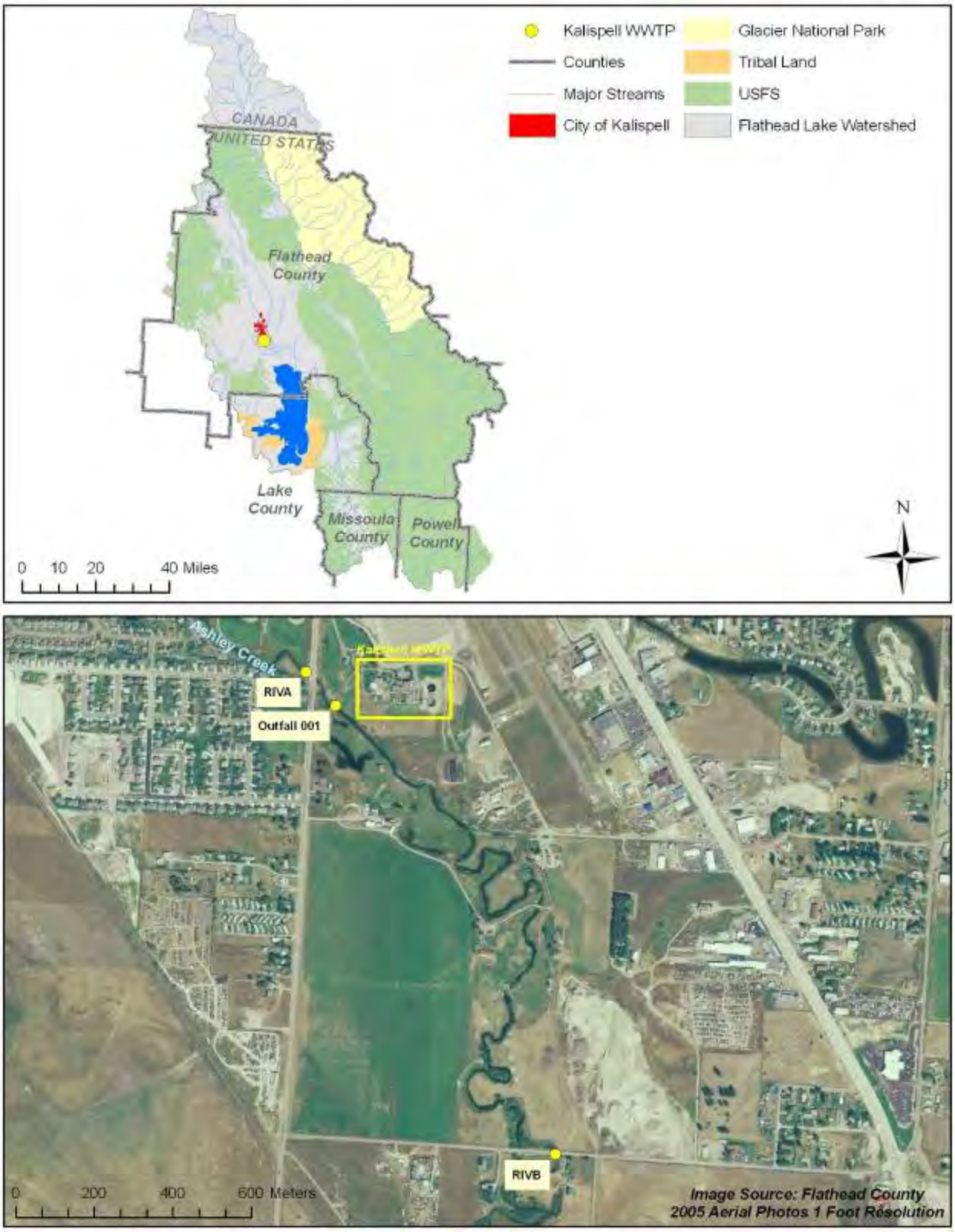
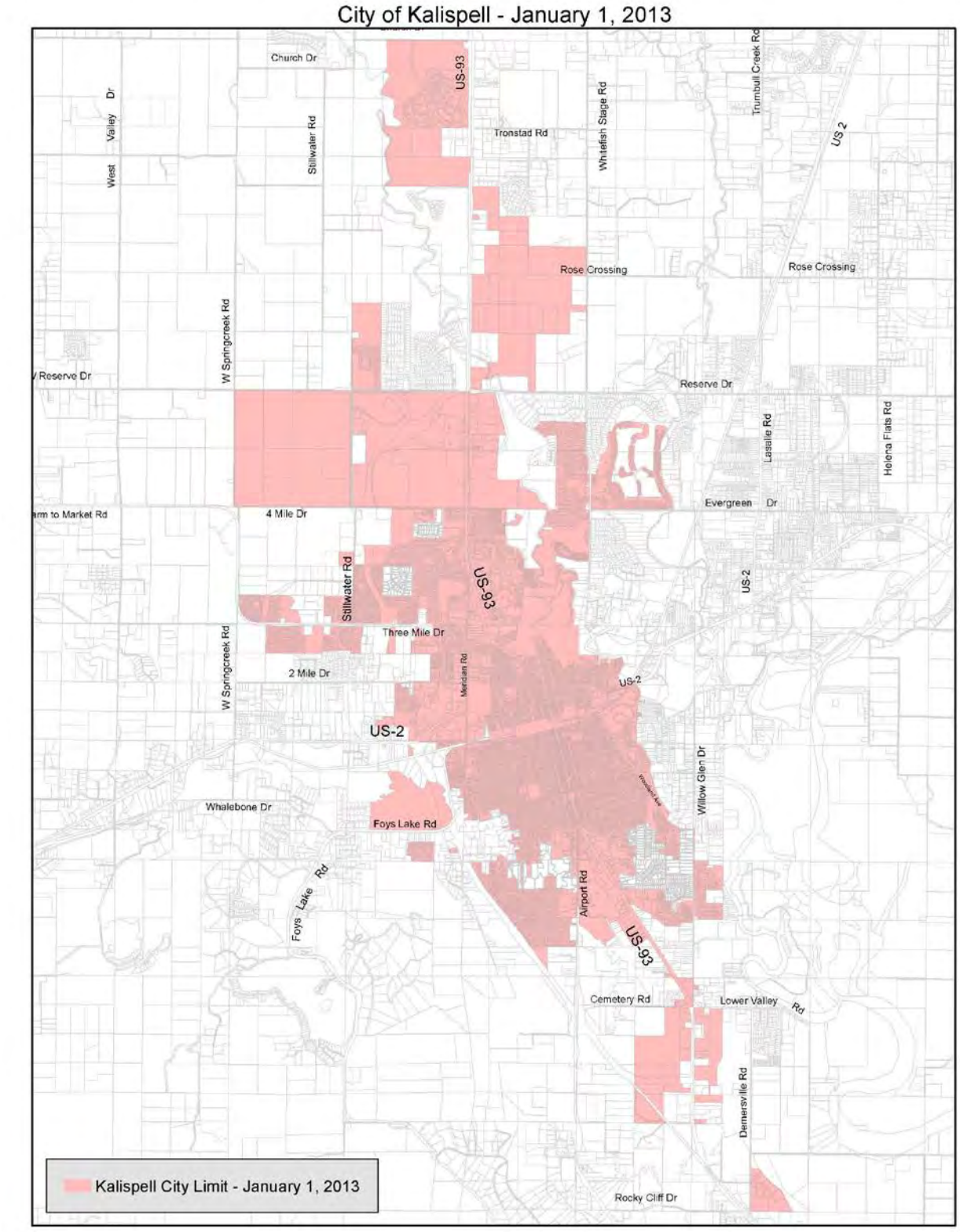


Figure 21. Kalispell WWTP permitted outfall.



Source of map: Rebekah Wargo, Assistant Civil Engineer, city of Kalispell, June 19, 2013.

Figure 22. Kalispell WWTP service area.

Table 23. Kalispell WWTP permit limits

Constituent	Units	Average monthly limit	Average weekly limit	Maximum daily limit
BOD_5	mg/L	10	15	--
	lb/day	259	388	--
TSS	mg/L	10	15	--
	lb/day	259	388	--
E. coli bacteria, winter [a]	cfu/100mL	630	--	1,260
E. coli bacteria, summer [b]	cfu/100mL	126	--	252
Total Phosphorus	mg/L	1.0	--	--
	lb/d	25.8	--	--
Total Nitrogen	lb/d	268	--	379
Total Ammonia, winter [a]	mg/L	2.16	--	2.22--
Total Ammonia, summer [b]	mg/L	1.23	--	2.22--
Oil and Grease	mg/L	--	--	10
DO Saturation	percent	--	--	>75%

Source: DEQ 2008c

Notes

BOD_5 = five-day biological oxygen demand; cfu/100mL = colony forming units per 100 milliliters; DO = dissolved oxygen; lb/d = pounds per day; mg/L = milligrams per liter; TSS = total suspended solids.

a. Winter is November 1 through March 31.

b. Summer is April 1 through October 31.

The facility is required to monitor the water quality of its effluent (outfall #001) and upstream and downstream of its outfall in Ashley Creek (RIVA and RIVB as shown in Figure 21). Table 23 and Table 24 summarize the available effluent water quality data at outfall #001; data were obtained directly from the Kalispell WWTP[27] and from ICIS (U.S. EPA 2013b). Influent data provided by the city of Kalispell are summarized in Table 23. Facility effluent data are summarized herein. ICIS data (summarized in Table 24) and facility influent data (Table 23) may be used to supplement facility effluent data during model development. The average effluent flow from 1998-2012 was 3.55 cfs, with an average total phosphorus concentration of 0.215 mg/L and an average total nitrogen concentration of 8.25 mg/L.

[27] Records provided as a series of Excel spreadsheets for 1993 through 2007 from Joni Emrick on May 28, 2008.

Table 24. Kalispell WWTP data summary - Influent data from Kalispell WWTP

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
BOD, 5-day, 20 °C	1/5/1993	12/30/2003	574	185	42	437
Flow rate (cfs)	1/1/1993	12/31/2007	5,478	3.41	0.13	10.51
Temperature (°C)	1/6/1993	12/31/2003	560	15.40	8.02	28.2
TSS (mg/L)	1/5/1993	12/30/2003	575	209	64	800

Source of data: Joni Emrick, plant manager, Kalispell WWTP, May 28, 2008.
Notes
avg. = average (arithmetic mean); BOD = biological oxygen demand; C = Celsius; cfs = cubic feet per second; max. = maximum; mg/L = milligrams per liter; min. = minimum; TSS = total suspended solids.

Table 25. Kalispell WWTP data summary - Effluent data from Kalispell WWTP

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	1/28/1993	12/27/2012	856	0.213	0.01	8.2
BOD, 5-day, 20 °C	1/3/1993	12/27/2012	3,166	2.51	2	24
Flow rate (cfs)	1/1/1998	12/31/2012	3,244	3.55	2	9.33
Nitrate (total as N) (mg/L)	1/28/1993	12/25/2012	836	7.19	0.2	19.1
Nitrogen (total) (mg/L)	1/4/2012	12/25/2012	52	8.25	6.67	10.3
Orthophosphate (as P) (mg/L)	11/21/2006	5/5/2009	37	0.0719	0.01	0.25
Phosphorus (total) (mg/L)	1/3/1993	12/27/2012	3,178	0.215	0	11.1
Temperature (°C)	1/6/1993	12/31/2012	2,396	14.7	1	22.5
TKN (total as N) (mg/L)	1/28/1993	12/25/2012	436	1.47	0.03	10.9
TSS (mg/L)	1/3/1993	12/27/2012	3,176	2.48	0.3	276

Source of data: Joni Emrick, plant manager, Kalispell WWTP, May 28, 2008 and Curt Konecky, plant manager, Kalispell WWTP, February 21-26, 2013.
Notes
avg. = average (arithmetic mean); BOD = biological oxygen demand; C = Celsius; cfs = cubic feet per second; lb/d = pounds per day; max. = maximum; mg/L = milligrams per liter; min. = minimum; N = nitrogen; NO2+NO3 = nitrite plus nitrate; P = phosphorus; TKN = total Kjeldahl nitrogen; TSS = total suspended solids.

Table 26. Kalispell WWTP data summary - Data from ICIS

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	4/28/1999	1/24/2013	166	0.163	0.015	8.2
BOD, 5-day, 20 °C	4/28/1999	1/24/2013	166	2.27	2	9.4
Conduit Flow (cfs)	4/28/1999	1/24/2013	150	3.95	2.41	6.48
Dissolved Oxygen	4/28/1999	1/24/2013	166	8.94	6.78	11.5
Nitrogen (total) (mg/L)	4/28/1999	1/24/2013	166	9.23	1.11	19.9
NO_2+NO_3 (total as N) (mg/L)	4/28/1999	1/24/2013	166	8.31	0.2	19.1
Phosphorus (total) (mg/L)	4/28/1999	1/24/2013	166	0.129	0.035	0.38
Temperature (°C)	4/28/1999	1/24/2013	166	15.1	9.6	21.8
TKN (total as N) (mg/L)	4/28/1999	1/24/2013	166	1.09	0.03	3.8
TSS (mg/L)	4/28/1999	1/24/2013	166	1.58	0.2	6

Source of data: ISIS (U.S. EPA 2013b)
Notes
DMR records from ICIS are monthly averages.
avg. = average (arithmetic mean); BOD = biological oxygen demand; C = Celsius; cfs = cubic feet per second; max. = maximum; mg/L = milligrams per liter; min. = minimum; N = nitrogen; NO_2+NO_3 = nitrite plus nitrate; TKN = total Kjeldahl nitrogen; TSS = total suspended solids.

Figure 23 shows the average daily influent flow from January 1993 through 2012. Influent flows have increased over time from an average of 2.2 cfs in 1993 to an average of 4.1 cfs in 2012. Effluent flow was not recorded for the entire period of record, as shown in Figure 24, which presents the average daily effluent flow from 1998 through 2012 and include data gaps. Effluent flows from 1998 through 2012 ranged from 2.0 cfs to 9.3 cfs with an average flow of 3.6 cfs.

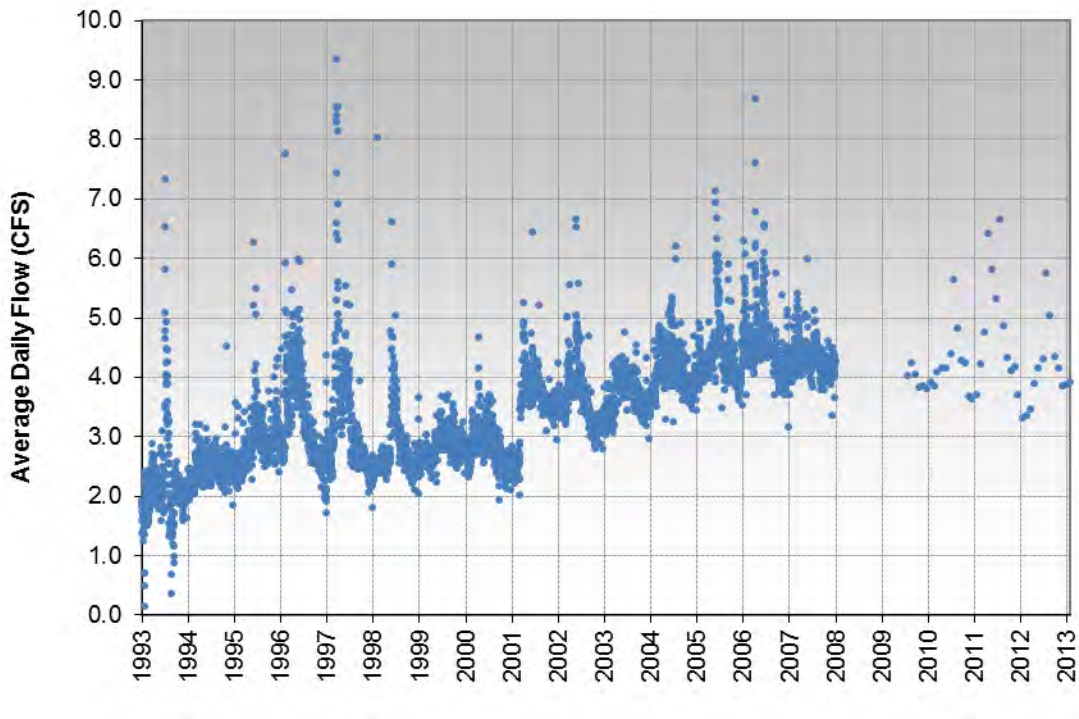


Figure 23. Average daily influent flow at the Kalispell WWTP

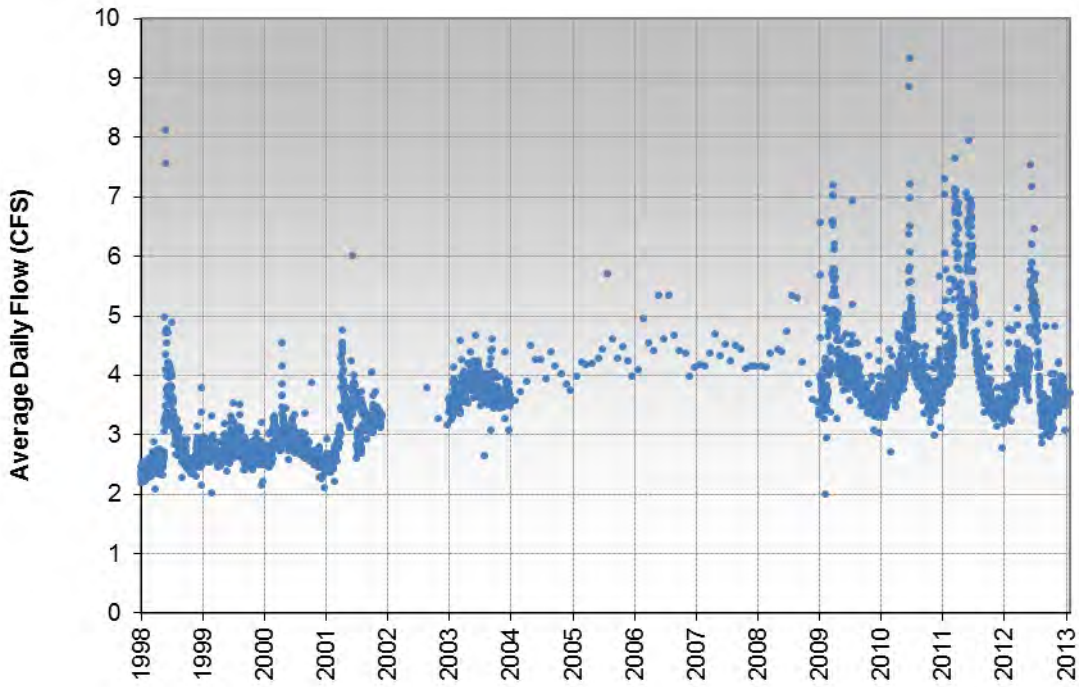


Figure 24. Average daily effluent flow at the Kalispell WWTP

Figure 25 shows the effluent total phosphorus concentrations and loads over time. Concentrations were highest in 1993 and lowest in 2000. Total phosphorus concentrations have remained relatively similar since 2000; however, total phosphorus loads have increased since 2000 due to increasing flows. The average daily load in 2000 was 1.6 pounds per day, and the average daily load in 2012 was 3.6 pounds per day.

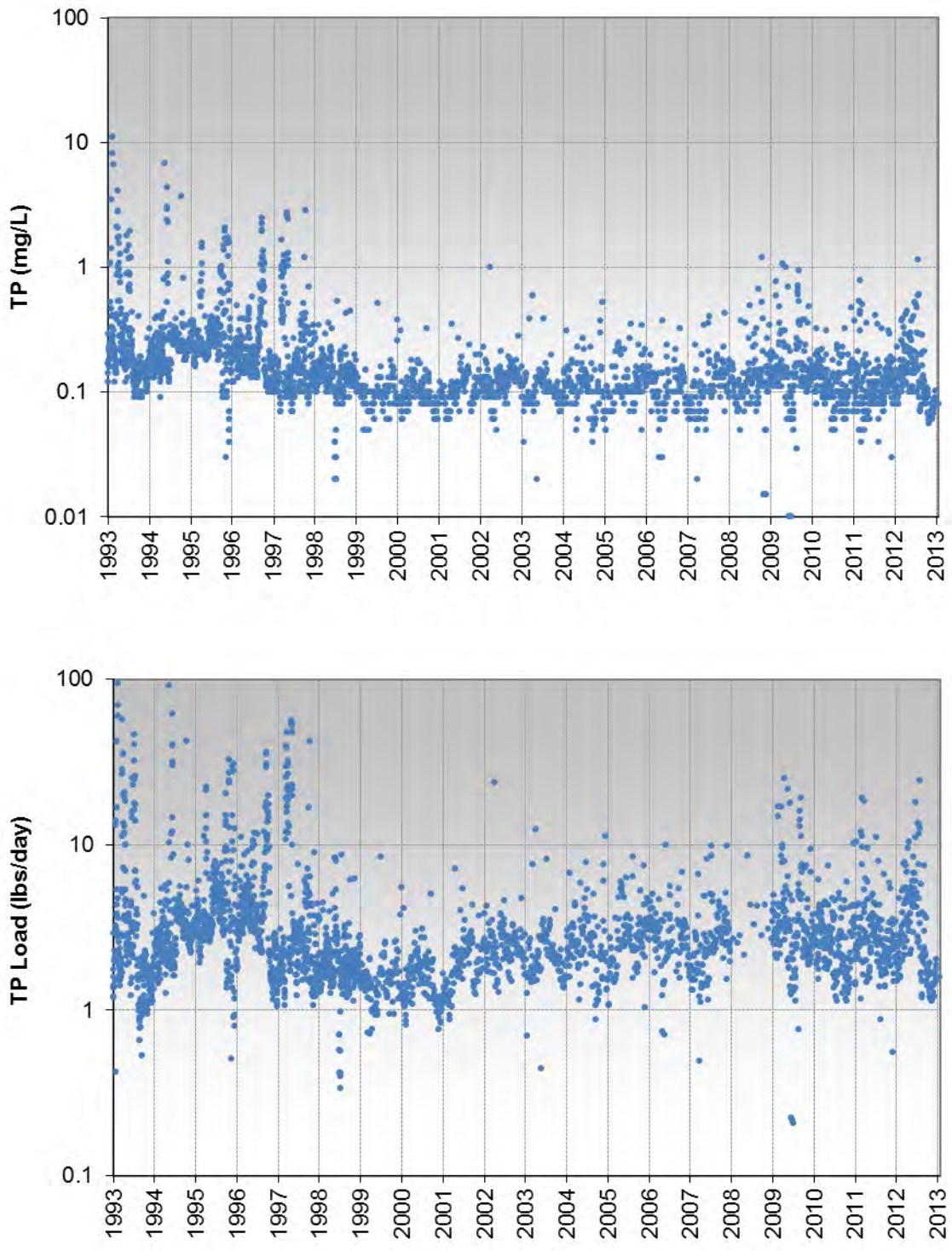


Figure 25. Total phosphorus at the Kalispell WWTP.

Figure 26 shows the effluent total nitrogen concentrations and loads over time. Total nitrogen concentrations were lowest in 1993 (average of 4.93 mg/L), increased during the 1990s, and have

remained fairly constant since 2000. Total nitrogen loads have increased over time due to both increasing flows and total nitrogen concentrations.

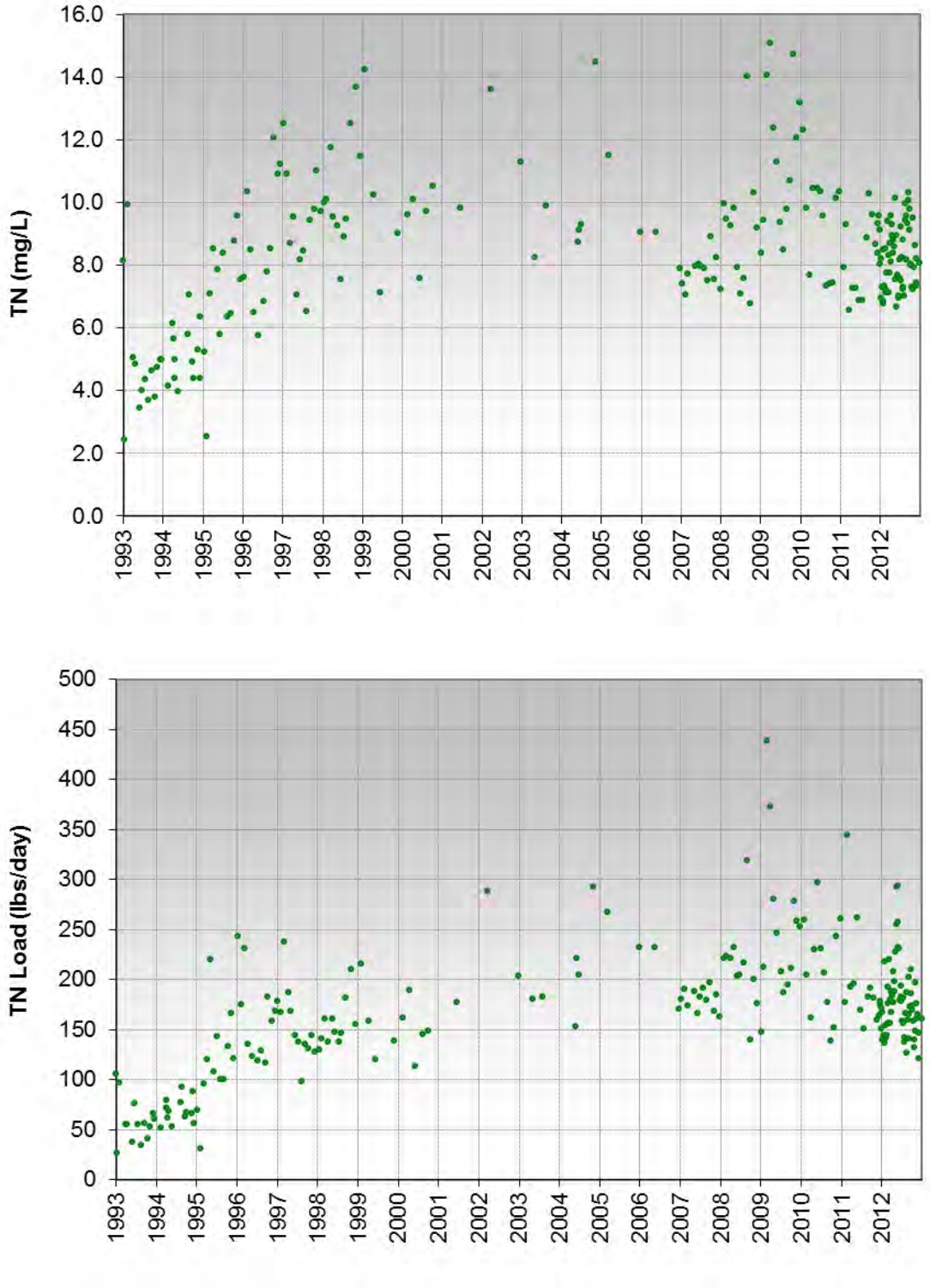


Figure 26. Total nitrogen at the Kalispell WWTP.

2.7 Hungry Horse Dam WWTP (MT0022578)

The Bureau of Reclamation, of the U.S. Department of the Interior, formerly operated a wastewater treatment facility that is located at the Hungry Horse Dam near Hungry Horse, Montana. A septic system with drainfield was recently installed in 2009 and there is no longer a discharge from the wastewater treatment facility.[28] Formerly, the plant served the Hungry Horse Dam facility. The WWTP was built in 1970 and consists of an extended aeration package plant with secondary and tertiary treatment.[29] The design flow was 0.009 mgd. No major upgrades have occurred since 1970. However, a design investigation was conducted in 2007 to look at alternatives to replacing the existing system with a system that does not discharge to the river. Even though the wastewater treatment facility is not actively used and does not discharge, the Bureau of Reclamation continues to maintain the permit in case they decide to reactivate the WWTP in the future.[30]

The WWTP is permitted to discharge effluent to the South Fork Flathead River from one outfall (#001) (DEQ 2008a). The most recent MPDES permit limits for the outfall are shown in Table 25. The permit also requires the pH of the effluent to remain between 6.5 and 9.0 standard units and there cannot be any visible foam, oil sheen, or floating solids in the effluent. The concentration of oil and grease cannot exceed 10 mg/L in any individual sample.

[28] Melee K. Valett, water quality specialist, DEQ – Permitting and Compliance Division – Water Protection Bureau – Water Quality Discharge Permits Section, personal communication, March 10, 2010.
[29] Dennis Philmon, Facility Manager, Hungry Horse Dam, personal communication, July 24, 2008.
[30] Melee K. Valett, water quality specialist, DEQ – Permitting and Compliance Division – Water Protection Bureau – Water Quality Discharge Permits Section, personal communication, March 10, 2010.

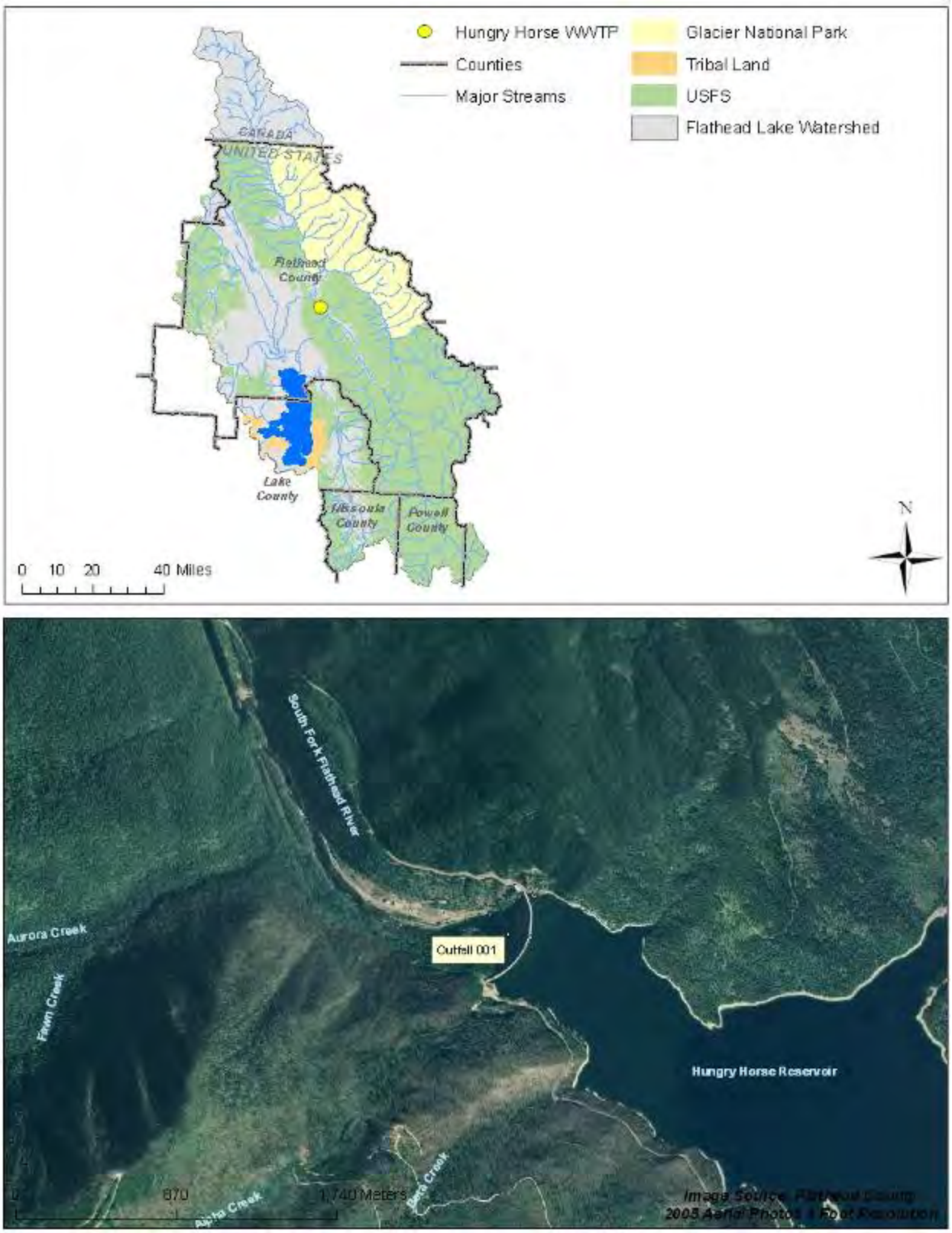


Figure 27. Hungry Horse Dam WWTP permitted outfall.

Table 27. Hungry Horse Dam WWTP permit limits

Constituent	Units	Average monthly limit	Average weekly limit	Maximum daily limit
BOD_5	mg/L	30	45	--
	lb/day	1.5	2.25	--
TSS	mg/L	30	45	--
	lb/day	1.5	2.25	--
E. coli bacteria, winter [a]	cfu/100mL	630	--	1,260
E. coli bacteria, summer [b]	cfu/100mL	126	--	252
Total Phosphorus	mg/L	1.0		
	lb/d	0.8	--	--
Total Residual Chlorine	mg/L	0.011		0.019

Source: DEQ 2008a.
Notes
BOD_5 = five-day biological oxygen demand; cfu/100mL = colony forming units per 100 milliliters; mg/L = milligrams per liter; TSS = total suspended solids.
a. This limitation applies from November 1 through March 31.
b. This limitation applies from April 1 through October 31.

Table 26 summarizes the available water quality data at outfall #001, which were obtained from ICIS (U.S. EPA 2013b; available for 1995 to 2013). The average effluent flow from 1995 to 2013 was less than 0.01 cfs, with an average total phosphorus concentration of 0.205 mg/L and an average total nitrogen concentration of 9.3 mg/L.

Table 28. Hungry Horse Dam WWTP data summary

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	11/25/1995	4/29/2011	151	0.857	0.02	16
BOD, 5-day, 20 °C	10/25/1995	4/29/2011	163	3.44	1	17
Flow rate (cfs)	10/25/1995	1/9/2013	469	0.00359	0.0000245	0.0184
Nitrogen (total) (mg/L)	11/25/1995	4/29/2011	152	9.3	0.48	57.3
NO_2+NO_3 (total as N) (mg/L)	11/25/1995	4/29/2011	153	7.9	0.04	54.3
Phosphorus (total) (mg/L)	10/25/1995	4/29/2011	158	0.205	0.03	1
Temperature (°C)	12/15/2008	1/9/2013	58	15.5	10.4	27
TKN (total as N) (mg/L)	11/25/1995	4/29/2011	146	1.46	0.11	15.7
TSS (mg/L)	10/25/1995	4/29/2011	163	6.73	1	34

Source of data: ISIS (U.S. EPA 2013b)
DMR records from ICIS are monthly averages.
Note: avg. = average (arithmetic mean); BOD = biological oxygen demand; C = Celsius; cfs = cubic feet per second; lb/d = pounds per day; max. = maximum; mg/L = milligrams per liter; min. = minimum; N = nitrogen; NO_2+NO_3 = nitrite plus nitrate; P = phosphorus; TKN = total Kjeldahl nitrogen; TSS = total suspended solids.

2.8 Yellow Bay WWTP (Flathead Lake Biological Station) (MT0023388)

The Flathead Lake Biological Station operates a wastewater treatment facility (Yellow Bay) that is on the eastern shore of Flathead Lake (Figure 28). The plant serves the Flathead Lake Biological Station campus (30-120 people, depending on the season) and the Yellow Bay State Park (FCCHD 2012).

The facility was built in 1974 and consists of an extended aeration package plant with tertiary treatment for phosphorus (U.S. EPA 2007a; FCCHD 2012). There is also a small water treatment facility consisting of a sand filter and chlorine disinfection[31]. The design flow of the plant is 33,000 gpd, although in a normal year, the average discharge is 10,000 gpd in the summer and 2,000 gpd in the winter (University of Montana 2008). No major upgrades have occurred since 1974.

The WWTP is permitted to discharge effluent to Flathead Lake from one outfall (#001) (U.S. EPA 2012). The most recent permit limits for the outfall are shown in Table 27. Additionally, the permit also requires the pH of the effluent to remain between 6.5 and 9.0 standard units and there cannot be any visible foam, oil sheen, or floating solids in the effluent. The concentration of oil and grease cannot exceed 10 mg/L in any individual sample.

[31] Mark Potter, Assistant Director of Facilities and Properties, University of Montana, personal communication, July 17, 2008.

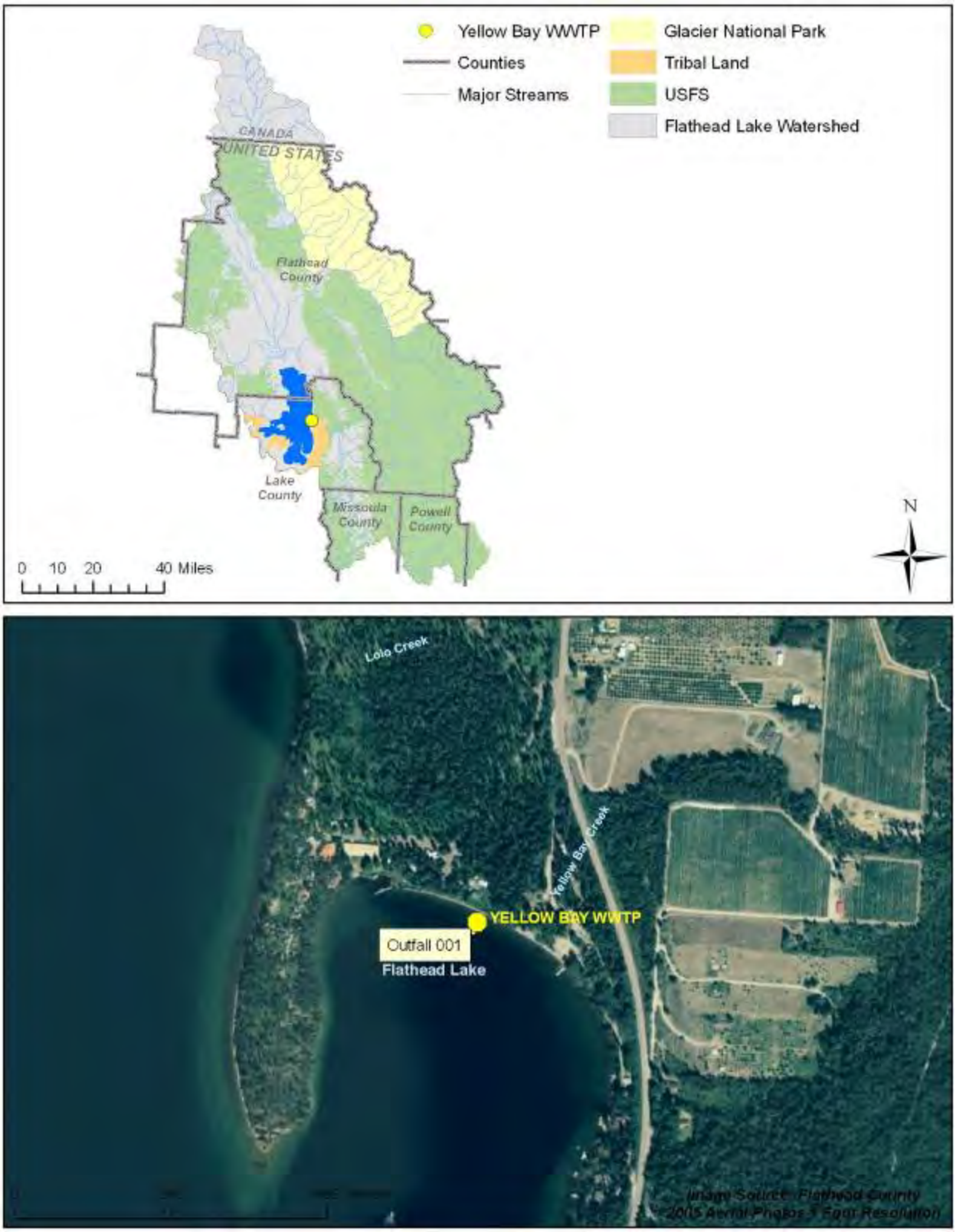


Figure 28. Yellow Bay WWTP permitted outfall.

Table 29. Yellow Bay WWTP permit limits

Constituent	Units	30-day average	7-day average	Daily maximum	Annual limit
BOD_5	mg/L	30	45	--	--
Chlorine (total residual)	mg/L	--	--	0.019	--
E. Coli Bacteria	cfu/100mL	32	50	--	--
Total Nitrogen	lb/year [a]	--	--	--	154
Total Phosphorus	lb/year [a]	--	--	--	0.3
TSS	mg/L	30	45	--	--

Source: U.S. EPA 2012
Notes
BOD_5 = five-day biological oxygen demand; cfu/100mL = colony forming units per 100 milliliters; lb/year = pounds per year; mg/L = milligrams per liter; TSS = total suspended solids.
a. Pounds of total nitrogen and total phosphorus discharged per month will be calculated by multiplying the average monthly flow time the average monthly concentrations of total nitrogen and total phosphorus. The amount discharged per year will be the sum of the pounds discharged each month.

Table 28 and Table 29 summarize the available water quality data from outfall #001; data were obtained directly from the Flathead Lake Biological Station and from ICIS (U.S. EPA 2013b). Data provided by the facility are summarized herein; ICIS data (summarized in Table 29) may be used to supplement facility data during model development.. FLBS reported that total phosphorus averaged 0.152 from 1983 to 2006. FLBS also reported that flow in 2007 averaged 0.00235 cfs. Finally, FLBS reported that total nitrogen in 2000 averaged 23.2 mg/L.

The Yellow Bay WWTP has a permit (MTG651004) to land apply sewage sludge.

Table 30. Yellow Bay WWTP data summary - Data from Flathead Lake Biological Station

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	7/29/1983	1/3/2006	184	1.66	0	47.9
BOD, 5-day, 20 °C	2/28/2001	3/27/2007	51	1.32	0.07	4.6
Flow rate (cfs)	1/2/2007	3/30/2007	61	0.00235	0.00009	0.00812
Nitrogen (total) (mg/L)	1/31/2000	12/31/2000	12	23.2	18.1	28.2
NO_2+NO_3 (total as N) (mg/L)	3/21/1988	1/3/2006	135	16.8	0.802	44.2
Phosphorus (total) (mg/L)	7/29/1983	2/7/2006	1,000	0.152	0	6.62
TPN (mg/L)	10/12/1983	2/7/2006	261	15.6	0.487	29.8
TSS (mg/L)	2/28/2001	6/30/2005	48	0.593	0.25	9

Source of data: Mark Potter, Assistant Director of Facilities and Properties, University of Montana, July 17, 2008.
Note: avg. = average (arithmetic mean); BOD = biological oxygen demand; C = Celsius; cfs = cubic feet per second; max. = maximum; mg/L = milligrams per liter; min. = minimum; N = nitrogen; NO_2+NO_3 = nitrite plus nitrate; P = phosphorus; TKN = total Kjeldahl nitrogen; TPN = total persulfate nitrogen; TSS = total suspended solids.

Table 31. Yellow Bay WWTP data summary - Data from ICIS

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
BOD, 5-day, 20 °C	4/2/2001	1/28/2013	131	1.31	0.07	6.9
Conduit Flow (cfs)	4/2/2001	1/28/2013	131	0.00396	0.00124	0.0124
Nitrogen (total) (mg/L)	7/30/2007	8/17/2012	60	18.8	3.08	170
NO_2+NO_3 (total as N) (mg/L)	7/30/2007	1/28/2013	67	14.9	1.73	33.7
TKN (total as N) (mg/L)	7/30/2007	1/28/2013	66	0.451	0	6.74
TSS (mg/L)	4/2/2001	1/28/2013	122	0.449	0.25	2.5

Source of data: ISIS (U.S. EPA 2013b)
Notes
DMR records from ICIS are monthly averages.
avg. = average (arithmetic mean); BOD = biological oxygen demand; C = Celsius; cfs = cubic feet per second; max. = maximum; mg/L = milligrams per liter; min. = minimum; N = nitrogen; NO_2+NO_3 = nitrite plus nitrate; TKN = total Kjeldahl nitrogen; TSS = total suspended solids.

Average daily flow data is only available for three months in 2007, monthly and bi-monthly flows are available from 2001 to 2013. Figure 29 summarizes all available facility flows from 2001 through 2012. Flows range from 0.001 to 0.01 cfs averaging 0.004 cfs.

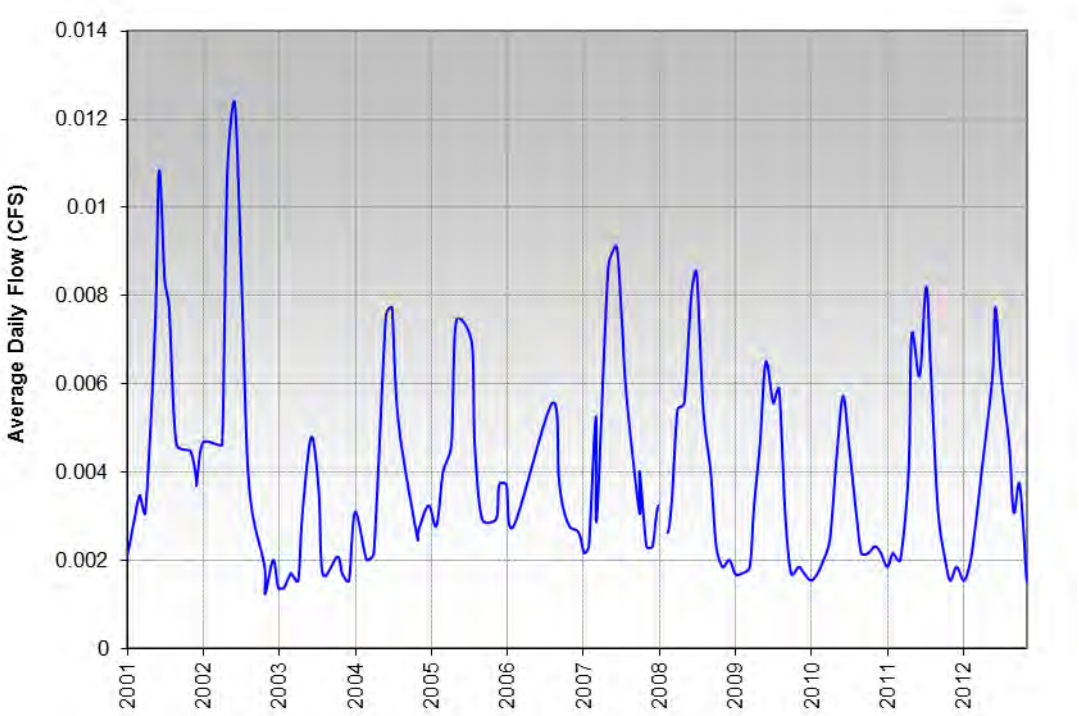


Figure 29. Average daily flow at the Yellow Bay WWTP.

Total phosphorus data are available from 1983 through February 7, 2006; however, since no corresponding flow data are available, loads cannot be calculated. Effluent total phosphorus concentrations have decreased since the early 1980s (Figure 30). From 1983 through 1990 concentrations ranged from 0.0008 mg/L to 5.80 mg/L and averaged 0.54 mg/L. From 1991 through February 7, 2006 concentrations ranged from 0.0062 mg/L to 6.62 mg/L and averaged 0.079 mg/L (total phosphorus concentrations reported as zero were excluded from the minimum and average calculations).

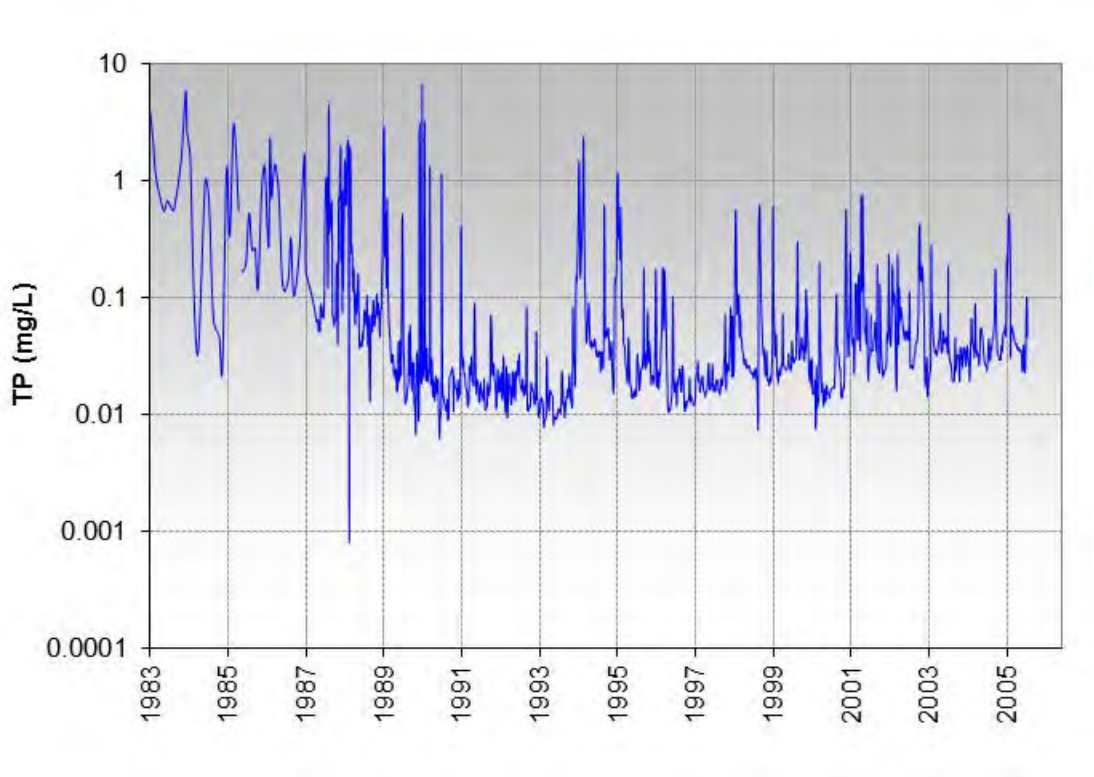


Figure 30. Total phosphorus at the Yellow Bay WWTP.

Total persulfate nitrogen data is also available from 1983 through February 7, 2006; however, no corresponding flow data are available. Concentrations display an increasing trend but stabilized in the mid-1990s through 2000s (Figure 31). From 2001 through February 7, 2006, concentrations have ranged from 12.5 mg/L to 29.8 mg/L and averaged 21.2 mg/L.

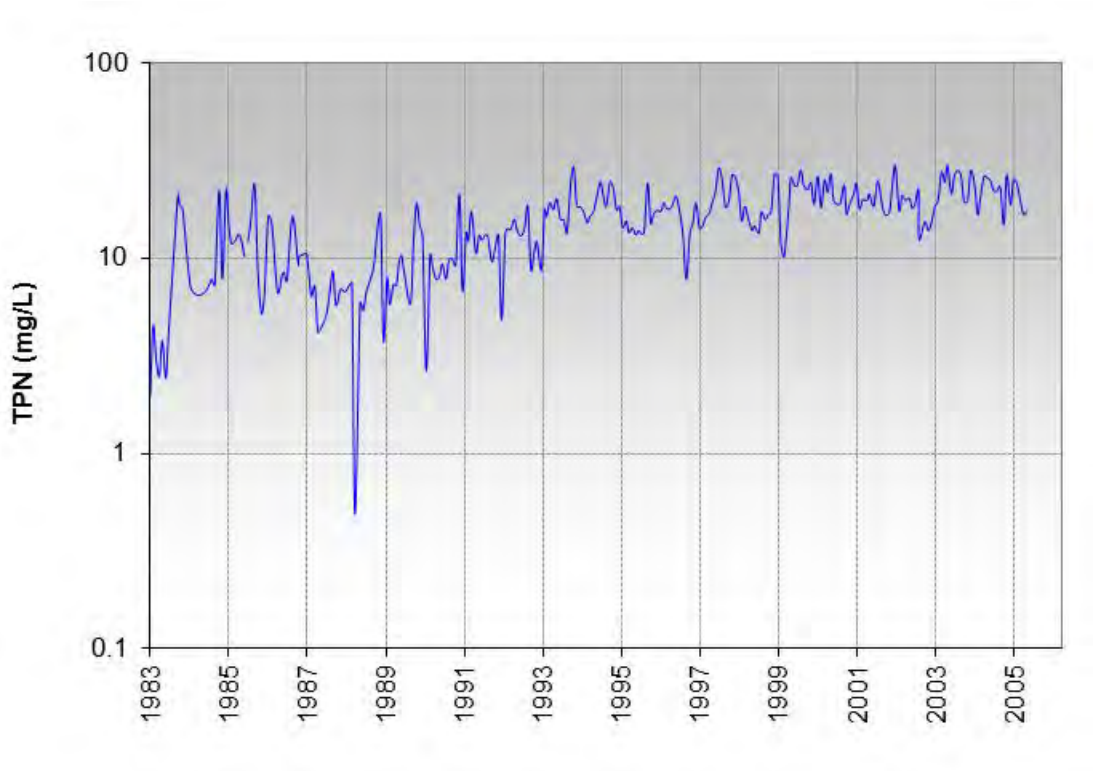


Figure 31. Total persulfate nitrogen at the Yellow Bay WWTP.

2.9 Columbia Falls Aluminum Co (MT0030066)

The Columbia Falls Aluminum Company is located in Columbia Falls, Montana on the Flathead River (Figure 32). The facility discharges wastewater from a series of industrial processes to five onsite percolation ponds that are hydrologically connected to the Flathead River through groundwater (DEQ 1999c). The facility is permitted to discharge from the following five outfalls (MT0030066):

- **Outfall #002** effluent is paste plant briquette cooling water from the coke and coal tar pitch mixer and extruder. It discharges from the end of the main briquette cooling belt, through a system of two percolation ponds north of the plant and into state groundwater that is hydrologically connected to the Flathead River.
- **Outfall #003** effluent is emissions scrubber water discharging to the scrubber effluent release basin within the plant. The release basin effluent discharges to a system of two percolation ponds north of the plant and into state groundwater that is hydrologically connected to the Flathead River.

  The flows of discharges 002 and 003 are combined with a discharge of compressor cooling water discharging through the compressor cooling water release line within the compressor house portion of the plant. The combined flow of discharges from outfalls #002, #003, and the compressor cooling water is approximately 2.5 mgd.
- **Outfall #004** effluent is contact cooling water from direct chill casting of aluminum ingots. The discharge is to three percolation ponds located approximately 1,500 feet south of the plant near the Flathead River. The percolation ponds discharge into state groundwater that is hydrologically connected to the Flathead River. The discharge ranges from 1.5 to 2.0 mgd.
- **Outfall #005** effluent is from the sewage treatment plant and discharges to the ingot cooling water pipeline that extends from the plant to the south percolation ponds. The percolation ponds discharge into state groundwater that is hydrologically connected to the Flathead River. The discharge is approximately 100,000 gpd.
- **Outfall #006** is groundwater flowing from beneath the plant site and discharging to surface water in the Flathead River. Groundwater receives water from the North Pond, South Pond, West Pond, dry wells, and historical disposal practices. The ponds and dry wells receive water from outfalls #002, #003,# 004, #005, stormwater, and many other facility discharges of cooling water, condensate, wash water, steam, and waste water.

Wastewater from the restrooms and laboratory sinks are treated at an on-site WWTP. The WWTP discharges to south #1 settling pond and its average 2008-2013 discharge was 0.09 mgd. Aluminum casting contact cooling water and rectifier non-contact cooling water also discharge to the south #1 settling pond. The South #1 settling pond discharges to south #2 and #3 settling ponds that infiltrate to groundwater hydrologically connected to the Flathead River[32].

The most recent MPDES permit limits (DEQ 1999c) are shown in Table 30 and Table 31. DEQ is in the process of revising the permit. The permit also requires the pH of the effluent from outfall 005 to remain between 6.0 and 9.0 standard units.

[32] Paul Skubinna and Christine Weaver, DEQ – Permitting and Compliance Division – Water Protection Bureau – Water Quality Discharge Permits Section, personal communication, June 27, 2013.

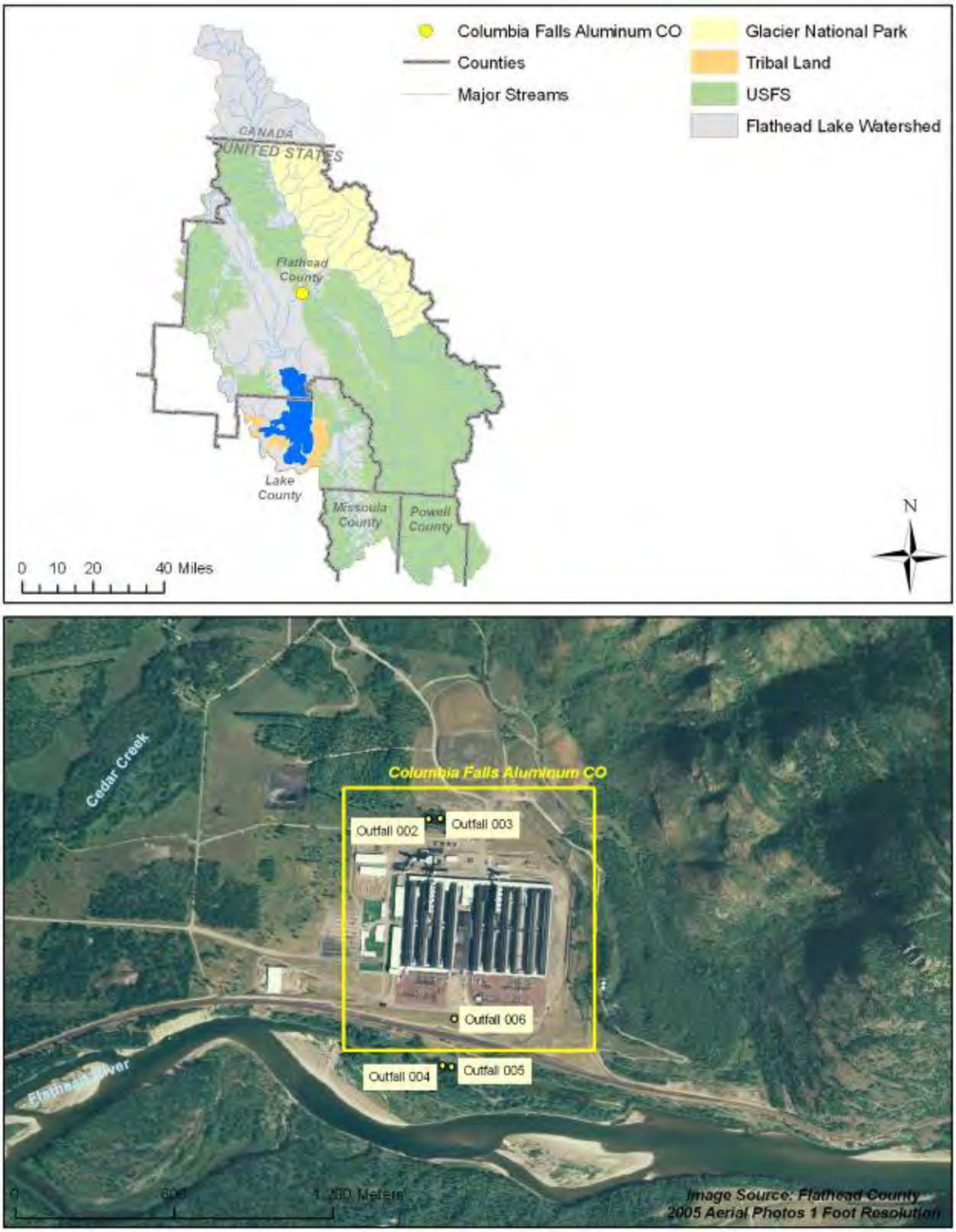


Figure 32. Columbia Falls Aluminum Company and permitted outfalls.

Table 32. Columbia Falls Aluminum Company permit limits for outfalls 002, 003, and 004

Parameter	Net monthly daily (kg/d)			Net monthly maximum (kg/d)		
	002	003	004	002	003	004
Benzo(a)pyrene	0.003 [a]	0.002	none	0.001 a	0.001	none
Antimony	0.189	0.123	1.579	0.066	0.043	0.53
Nickel	0.054	0.035	0.45	0.028	0.018	0.228
Aluminum	0.6	0.39	5	0.207	0.135	1.671
Fluoride	5.845	3.802	48.696	2.016	1.312	16.282

Source: DEQ 1999c
Notes
kg/d = kilogram per day
a. Benzo(a)pyrene limits are for gross rather than net values.

Table 33. Columbia Falls Aluminum Company permit limits for outfall 005

Parameter	Units	30-day average	7-day average
BOD	mg/L	30	45
TSS	mg/L	30	45

Source: DEQ 1999c
Note: BOD = biological oxygen demand; mg/L = milligrams per liter; TSS = total suspended solids.

The Columbia Falls Aluminum Company is required to monitor the water quality of its effluent. Monitoring is required for outfalls #002, #004, and #005. The facility is also required to do in-stream and well monitoring at several locations, as shown in Figure 33 and Figure 34. RIV-1 is a monitoring station on the Flathead River upstream of the south percolation ponds. RIV-2 and RIV-M are monitoring stations on the north bank of the Flathead River downstream of the south percolation ponds. There are 11 groundwater monitoring locations located around the facility (Figure 33).

DMR water quality results are not presented herein. Nutrients data, the focus of the TMDL project, are not available for any outfall. The waste stream is complex: a series of settling ponds, which receive various waste-, process-, and cooling-waters, that infiltrate to shallow groundwater hydrologically connected to the Flathead River. It is not known to what extent that nutrients discharged from restrooms may travel and if nutrient loads from the restrooms may reach the Flathead River.

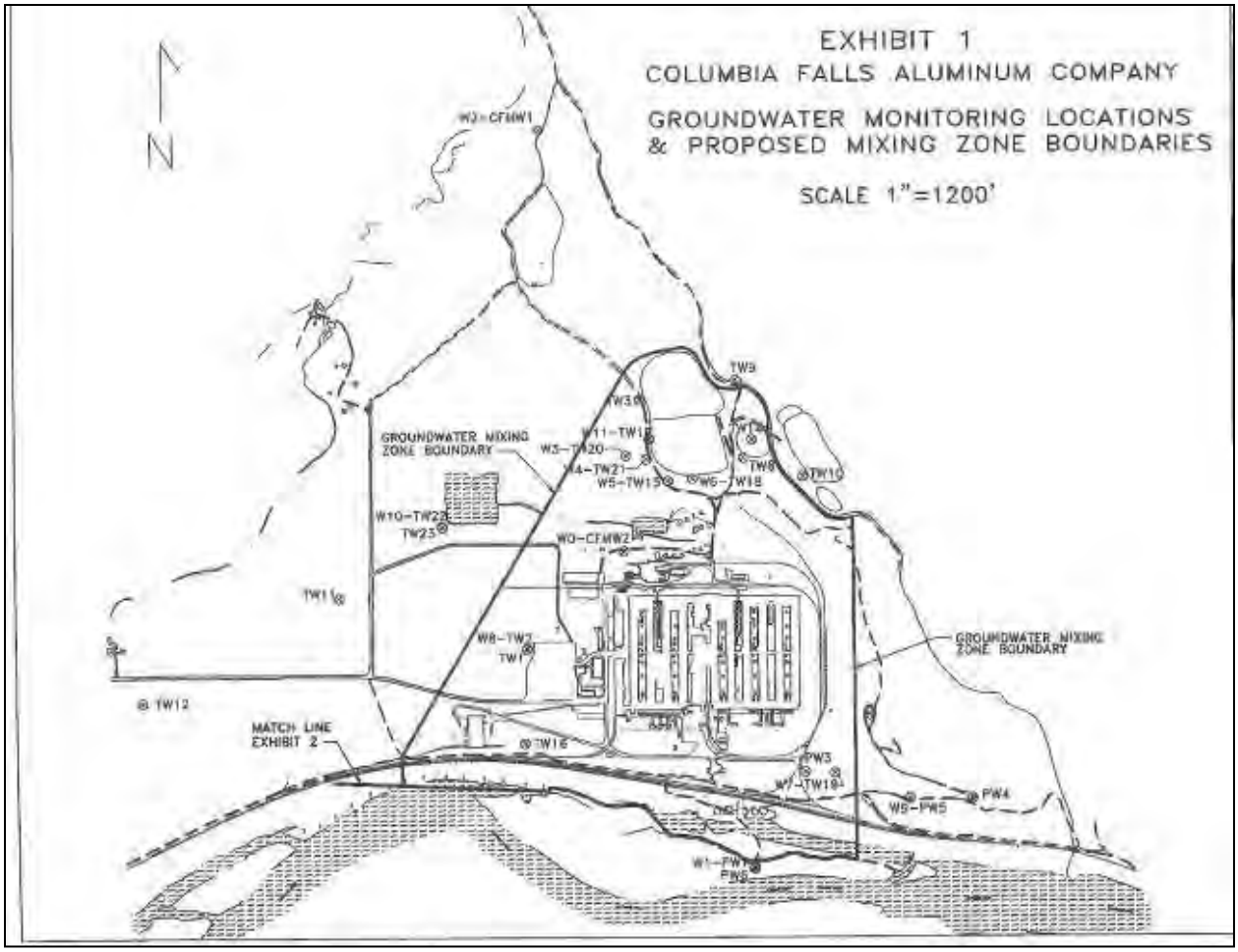


Figure 33. Columbia Falls Aluminum Company groundwater monitoring sites.

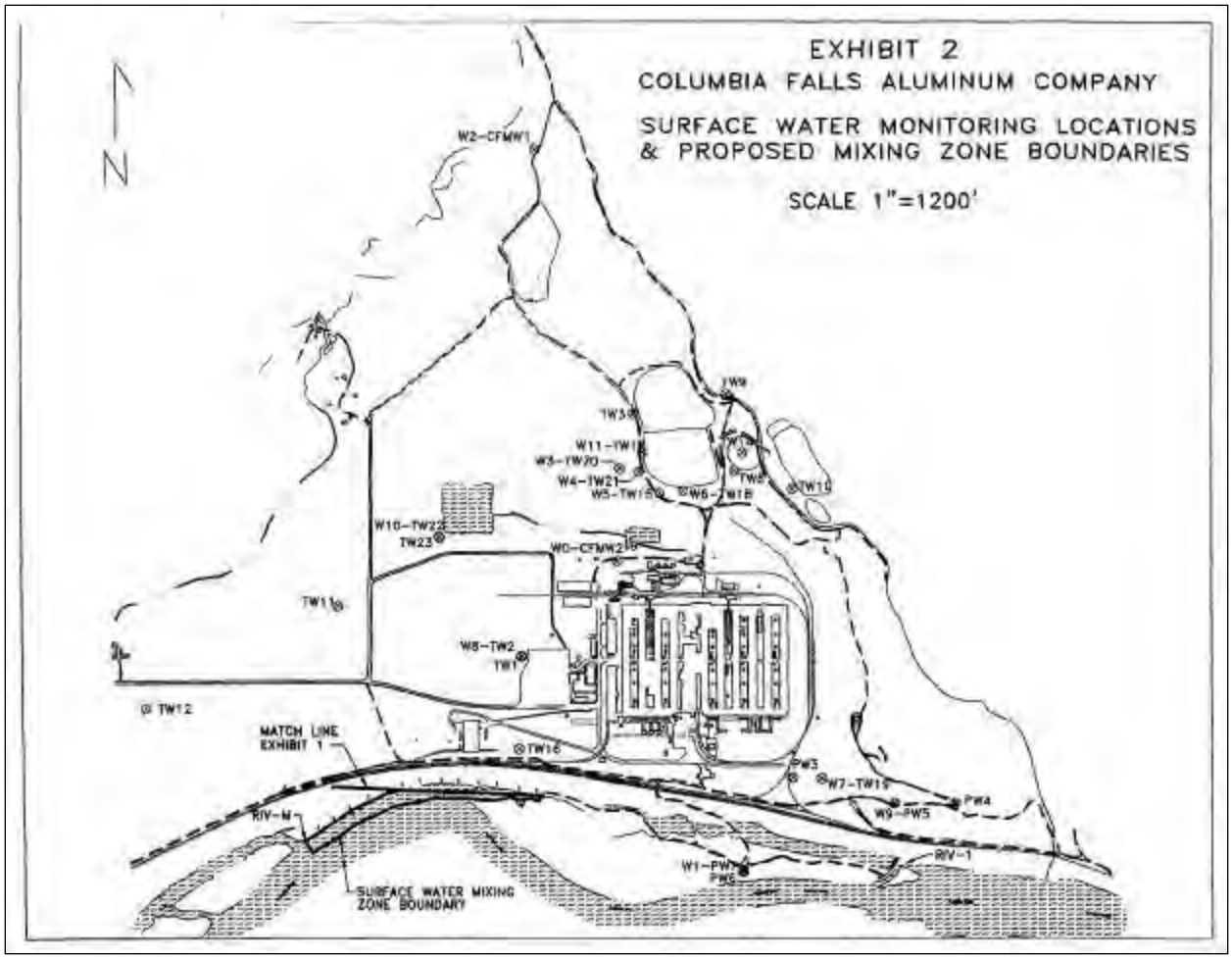


Figure 34. Columbia Falls Aluminum Company surface water monitoring sites.

2.10 Whitefish WTP (MT0030414)

There is only one MPDES permitted water treatment plant (WTP) in the Flathead Lake basin – the City of Whitefish WTP. It is in the Haskill Creek watershed, north and east of the City (Figure 35). The current facility was constructed in 2000. Prior to that, the city had no treatment other than chlorination. Raw water for treatment is withdrawn from the Haskill Creek watershed (First, Second, and Third Creeks) and from Whitefish Lake (although most of the water is withdrawn from the Haskill Creek watershed)[33]. Potable water is produced to supply the City of Whitefish, and the plant has a capacity 6.0 MGD.

The water treatment plant is permitted to discharge waste water (MT0030414) to a reservoir that eventually discharges to an unnamed tributary to Whitefish Lake (DEQ 2007b). The most recent MPDES permit limits for the outfall are shown in Table 33. The permit also requires the pH of the effluent to remain between 6.0 and 9.0 standard units and there cannot be any visible foam, oil sheen, or floating solids in the effluent.

[33] Greg Acton, Public Works Utilities Supervisor, City of Whitefish, personal communication, June 4, 2008.

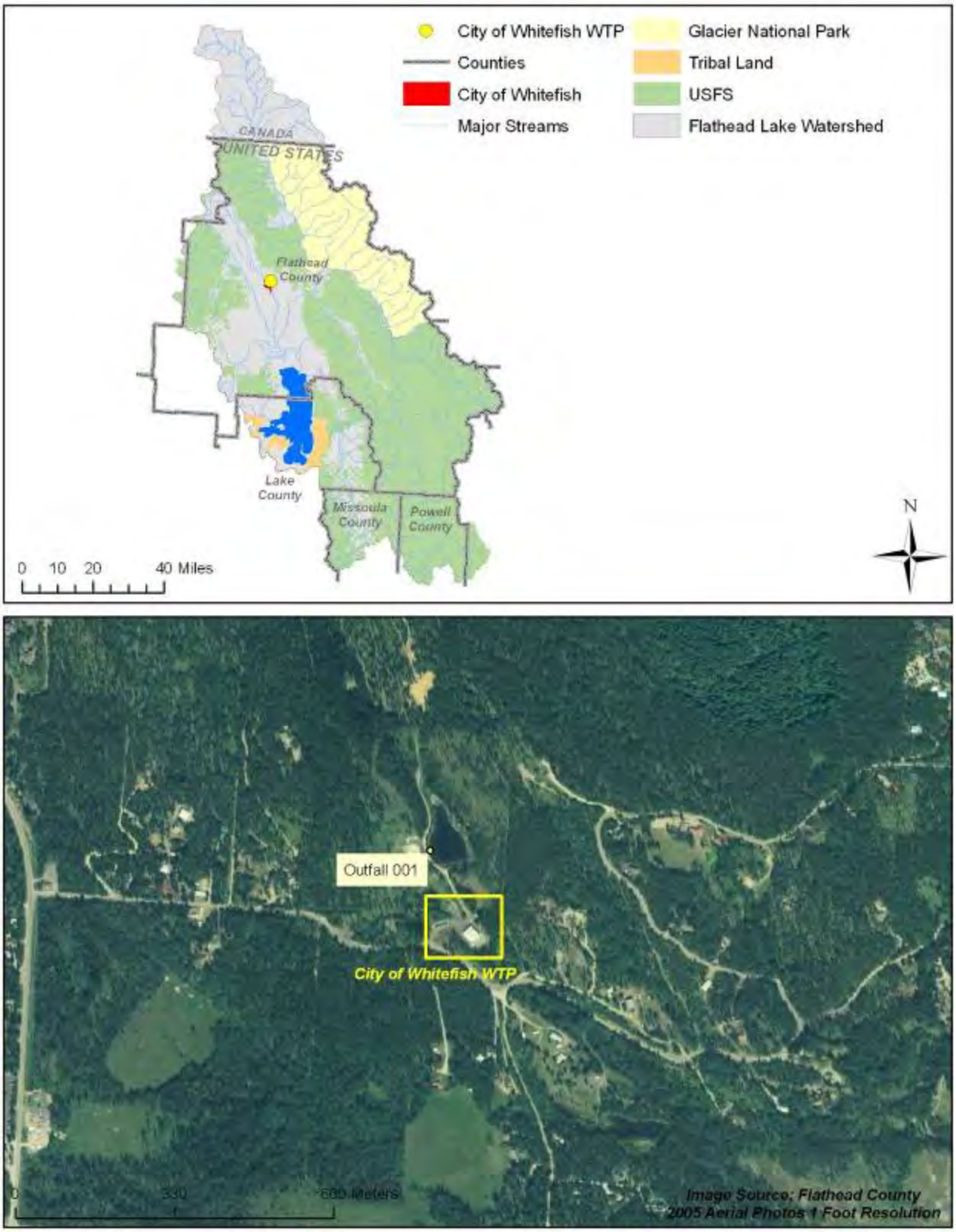


Figure 35. Whitefish WTP and permitted outfall.

Table 34. Whitefish WTP permit limits

Constituent	Units	Average monthly limit	Average weekly limit	Maximum daily limit
Aluminum (dissolved)	mg/L	--	--	0.75
	lb/d	--	--	0.4
Chlorine (total residual)	mg/L	0.011	--	0.019
Turbidity (net change)	NTU	--	--	≤0

Source: DEQ 2007b.
Note: lb/d = pound per day; mg/L = milligrams per liter; NTU = Nephelometric turbidity units.

Table 34 and Table 35 summarize the available water quality data from outfall #001, which were obtained from the city of Whitefish (2000 to 2008) and ICIS (U.S. EPA 2013b). The average effluent flow during this period was 0.0195 cfs. No nutrient data were available for this facility.

Table 35. Whitefish WTP flow (cfs) data summary - Data from Whitefish WTP

Location	Start date	End date	No. of records	Avg.	Min.	Max.
Haskill Reservoir	1/15/2001	5/15/2008	89	1.61	0.0869	3.27
Whitefish Lake PS	1/15/2001	5/15/2008	89	0.262	0	2.27

Source of data: Greg Acton, Public Works Utilities Supervisor, City of Whitefish, June 4, 2008.
Notes
Only flow in cubic feet per second is reported for this facility.
avg. = average (arithmetic mean); cfs = cubic feet per second; max. = maximum; min. = minimum.

Table 36. Whitefish WTP flow (cfs) data summary - Data from ICIS

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
Conduit Flow	12/29/2000	1/18/2013	143	0.0195	0.00866	0.0562

Source of data: ISIS (U.S. EPA 2013b)
Notes
Only flow in cubic feet per second is reported for this facility.
DMR records from ICIS are monthly averages.
avg. = average (arithmetic mean); max. = maximum; min. = minimum.

2.11 Lake McDonald (Glacier National Park) WWTP (MT0030601)

Glacier National Park operates a wastewater treatment facility that is on the west side of the park near the town of West Glacier, Montana (Figure 36). The plant serves the park headquarters, Apgar, Fish Creek, and western Lake McDonald regions of the park (Figure 37).[34] It was built in 2004, and consists of three aerated lagoons. The design flow is 0.25 mgd.

The WWTP is permitted to discharge effluent to a series of ponds which are used to store effluent (DEQ 2007c). All plant effluent is then land applied to a 10 acre field located on a bench next to the Flathead River.[35] Land application occurs almost continuously once the ground is thawed, generally from April to October of each year (Figure 36; MTG650045).

The most recent MPDES permit limits for the outfall are shown in Table 36. The permit requires the pH of the effluent to remain between 6.0 and 9.0 standard units and there cannot be any visible foam, oil sheen, or floating solids in the effluent. The permit also requires an 85 percent reduction in TSS and BOD_5 and for there to be no acute toxicity.

The Glacier National Park WWTP has a permit (MTG650045) to dispose of sewage sludge at the Glacier Gold facility in Olney, Montana. No sludge is land applied[36] (i.e., only effluent wastewater is land applied).

[34] Jim Foster, Deputy Chief of Facility Management, Glacier National Park, personal communication, July 18, 2008.
[35] Ibid.
[36] Jim Foster Deputy Chief of Facility Management, Glacier National Park, personal communication, July 18, 2008.

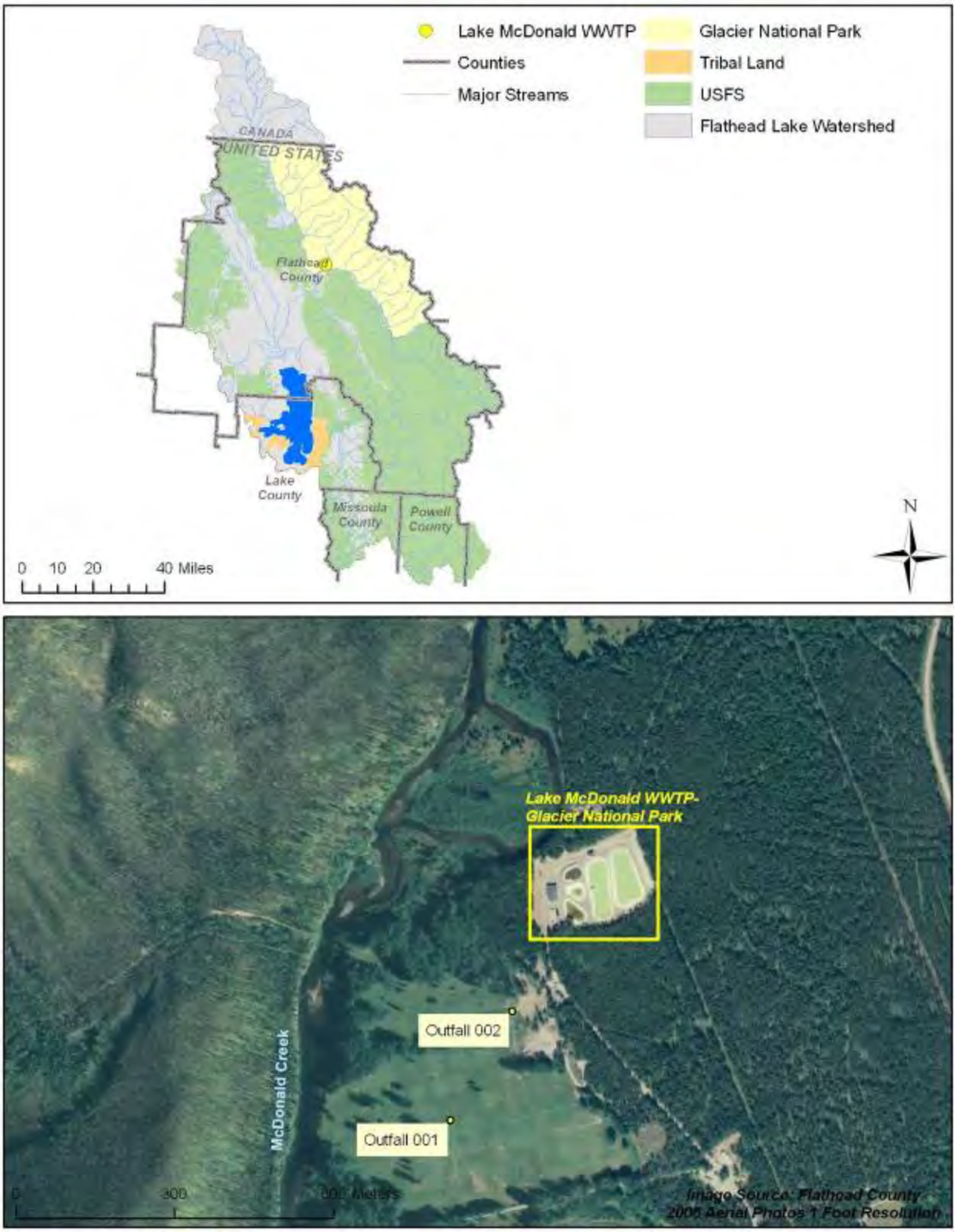


Figure 36. Lake McDonald WWTP permitted outfalls.

Figure 37. Lake McDonald WWTP service area.

Table 37. Lake McDonald WWTP permit limits

Constituent	Units	Average monthly limit	Average weekly limit	Maximum daily limit
BOD_5	mg/L	30	45	--
	lb/day	50	75	--
TSS	mg/L	30	45	--
	lb/day	50	75	--
E. coli bacteria[a]	cfu/100mL	32	64	--
Total Ammonia	mg/L	3.0	--	--
	lb/d	5	--	--
Total Nitrogen[b]	mg/L	7.0	--	--
	lb/d	11.7	--	--
Total Phosphorus	mg/L	0.7	--	--
	lb/d	1.2	--	--

Source: DEQ 2012b.
Notes
BOD_5 = five-day biological oxygen demand; cfu/100mL = colony forming units per 100 milliliters; mg/L = milligrams per liter; TSS = total suspended solids.
a. Report geometric mean is more than one sample is collected per month.
b. Total Nitrogen is the sum of Total Kjeldahl Nitrogen plus NO2- (nitrite) and NO3- (nitrate).

Table 37 summarizes the available water quality data for outfalls #001 and #002, which were obtained from ICIS (U.S. EPA 2013b). Average monthly data were available from April 2005 to January 2013. During months with discharges, the average flow was 0.0952 cfs, and total nitrogen and total phosphorus were 4.66 mg/L and 0.0547 mg/l respectively.

Table 38. Lake McDonald WWTP data summary

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	2/28/2012	1/11/2013	12	0.863	0.108	2
BOD, 5-day, 20 °C	4/13/2005	1/11/2013	93	0.774	0	4.85
Flow rate (cfs)[a]	4/13/2005	1/11/2013	102	0.0952	0.00681	1.11
Nitrogen (total) (mg/L)	2/28/2012	1/11/2013	12	4.66	2.06	12.1
NO_2+NO_3 (total as N) (mg/L)	2/28/2012	1/11/2013	12	3.15	0.52	10.8
Phosphorus (total) (mg/L)	2/28/2012	1/11/2013	12	0.0547	0	0.27
TKN (total as N) (mg/L)	2/28/2012	1/11/2013	12	1.51	0.47	3.1
TSS (mg/L)	4/13/2005	1/11/2013	94	0.767	0	8.5

Source of data: ISIS (U.S. EPA 2013b)
Notes
DMR records from ICIS are monthly averages.
The facility did not discharge during every month of operation. Outfall #001 only had 6 months with reported discharge data, while outfall #002 had 35 months with reported discharge data from November 2003 to March 2008.
avg. = average (arithmetic mean); BOD = biological oxygen demand; C = Celsius; cfs = cubic feet per second; max. = maximum; mg/L = milligrams per liter; min. = minimum; N = nitrogen; NO_2+NO_3 = nitrite plus nitrate; TKN = total Kjeldahl nitrogen; TSS = total suspended solids.
a. Flows were reported as gallons per minute in the DMR reports. This was assumed to be incorrect, and the units were changed to gallons per day.

2.12 Donald G. Abbey House (MT0030651)

The Donald G. Abbey private residence is located on Shelter Island in Flathead Lake (Figure 38). The residence is authorized to discharge non-contact cooling water from a heat exchange system to Flathead Lake. The house has a heating and cooling system that consists of a closed loop heat exchange system that withdraws water from Flathead Lake, removes or adds heat to the source water and then returns the water to the lake. The water is pumped from and returned to the lake through intake and return pipes running along the bottom of Flathead Lake. The outfall location is located at a depth of 25 feet below minimum lake elevation, in a thermocline, and approximately 150 feet offshore. The water enters the system at approximately 44 degrees Fahrenheit (° F) and exits at 50° F in the summer (DEQ 2003). During the winter months, water enters at approximately 40° F and is discharged at 38° F. The discharge is at the south end of Shelter Island in Flathead Lake, which is just east of Big Arm Bay in Flathead Lake.

Effluent is required to have a temperature between 35° F and 79° F and a pH between 6.0 and 9.0 standard units; additionally, the effluent cannot cause a visible oil sheen in Flathead Lake (DEQ 2013). The facility is required to monitor its thermal discharges, flow, and pH. DMR data were obtained from ICIS by U.S. EPA (2013b). Table 38 summarizes the available DMR data. The design flow is 0.5 mgd. Flow data indicate an average of 0.419 cfs (0.27 mgd).

Table 39. Donald G. Abbey house data summary

Parameter	Start date	End date	No. of records	Avg.	Min.	Max.
Flow rate (cfs)	1/10/2005	1/7/2013	47	0.419	0.00511	0.8
Temperature (°C)	1/10/2005	1/7/2013	47	11.5	2.78	23.1

Source of data: ISIS (U.S. EPA 2013b)
Notes
DMR records from ICIS are monthly averages.
avg. = average (arithmetic mean); C = Celsius; cfs = cubic feet per second; max. = maximum; min. = minimum.

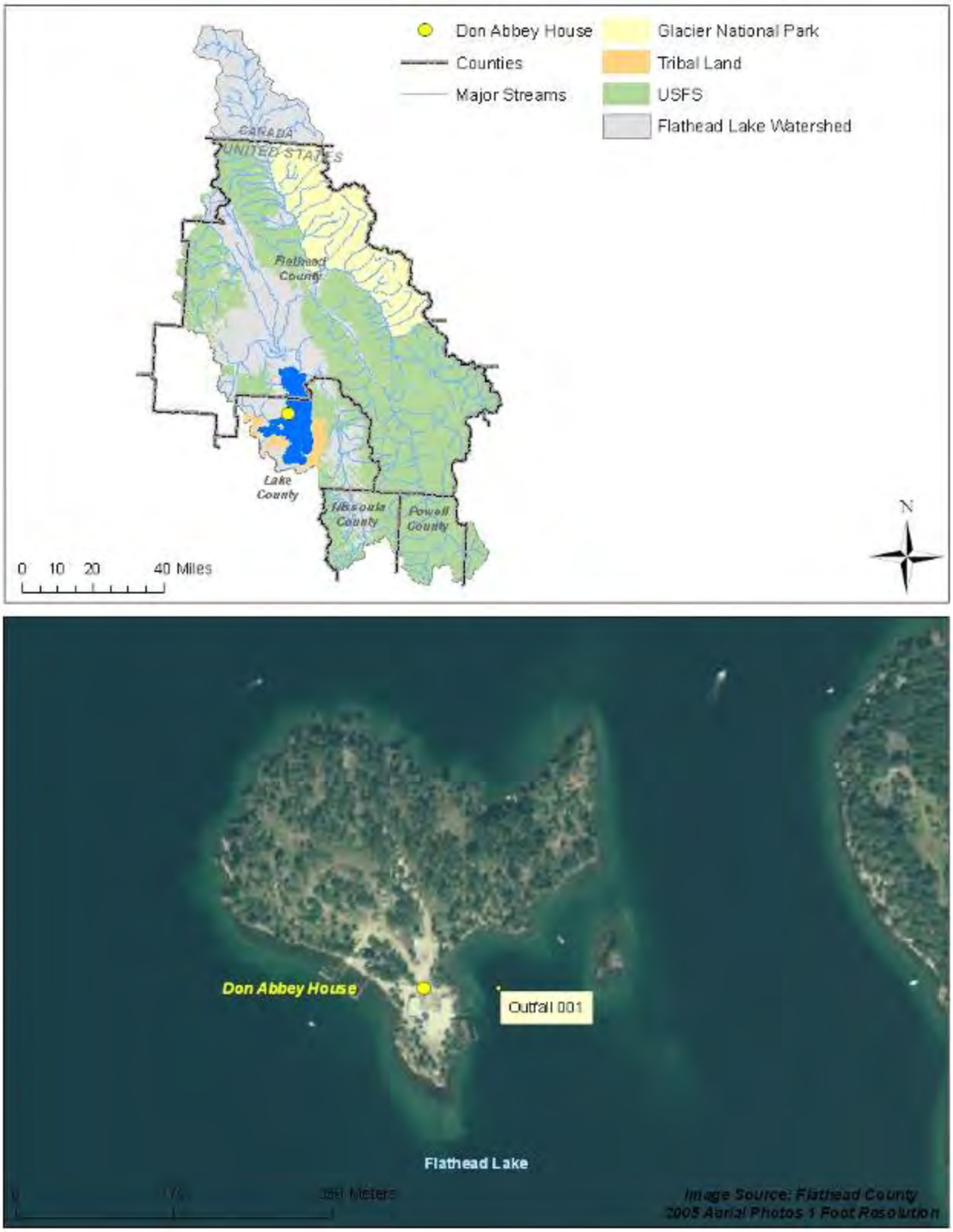


Figure 38. Donald G. Abbey house and permitted outfall.

2.13 John Collins Pool House (MT0031658)

The John Collins private residence is on Whitefish Lake (Figure 39). The residence is authorized to discharge non-contact cooling water from a heat exchange system to Whitefish Lake. The house has a heating and cooling system which consists of a closed loop heat exchange system that withdraws water from Whitefish Lake. The water is pumped from and returned to the lake through intake and return pipes (both are 3 inch polyethylene) running along the bottom of Whitefish Lake. The intake is at a 50 foot depth, approximately 50 feet offshore from Eagle Point. The outfall is at a depth of 80 feet and approximately 70 feet offshore from Eagle Point.

Effluent is required to have a temperature between 32° F and 66° F and a pH between 6.0 and 9.0 standard units; additionally, the effluent cannot cause a visible oil sheen in Flathead Lake (DEQ 2010b). The facility is required to monitor its thermal discharges, flow, and pH. DMR data were obtained from ICIS by U.S. EPA (2013b). Table 39 summarizes the available DMR data. Flow data indicate an average of 0.17 cfs.

Table 40. John Collins pool house data summary

Parameter	Start date	End date	No. of records	Avg.	Min.	Max.
Flow rate (cfs)	7/26/2012	1/28/2013	7	0.172	0.168	0.175
Temperature (°C)	7/26/2012	1/28/2013	7	19.6	14.6	24.6

Source of data: ISIS(U.S. EPA 2013b)
Notes
DMR records from ICIS are monthly averages.
avg. = average (arithmetic mean); C = Celsius; cfs = cubic feet per second; max. = maximum; min. = minimum.

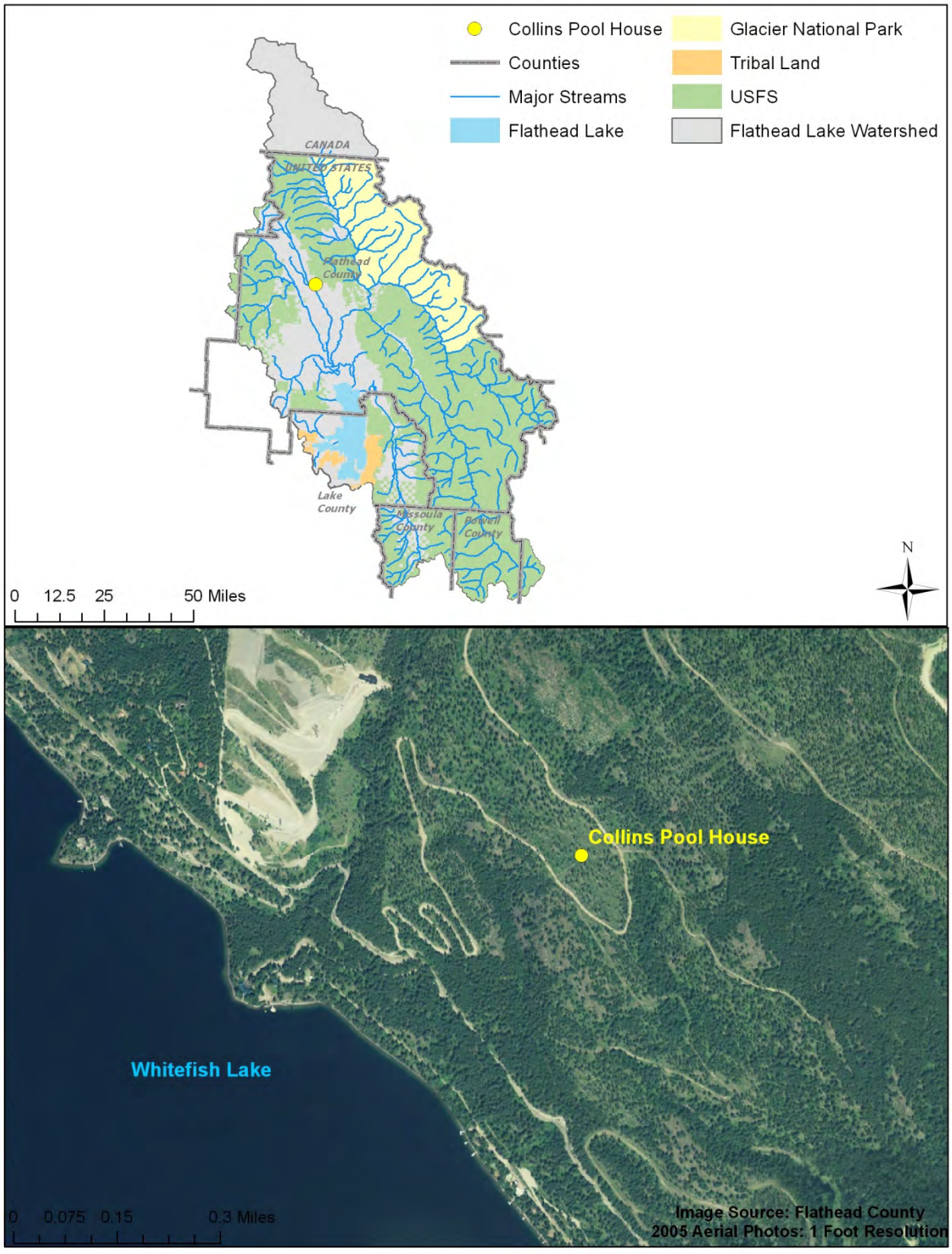


Figure 39. John Collins pool house.

2.14 BNSF Railway KRY Site Petroleum Cleanup (MT0031739)

Burlington North Santa Fe Railway Company operates a petroleum cleanup site in Kalispell Montana (Figure 40). The remedial wastewater treatment system is a rock wash, with a design flow of 0.025 mgd that discharges to the Stillwater River (DEQ 2012a).

The permit (MT0031739) includes limits to BOD, TSS, metals, and petroleum hydrocarbons (DEB 2012a). The BOD and TSS limits are 53.0 mg/L and 11.3 mg/L (respectively) and are maximum daily limits. The permit also requires the pH of the effluent to remain between 6.0 and 9.0 standard units and there cannot be any visible foam, oil sheen, or floating solids in the effluent. The facility must also perform whole effluent toxicity monitoring for acute toxicity each year.

U.S. EPA (2013b) obtained all available DMR data for the Flathead Lake basin; data were not available for this facility.

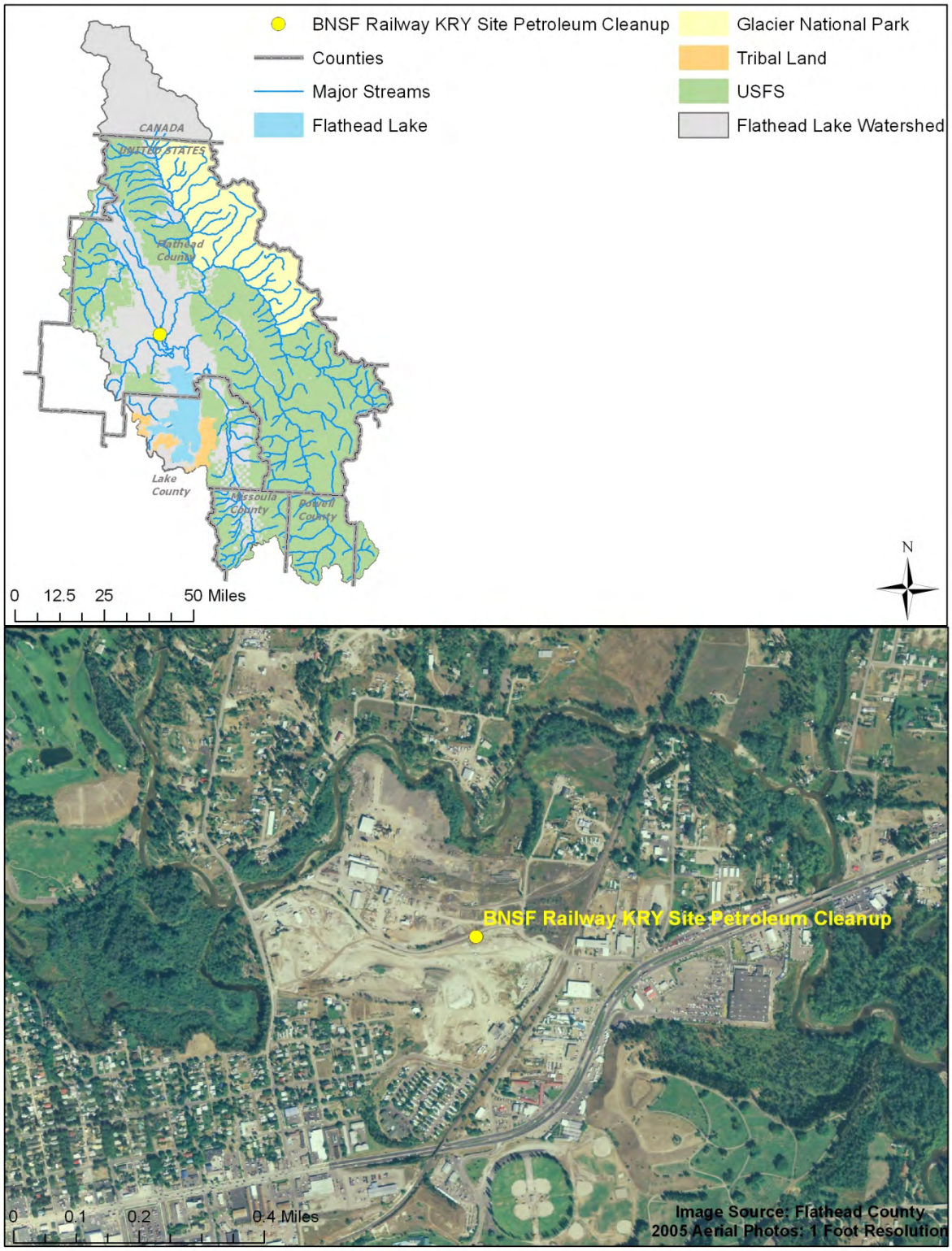
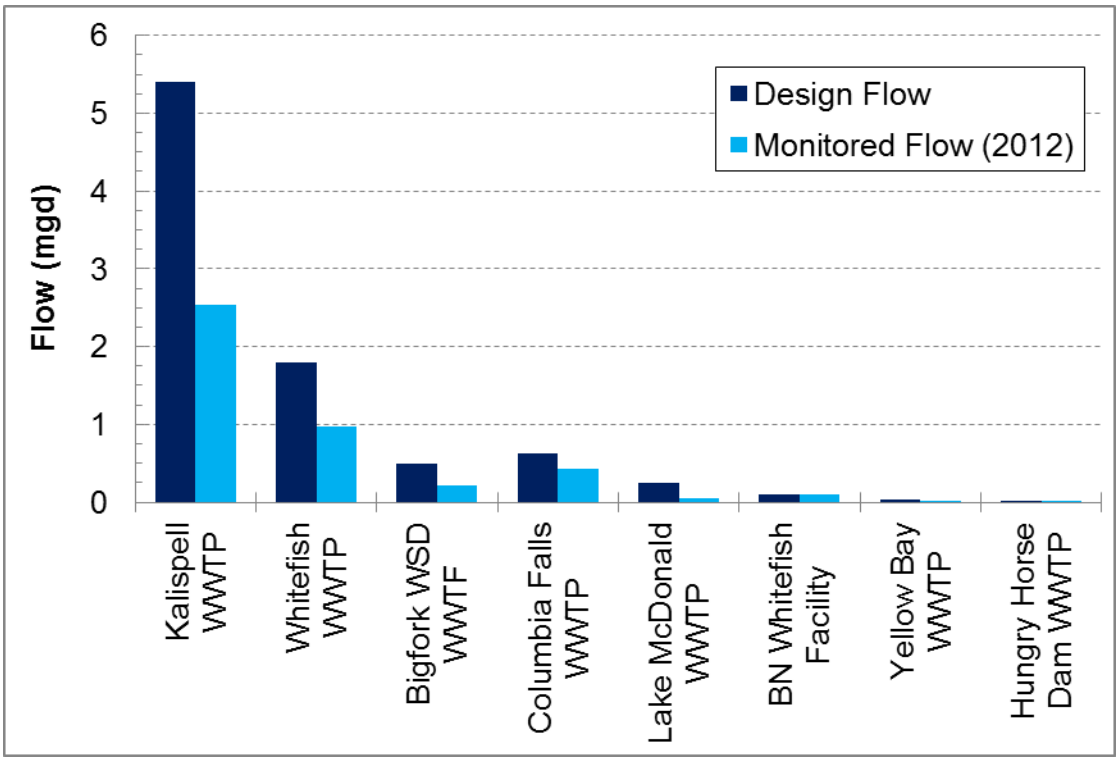


Figure 40. BNSF Railway Company KRY Site.

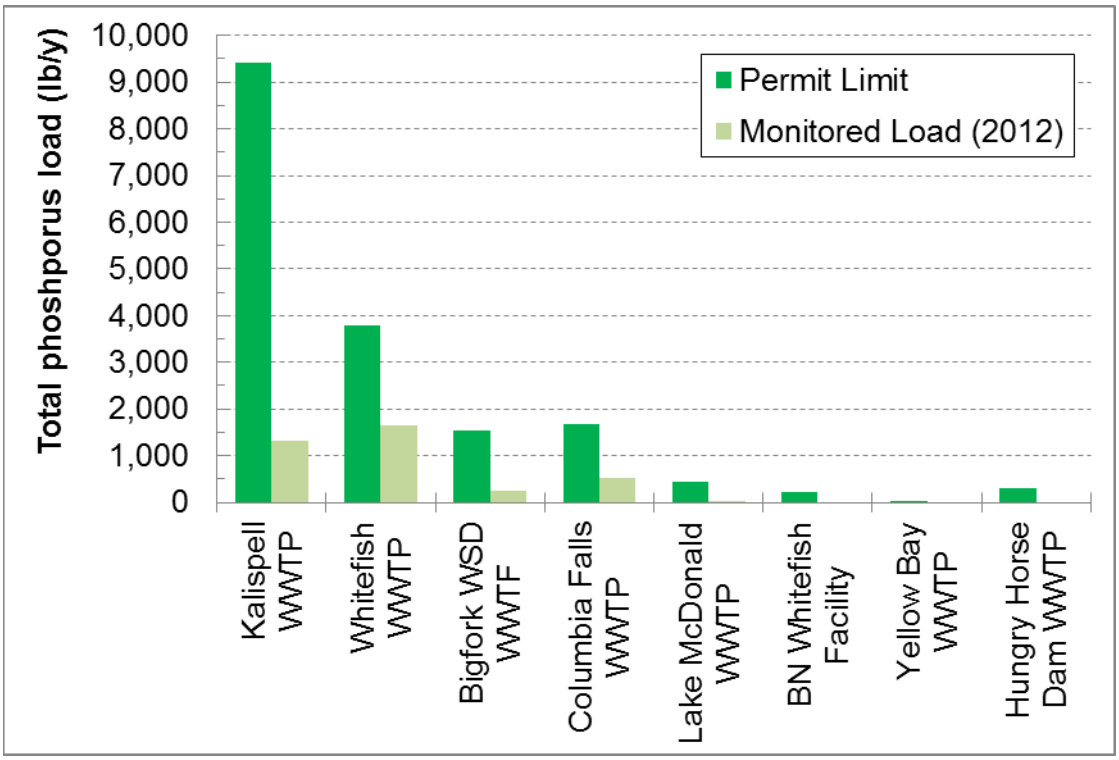
2.15 Comparing Nutrient Loads of Individual MPDES Permitees

Only eight of the 17 facilities with individual MPDES permits have nutrient permit limits: Bigfork WWTF, Burlington-Northern Whitefish Facility, Columbia Falls WWTP, Hungry Horse Dam WWTP, Lake McDonald WWTP, Kalispell WWTP, Whitefish WWTP, and Yellow Bay WWTP. Figure 41, Figure 42, and Figure 43 display the *permitted* and *actual* flow volumes, total phosphorus loads, and total nitrogen loads (respectively) for these facilities. These figures indicate the potential flow and loads that each facility is theoretically allowed to discharge according to the permits. Note that permits issued more recently require discharge concentrations that are less than those allowed from older permits.



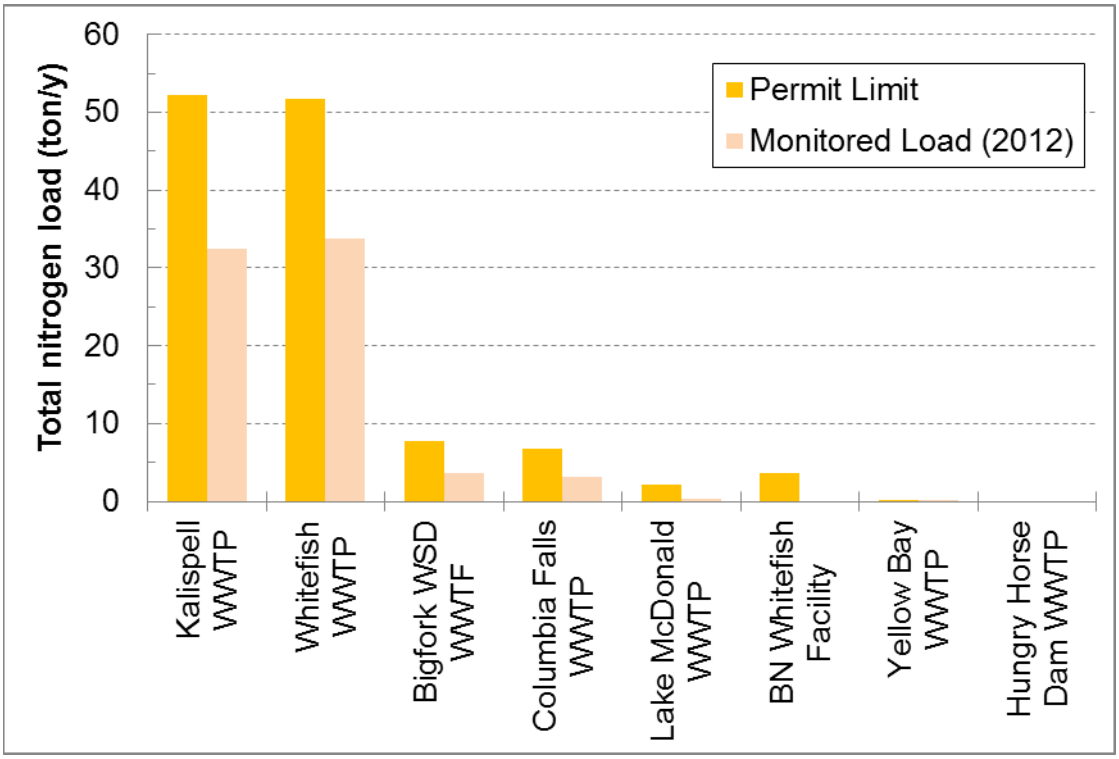
Sources of monitoring data: Curt Konecky (Kalispell WWTP), Greg Acton (Whitefish WWTP), Julie Spencer (Bigfork WSD WWTF , Hugh Robertson (Columbia Falls WWTP), and U.S. EPA 2013b for the other facilities.
Sources of permit information: DEQ 2001b, 2007, 2008a,c, 2009, 2010a, and 2012b; U.S. EPA 2012a

Figure 41. Flows for the eight facilities with phosphorus or nitrogen permit limits.



Sources of monitoring data: Curt Konecky (Kalispell WWTP), Greg Acton (Whitefish WWTP), Julie Spencer (Bigfork WSD WWTF , Hugh Robertson (Columbia Falls WWTP), and U.S. EPA 2013b for the other facilities.
Sources of permit information: DEQ 2001b, 2007, 2008a,c, 2009, 2010a, and 2012b; U.S. EPA 2012a
Note: Total phosphorus monitoring data are not available for the Burlington North Whitefish Facility or Hungry Horse Dam WWTP.

Figure 42. Permitted annual total phosphorus loads (pounds per year).



Sources of monitoring data: Curt Konecky (Kalispell WWTP), Greg Acton (Whitefish WWTP), Julie Spencer (Bigfork WSD WWTF , Hugh Robertson (Columbia Falls WWTP), and U.S. EPA 2013b for the other facilities.
Source of permit information: DEQ 2001b, 2007, 2008a,c, 2009, 2010a, and 2012b; U.S. EPA 2012a
Note: Total nitrogen monitoring data are not available for the Burlington North Whitefish Facility, Yellow Bay WWTP, or Hungry Horse Dam WWTP.

Figure 43. Permitted annual total nitrogen loads (tons per year)

2.16 Trends in Annual Nutrient Loads for the largest, continuously discharging facilities

An analysis of permit limits, facility status, and available data shows that the following four MPDES-permitted facilities are the largest continuously discharging facilities (by volume) in the basin: Kalispell WWTP, Whitefish WWTP, Columbia Falls WWTP, and Bigfork Water and Sewer District WWTF. Polson WWTP is excluded from this analysis and the rest of the analyses in this section because it discharges downstream of Flathead Lake.

Figure 44 and Figure 45 shows the annual effluent and influent flows at these four facilities. Annual effluent flow at the Whitefish WWTP and Columbia Falls WWTP has fluctuated from year to year. Annual effluent flow at the Kalispell WWTP generally increased from 1998 through 2008 and, with the exception of 2011, generally decreased from 2009 through 2012. Annual effluent flow at the Bigfork Water and Sewer District WWTF has slowly increased.

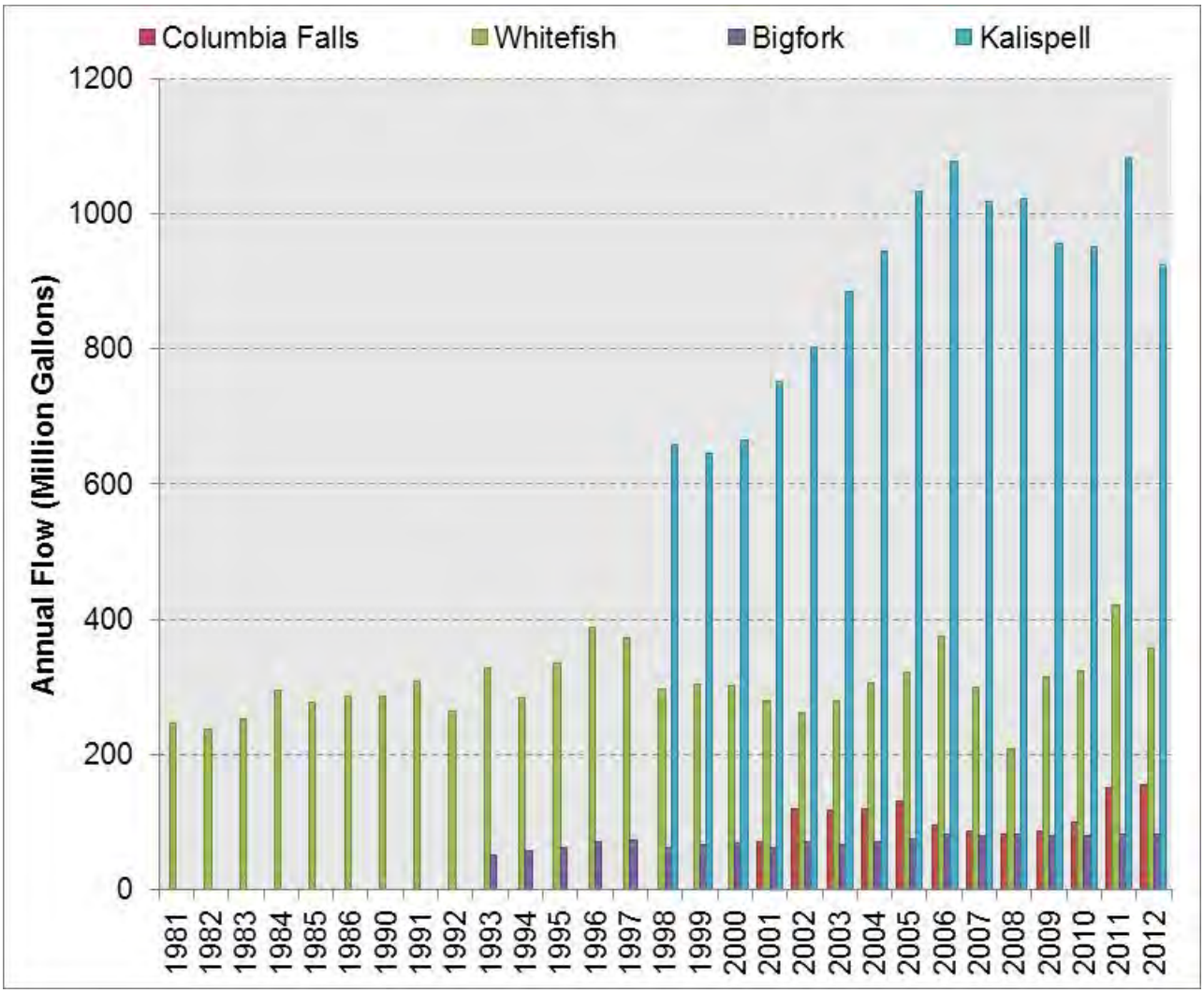


Figure 44. Effluent flow (million gallons per year) at the largest continuously discharging facilities.

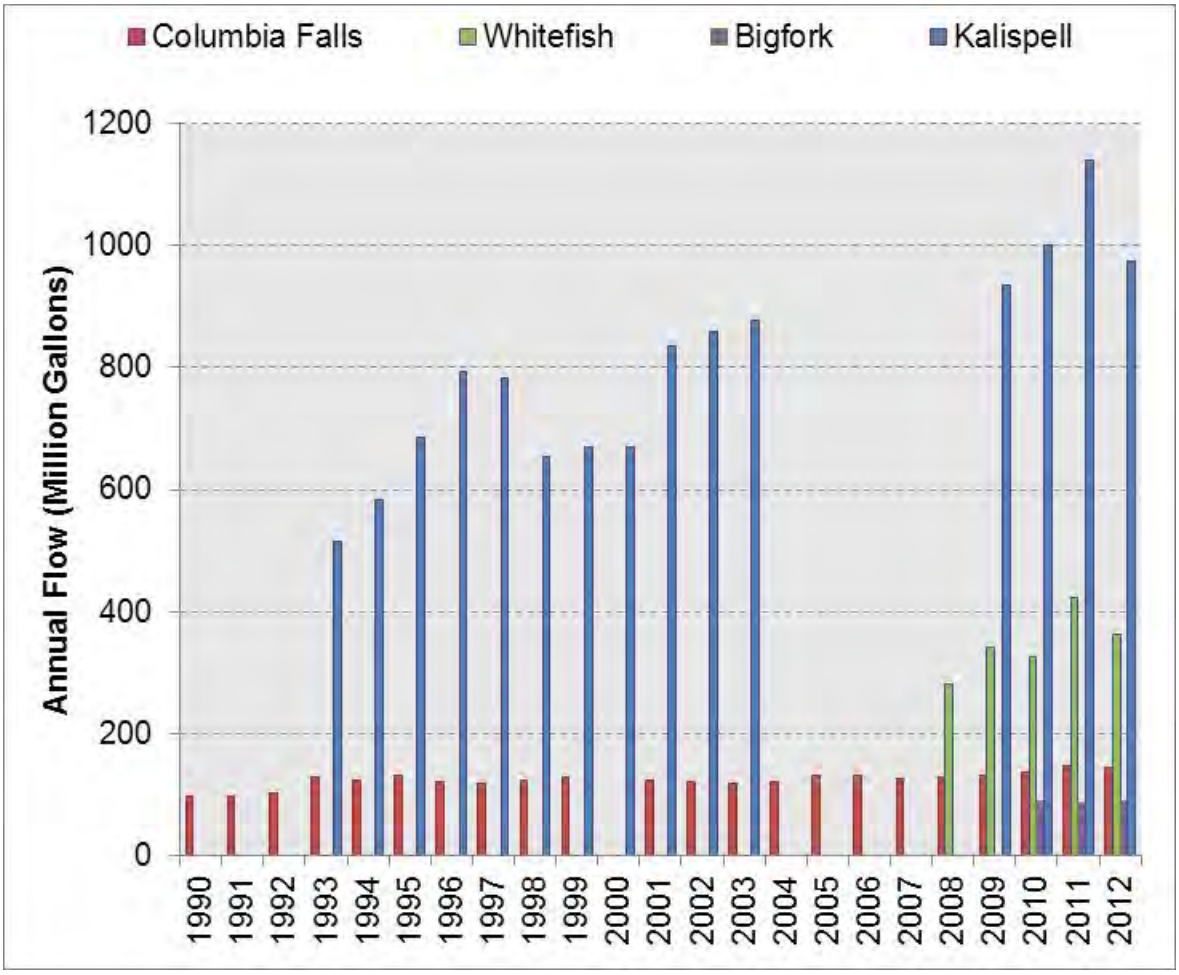


Figure 45. Influent flow (million gallons per year) at the largest continuously discharging facilities.

Similar to Figure 44, Figure 46 displays total phosphorus loads at these four facilities to the most recent year with data. Annual loads vary with fairly steady increases observed at all four facilities. It should be noted that the trends (or lack thereof) in annual loads could reflect actual conditions at the facilities or natural variations with the limited sampling data (i.e., most facilities only report a single phosphorus concentration per month which is suboptimal for calculating annual loads).

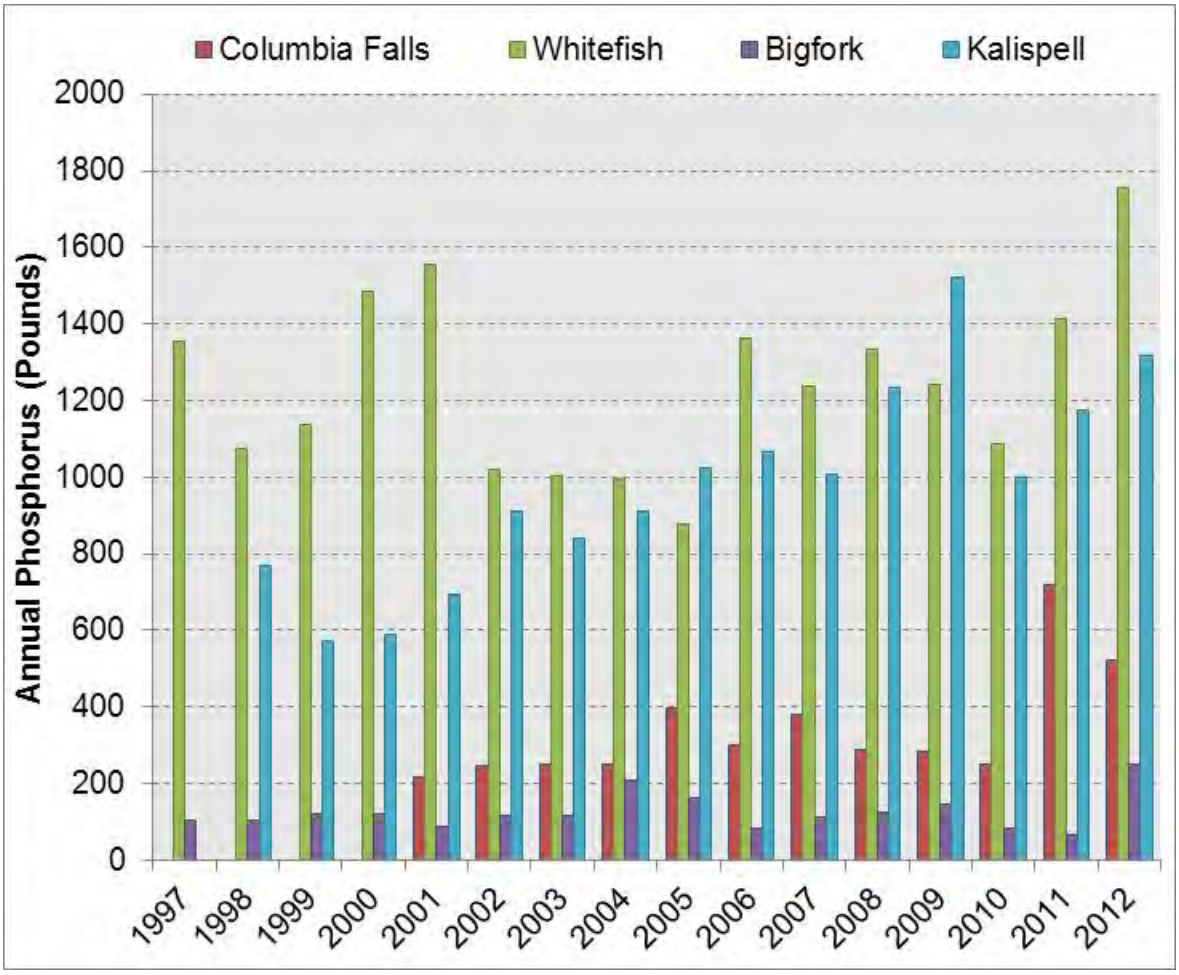


Figure 46. Total phosphorus loads (pounds per year) at the largest continuously discharging facilities.

Figure 47displays total nitrogen loads at these four facilities to the most recent year with data. Annual nitrogen loads varied with no consistent, obvious trends.

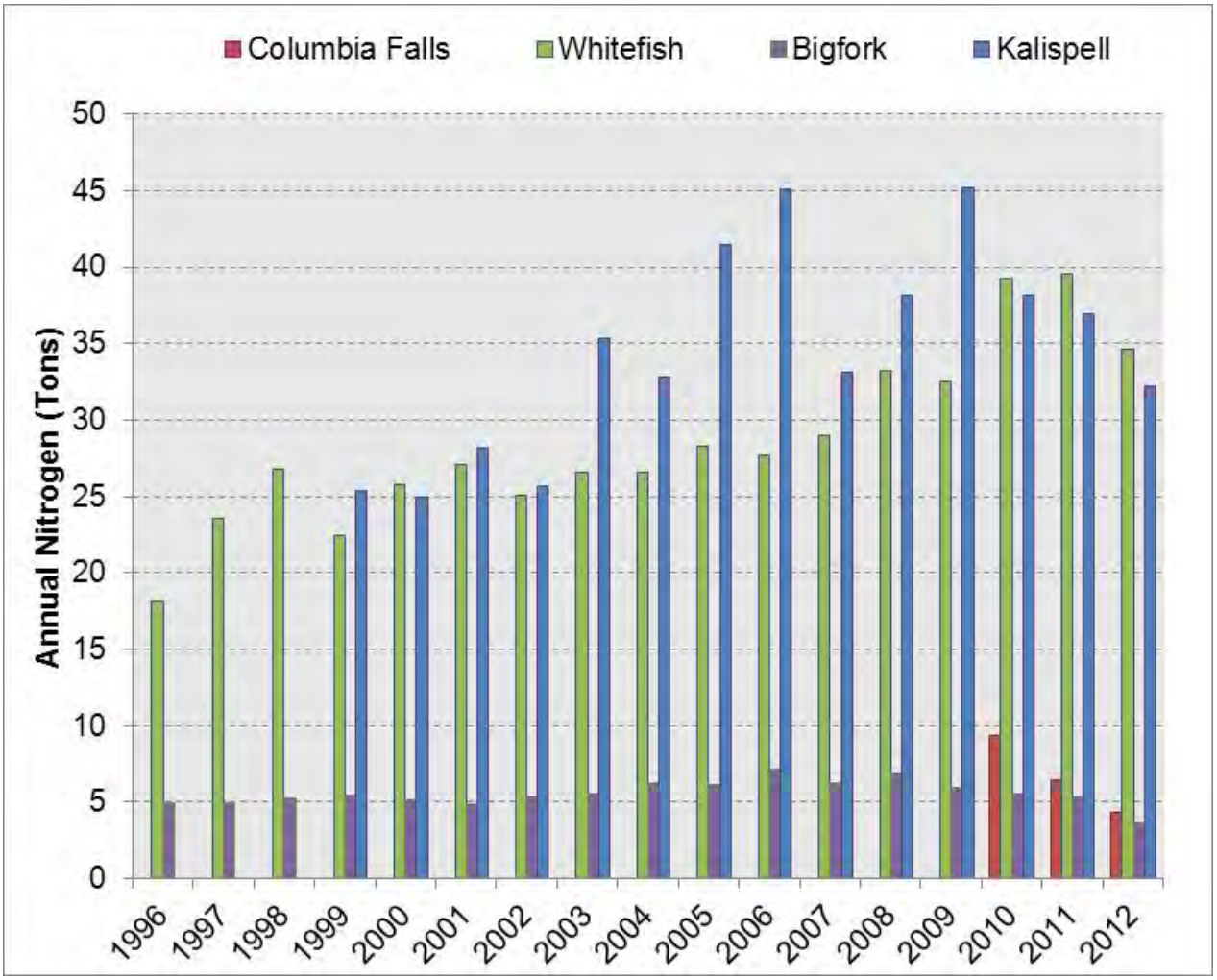


Figure 47. Total nitrogen loads (tons per year) at the largest continuously discharging facilities.

3.0 MGWPCS Permits

Sixteen facilities are permitted to discharge effluent to groundwater in the Flathead Lake basin (Table 40). DEQ administers the Montana Groundwater Pollution Control System and data are managed within the DMR framework[37]. The groundwater discharges are issued permits that begin with MTX, though they are not MPDES permits. Monitoring data are available for some of these facilities, which are presented in this section. It is noteworthy that some MGWPCS permitees formerly had individual MPDES permits. Facilities without current permits (see footnotes *a* and *b* in Table 40) are not further discussed, with the exception of International RV LLC (aka Paradise Pines RV Condominiums).

Table 41. MGWPCS permits in the Flathead Lake basin

Permit no.	Name
MTX000066	Meadow Dairy Gold
MTX000092	Plum Creek Manufacturing Facility
MTX000100	Stampede Packing Company (aka Meat Production Inc.)
MTX000120 [a]	International RV LLC (aka Paradise Pines RV Condominiums)
MTX000133 [a]	Ehrman Lease Subdivision
MTX000155 [a]	Kelsey Subdivision WWTF
MTX000164	Glacier Ranch Subdivision
MTX000173 [b]	Fox Hill Subdivision
MTX000183 [a]	Paradise Cove RV Condominium Community
MTX000188	Kootenai Lodge Lake County Water and Sewer District
MTX000193	Hungry Horse Wastewater Treatment Plant
MTX000199	Cove Creek Ridge Subdivision (TLW Properties LLC)
MTX000200 [a]	Crown Jewel Estates
MTX000214	Point of Pines Wastewater Treatment System
MTX000220	Glacier International Airport Rental Car Facility Car Wash (FCA Rentals LLC)
MTX000228 [b]	FH Stoltze Land and Lumber Company

Notes
aka = also known as; LLC = limited liability company; RV = recreational vehicle; WWTF = wastewater treatment facility.
a. Montana DEQ identified the permit as no longer necessary (e.g., the permit was terminated).
b. Montana DEQ identified the permit as pending (i.e., no permit has been written and no previous permit was written that could be administratively continued).

[37] Jason Gildea, U.S. EPA Region 8 Montana Operations Office, compiled DMR data for all permitted facilities in Flathead, Lake, and Missoula counties, including available groundwater monitoring data. He also compiled all available MGWPCS permits from DEQ for individually permitted facilities in the Flathead Lake basin.

3.1 Meadow Gold Dairy (MTX000066)

Meadow Gold Dairies, Inc. operates a milk-processing facility that is in Flathead County, near the City of Kalispell (Figure 48). The permit states that the dairy facility, "processes raw milk from area producers into fluid milk, cottage cheese, sour cream, butter, and dairy mixes (ice cream and milk shakes)" (DEQ 1996a). The milk-processing facility operates four days per week and produces two types of liquid wastes: (1) whey as a by-product of cottage cheese production and (2) rinse- and wash-water from the cleaning of production equipment. The whey is used as feed by local livestock producers. The weekly rinse- and wash-water volumes, ranging from 53,188 gallons to 94,600 gallons (Newman 1991), is land applied at two different locations. One area occupies stream deposits in and adjacent to the Smith Spring Creek floodplain. The other area is on poorly-sorted glacial till composed primarily of silt and clay intermixed with coarse sand, gravel, cobbles, and boulders (Montana Department of Health and Environmental Sciences Water Quality Bureau 1991).

The facility is required to monitor its outflow (outfall #001) and upstream and downstream in Smith Spring Creek. Monitoring data were obtained by U.S. EPA (2013b) from ICIS, and the data are summarized in Table 41. No data were available for the upstream or downstream stream sites on Smith Spring Creek.

Table 42. Meadow Gold Dairy data summary

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
BOD_5 (mg/L)	12/31/2002	10/15/2012	27	6,200	10	22,700
TKN (mg/L)	12/31/2002	10/15/2012	27	130	2.23	276

Source of data: ISIS (U.S. EPA 2013b)
Notes
DMR records from ICIS are monthly averages.
avg. = average (arithmetic mean); BOD_5 = five-day biological oxygen demand; max. = maximum; mg/L = milligrams per liter; min. = minimum; TKN = total Kjeldahl nitrogen.

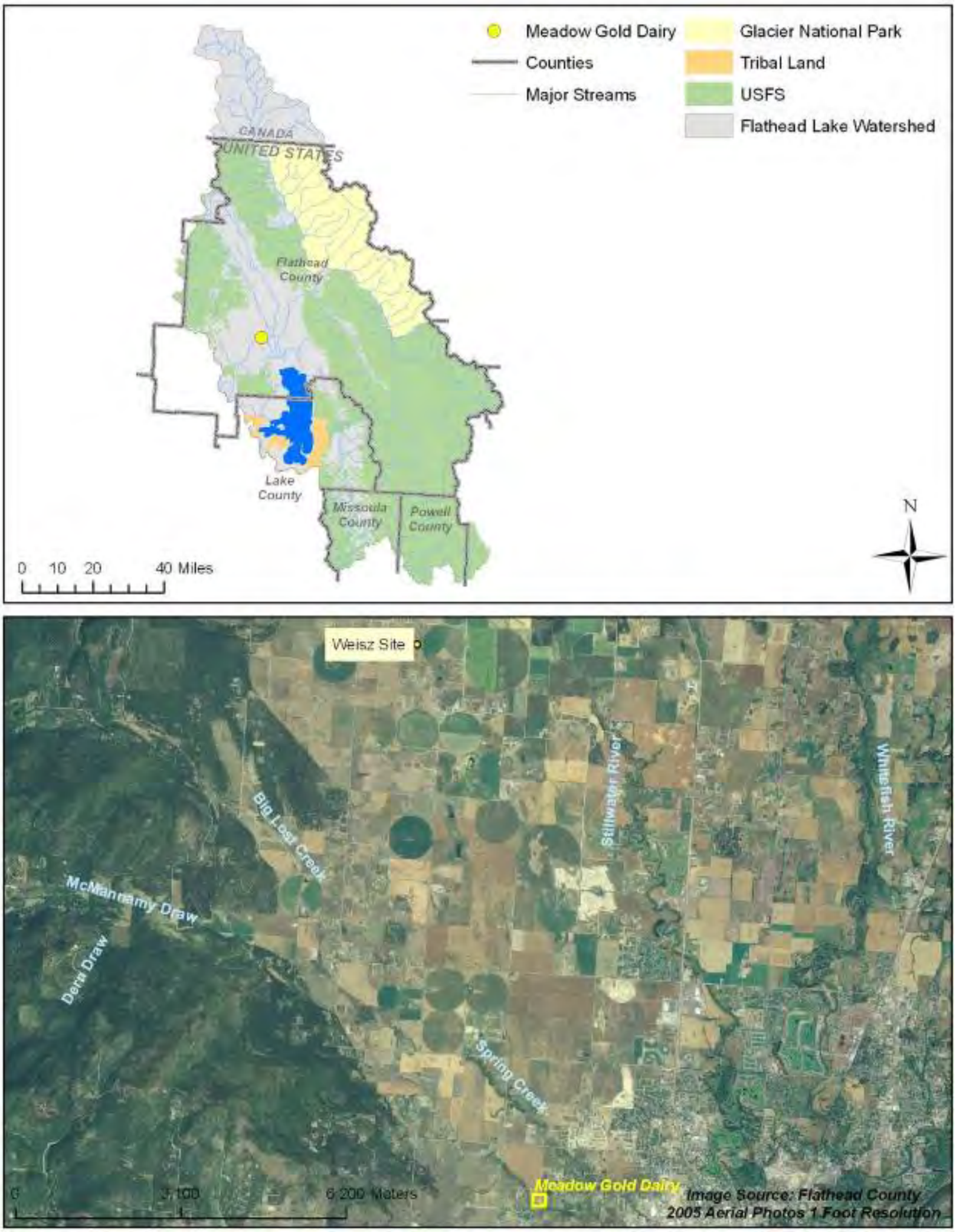


Figure 48. Meadow Gold Dairy and permitted outfall.

3.2 Plum Creek Manufacturing Facility (MTX000092)

Plum Creek Manufacturing, L.P. operates a sawmill that is in Columbia Falls, near the Flathead River (Figure 49). The facility is authorized to discharge process wastewater and stormwater to groundwater through one wastewater treatment and retention pond, a medium density fiberboard pond, an overflow pond, and a log pond (DEQ 1996b). The retention and treatment pond and medium density fiberboard pond receive process pit fluids and non-contact cooling water from the medium density fiberboard plant and stormwater routed from the log pond. The log pond receives boiler blowdown, softener backwash, boiler area washdown waster and excess log deck sprinkler runoff and storm water runoff. The MGWPCS permit limits (MTX000092) the pH of the effluent to remain between 6.0 and 9.0 standard units and limits nitrate plus nitrate to a maximum of 10 mg/L.

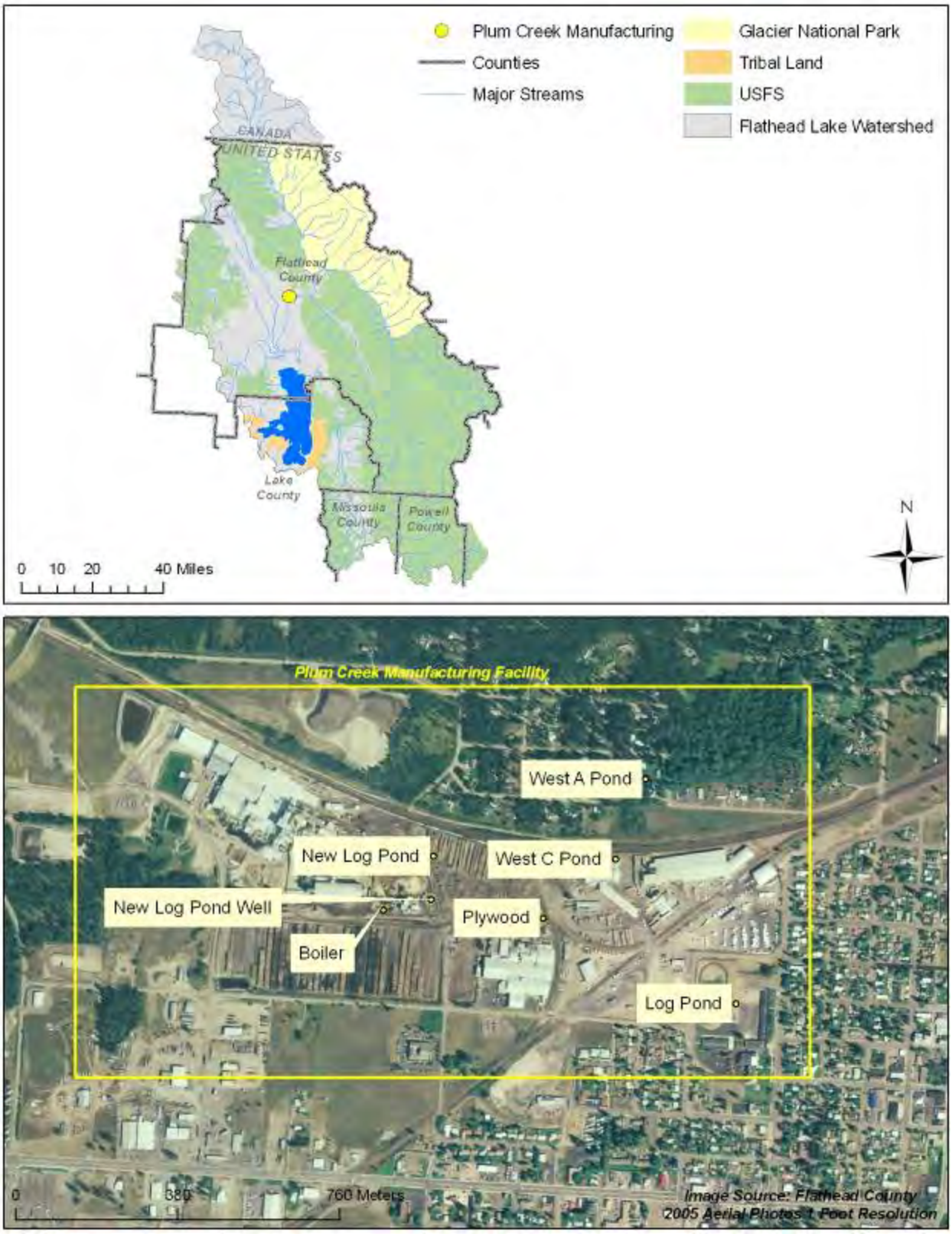


Figure 49. Plum Creek Manufacturing and permitted outfalls.

Water quality monitoring data for the facility were obtained from DMR records from ICIS that were provided by U.S. EPA (2013b) and are summarized in Table 42. DMR data are available for several monitoring wells and for four of the outfalls. The facility did not report flow data.

Table 43. Plum Creek Manufacturing data summary

Parameter	Start date	End date	No. of records	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	2/26/2003	10/27/2008	48	78.1	0.05	2,020
BOD, 5-day, 20 °C	5/1/2009	1/28/2013	94	79.1	1	705
Nitrogen (total) (mg/L)	5/1/2009	1/28/2013	111	3.92	0.25	17.1
NO_2+NO_3 (total as N) (mg/L)	10/25/2004	1/28/2013	77	0.739	0.005	2.06
Phosphorus (total) (mg/L)	5/1/2009	1/28/2013	115	1.05	0.005	3.03
TKN (total as N) (mg/L)	2/26/2003	1/28/2013	141	30	0.25	841

Source of data: ICIS (U.S. EPA 2013b)
Notes
DMR records from ICIS are monthly averages.
BOD = biological oxygen demand; C = Celsius; mg/L = milligrams per liter; N = nitrogen; NO_2+NO_3 = nitrite plus nitrate; TKN = total Kjeldahl nitrogen.

3.3 Stampede Packing Company (MTX000100)

The Stampede Packing Company (also known as Meat Production Inc.) is in Flathead County, near Kalispell (Figure 50). The facility is authorized to dispose of wastewater from meat cutting and packaging, laundry, and meat curing, into a standard pressurized drainfield (i.e., groundwater discharge) (DEQ 1997). Effluent from this facility is generated during cleanup of meat cutting, packaging and curing operations and laundry operations. The permit states that the daily maximum flow limit is 1,500 gpd with a daily average of 1,048 gpd (DEQ 1997). The facilities design flow is 0.002 mgd. The facility also has total nitrogen permit limits of 20.7 mg/L (maximum) and samples must be collected at the pump chamber prior to discharge to the drainfield (DEQ 2012b).

Monitoring data were obtained from ICIS (U.S. EPA 2013b) for 2012 to 2013. Table 43 summarizes the available DMR data for the Stampede Packing Company. Only two flow sampling dates were available in the DMR data. Flow averaged less than 0.01 cfs and total nitrogen averaged 58.8 mg/L.

Table 44. Stampede Packing Company data summary

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	2/18/2004	10/27/2011	25	15.4	4.75	51.3
Flow rate (cfs)	12/10/2012	1/8/2013	2	0.00383	0.00368	0.00399
Nitrogen (total) (mg/L)	2/18/2004	1/8/2013	36	58.8	0.07	96.4
NO_2+NO_3 (total as N) (mg/L)	2/23/2012	1/8/2013	11	0.1	0.02	0.38
TKN (total as N) (mg/L)	2/23/2012	1/8/2013	12	66.7	45.2	96.4

Source of data: ICIS (U.S. EPA 2013b)
Notes
DMR records from ICIS are monthly averages.
cfs = cubic feet per second; mg/L = milligrams per liter; N = nitrogen; NO_2+NO_3 = nitrite plus nitrate; TKN = total Kjeldahl nitrogen.

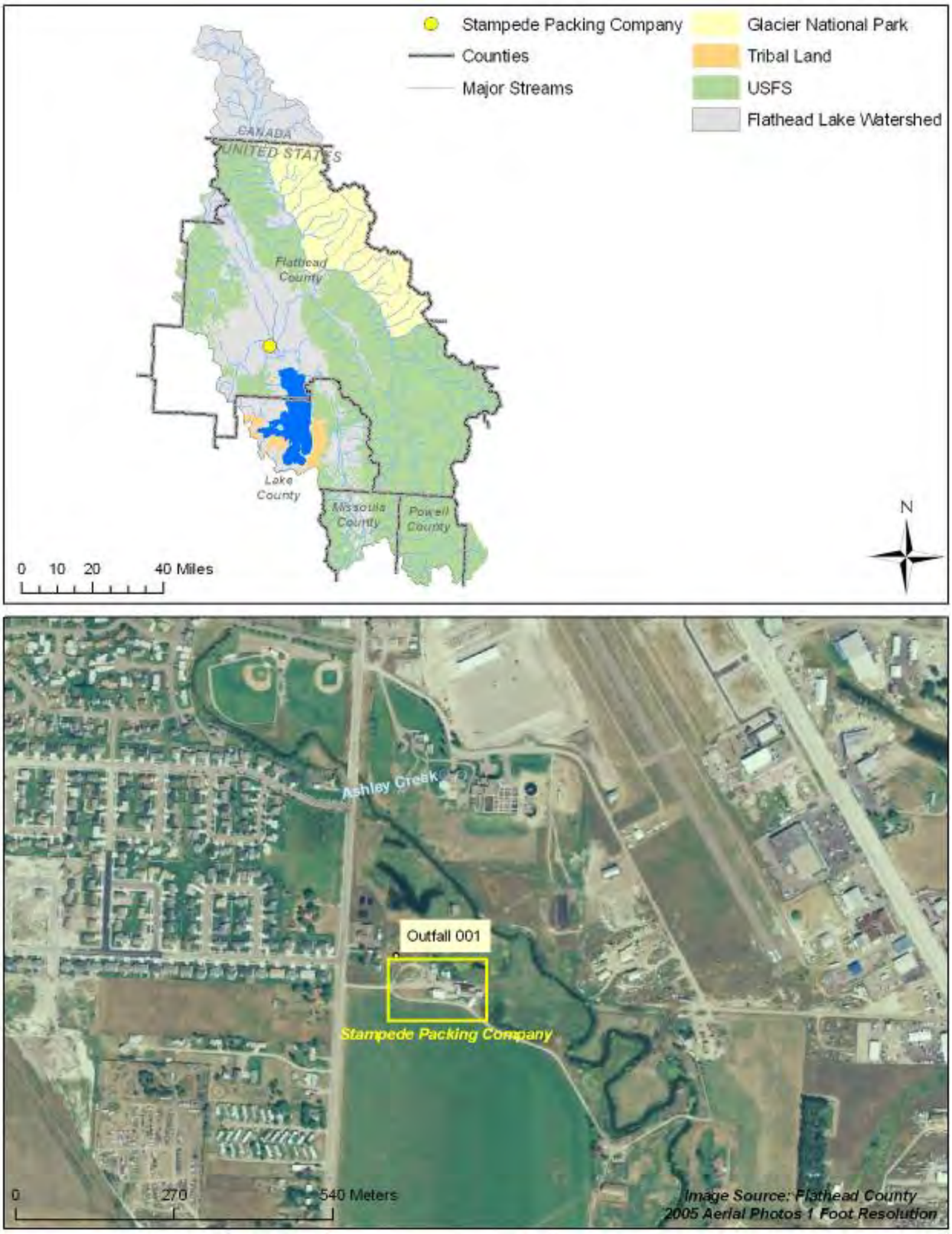


Figure 50. Stampede Packing Company and permitted outfall

3.4 International RV LLC (MTX000120)

International RV LLC (aka Paradise Pine RV LLC) is a mobile home and RV (recreational vehicle) community located in Lake County near the city of Polson, Montana (Figure 51). Wastewater from a single-family home, 15 mobile homes, 90 RV sites, and a restaurant is discharged to a sub-surface dosed drainfield to Class I groundwater (DEQ 2002). The 2002 MGWPCS permit was not renewed[38]. The old permit (DEQ 2002) had effluent limits for total inorganic nitrogen: 54 mg/L 30-day average concentration and 8.1 lb/d average annual load; the groundwater quality limits are shown in Table 44.

Table 45. Groundwater quality limits for the end of the mixing zone to protect Class I groundwater

Constituent	Units	Groundwater quality limits
Ammonia	mg/L	30
Nitrate plus nitrite	mg/L	10
Fecal coliform bacteria	organisms/100 mL	< 1
Specific conductance	µS/cm	≤ 1,000

Source: DEQ 2002.
Note: mg/L = milligram per liter; mL = milliliter; µS/cm = microsiemen per centimeter.

Monitoring data for outfall #001 were obtained from ICIS (U.S. EPA 2013b) and are summarized in Table 45. The average flow between 2006 and 2011 was 0.00657 cfs, with an average total phosphorus concentration of 6.01 mg/L and an average ammonia concentration of 40.8 mg/L.

Table 46. International RV LLC data summary

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	8/10/2006	1/25/2011	51	40.8	4.84	89.1
BOD, 5-day, 20 °C	8/10/2006	1/25/2011	51	137	38	319
Flow rate (cfs)	8/14/2006	1/25/2011	53	0.00657	0.00000232	0.105
Inorganic nitrogen (total) (mg/L)	8/10/2006	1/25/2011	14	46.2	20.8	82.9
NO_2+NO_3 (total as N) (mg/L)	8/10/2006	1/25/2011	46	0.0359	0.01	0.24
Phosphorus (total) (mg/L)	8/10/2006	1/25/2011	51	6.01	1.46	11.8
TSS (mg/L)	8/10/2006	1/25/2011	51	41	9	194

Source of data: ICIS (U.S. EPA 2013b).
Notes
DMR records from ICIS are monthly averages.
cfs = cubic feet per second; mg/L = milligrams per liter; N = nitrogen; NO_2+NO_3 = nitrite plus nitrate; TSS = total suspended solids.

[38] DEQ declared that the facility did not need an MGWPCS permit. DEQ likely determined that the discharge was insignificant and did not impact nearby surface waters.

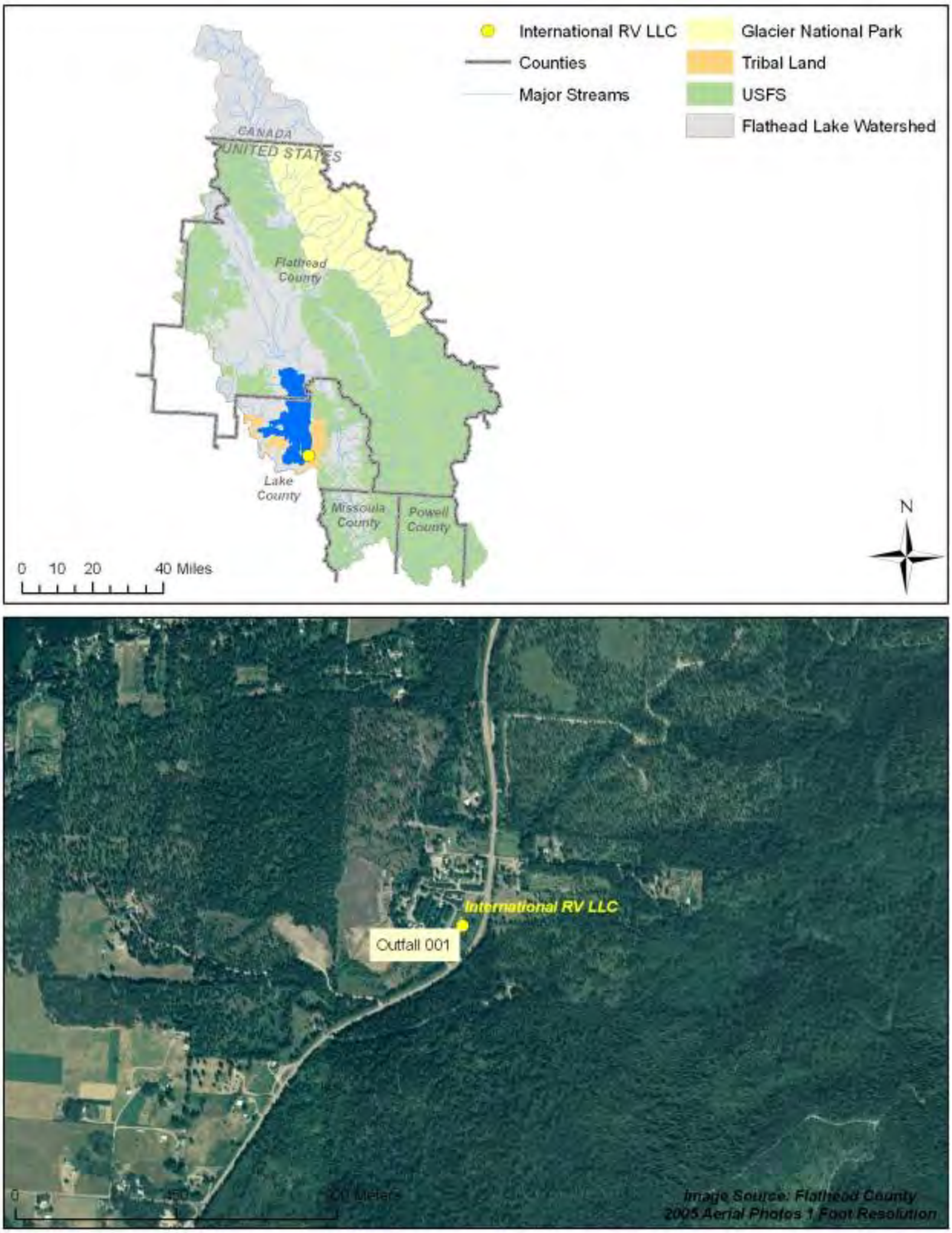


Figure 51. International RV LLC and permitted outfall.

3.5 Glacier Ranch Subdivision (MTX000164)

Glacier Ranch Subdivision (aka First Interstate Bank) is in Flathead County, north of Kalispell (Figure 52). Wastewater is discharged to a sub-surface dosed drainfield to Class I groundwater (DEQ 2007d). Information regarding the subdivision and wastewater treatment works was not reported in the MPDES permit. Additionally, the MGWPCS permit expired in 2012 and is assumed to be administratively continued.

The most recent MGWPCS permit limits are shown in Table 51; samples must be collected at the dose tank prior to discharge to the drainfields. The average daily design flow for outfall #001 is limited to no more than 52,000 gpd. The facility is also required to monitor groundwater from four shallow monitoring wells (MW1A, MW1B, MW1C, and MW1D). Three monitoring wells (MW1A, MW1B, and MW1C) are for monitoring compliance with the site-specific mixing zone and one monitoring well (MW1D) is for monitoring bacteria levels. The permit includes groundwater trigger values for all four monitoring wells. If at any time the trigger values are exceeded, Glacier Ranch Subdivision must implement additional permit requirements and corrective actions. Trigger values are shown in Table 50; the trigger value for MWID is only for *E. coli* (≥ 1 organisms per 100 mL).

Table 47. Glacier Ranch Subdivision permit limits

Constituent	Daily maximum concentration (mg/L) per outfall	30-day average load (lb/d) per outfall
Total Nitrogen, as N	26	6.51
Total Phosphorus, as P	2.5	1.08

Source: DEQ 2007d.
Notes: mg/L = milligram per liter; N = nitrogen; P = phosphorus.

Table 48. Groundwater trigger values for monitoring well MW1A, MW1B, and MW1C

Constituent	Units	Trigger values
E. Coli bacteria	organisms/100 mL	≥ 1
Nitrate	mg/L	7.5

Source: DEQ 2007d.
Note: mg/L = milligrams per liter; mL = milliliter.

Monitoring data were obtained from ICIS (U.S. EPA 2013b) and are summarized in Table 48. Data for the monitoring well show an average total nitrogen concentration of 0.69 mg/L. Only 3 sample event records were contained in the DMR dataset. No flows were reported.

Table 49. Glacier Ranch Subdivision data summary

Parameter	Start date	End date	No. of records	Avg.	Min.	Max.
Nitrate (total as N) (mg/L)	1/11/2012	1/11/2012	3	0.69	0.58	0.87
Nitrogen (total) (mg/L)	1/11/2012	1/11/2012	3	0.793	0.62	0.93
NO_2+NO_3 (total as N) (mg/L)	1/11/2012	1/11/2012	3	0.653	0.58	0.76
TKN (total as N) (mg/L)	1/11/2012	1/11/2012	3	0.27	0.21	0.35

Source of data: ICIS (U.S. EPA 2013b).
Notes
DMR records from ICIS are monthly averages.
avg. = average (arithmetic mean); max. = maximum; mg/L = milligrams per liter; min. = minimum; N = nitrogen; NO_2+NO_3 = nitrite plus nitrate; TKN = total Kjeldahl nitrogen.

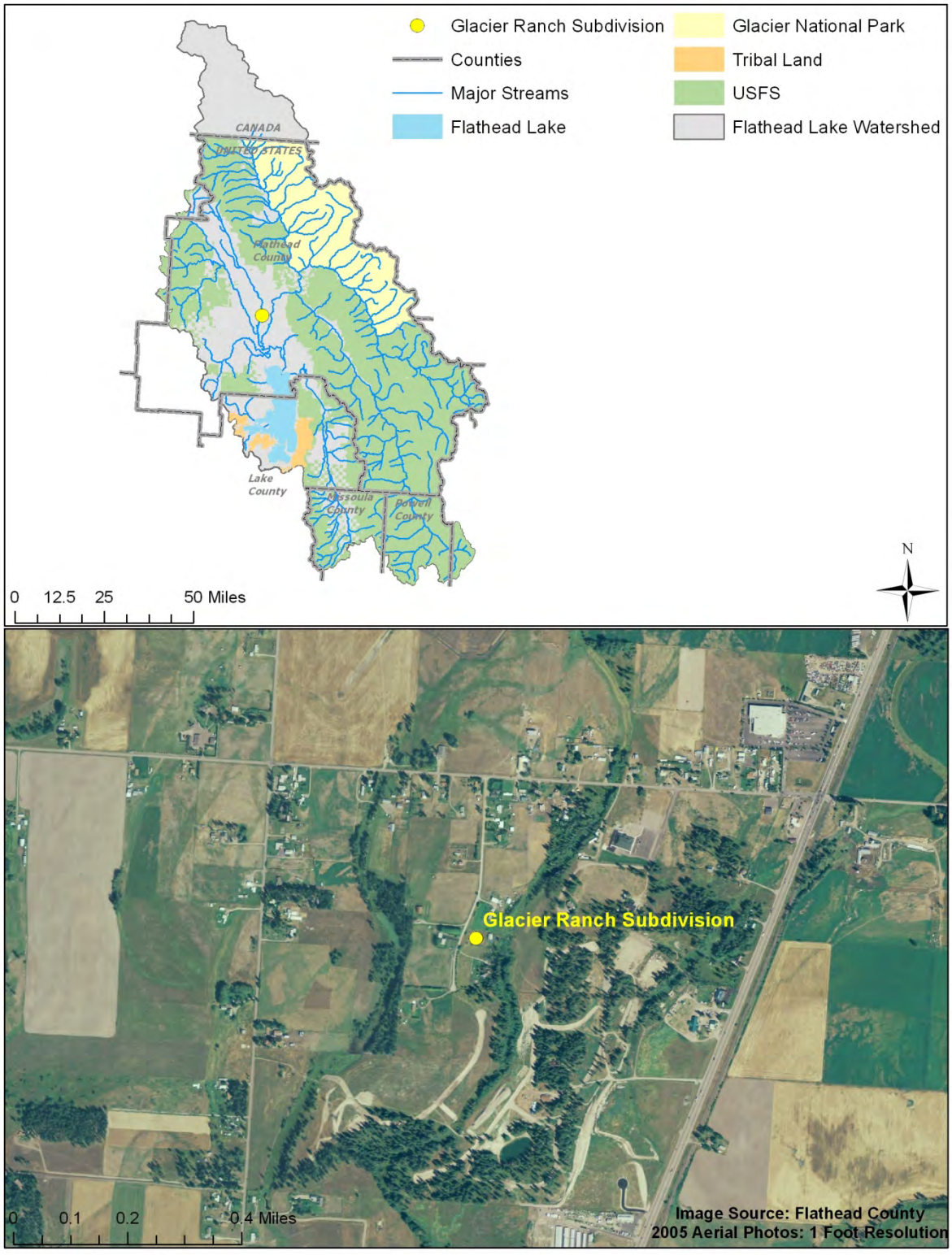


Figure 52. Glacier Ranch subdivision.

3.6 Kootenai Lodge/Lake County Water & Sewer District (MTX000188)

The Kootenai Lodge/Lake County Water and Sewer District is a residential development in Lake County near the town of Bigfork, Montana near the Swan River (Figure 53). The development complex consists of 53 single family homes, a lodge meeting room, and a pool. The Kootenai Lodge residential complex covers 40.9 acres of land. The facility is authorized to discharge to its sub-surface disposal to Class I groundwater (MTX000188). It has a design flow of 23,050 gpd.

The most recent MPDES permit limits are shown in Table 49. In addition to the limits listed below, the permit states that the average daily flow of effluent to outfall #001 and outfall #002 (combined) shall not exceed 15,100 gpd (DEQ 2007d). There must be at least 60 percent removal of total nitrogen from the raw influent. The permit includes groundwater trigger values for monitoring well MW1A (Table 50). Additional procedures and corrective actions are required if trigger values are exceeded (DEQ 2007d). Trigger values are shown in Table 50.

Table 50. Kootenai Lodge/Lake County Water and Sewer District permit limits for outfalls 001 and 002

Constituent	Daily maximum concentration (mg/L) per outfall	30-day average load (lb/d) per outfall
Total Nitrogen	67	8.34
Total Phosphorus	--	1.33

Source: DEQ 2007b.
Note: lb/d = pounds per day; mg/L = milligrams per liter.

Table 51. Groundwater trigger values for monitoring well MW1A

Constituent	Units	Trigger values
E. Coli bacteria	organisms/100 mL	≥ 1
Nitrate	mg/L	7.5

Source: DEQ 2007b.
Note: mg/L = milligrams per liter; mL = milliliter.

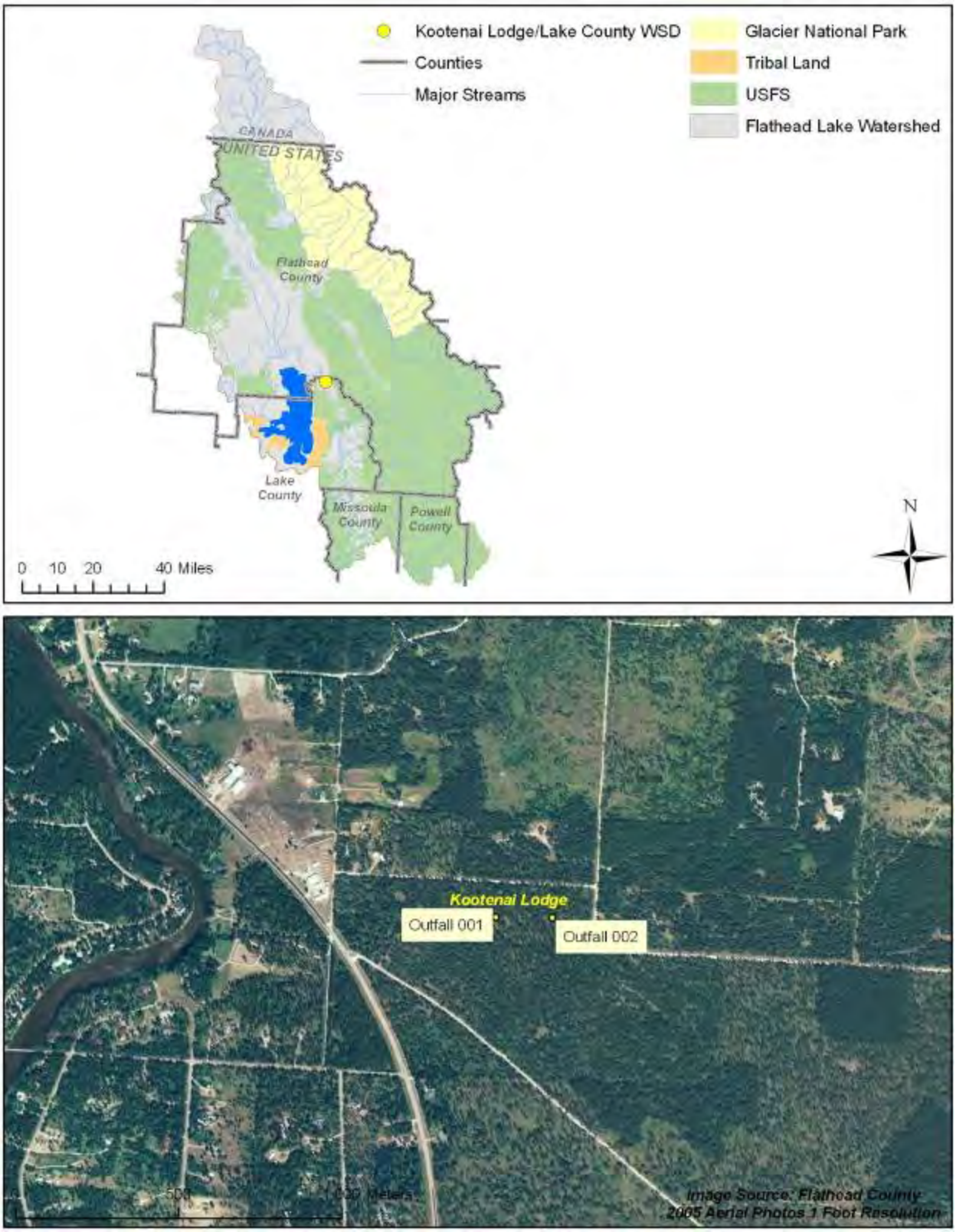


Figure 53. Kootenai Lodge/Lake County Water and Sewer District and permitted outfalls

Monitoring data for the two outfalls were obtained from ICIS (U.S. EPA 2013b) and are summarized in Table 51. Twenty flow samples were available from 2008 to 2013 with an average of less than 0.01 cfs. Data for the monitoring well show an average total nitrogen concentration of 10.8 mg/L and an average total phosphorus concentration of 1.34 mg/L.

Table 52. Kootenai Lodge/Lack County Water and Sewer District data summary

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
Ammonia (total as N) (mg/L)	4/22/2008	1/24/2013	20	0.512	0.04	3.6
BOD, 5-day, 20 °C	4/22/2008	1/24/2013	20	3.16	1	11
Flow rate (cfs)	4/22/2008	1/24/2013	20	0.000924	0.000381	0.00186
Nitrogen (total) (mg/L)	4/22/2008	1/24/2013	20	10.8	2.41	20.6
NO2NO3 (total as N) (mg/L)	4/22/2008	1/24/2013	20	10.2	2.28	20
Phosphorus (total) (mg/L)	4/22/2008	1/24/2013	20	1.34	0.32	2.57
TKN (total as N) (mg/L)	4/22/2008	1/24/2013	19	0.671	0.09	3.8
TSS (mg/L)	4/22/2008	1/24/2013	19	2.31	0.33	8.33

Source of data: ICIS (U.S. EPA 2013b)
Notes
DMR records from ICIS are monthly averages.
BOD = biological oxygen demand; cfs = cubic feet per second; mg/L = milligrams per liter; N = nitrogen; NO2NO3 = nitrite plus nitrate; TKN = total Kjeldahl nitrogen; TSS = total suspended solids.

3.7 Hungry Horse Wastewater Treatment Plant (MTX000193)

The Bureau of Reclamation, of the U.S. Department of the Interior, formerly operated a wastewater treatment facility that was located at the Hungry Horse Dam near Hungry Horse, Montana (Figure 54). A septic system with drainfield was installed in 2009.[39] The plant serves the Hungry Horse Dam facility.

The WWTP was built in 1970 and consisted of an extended aeration package plant with secondary and tertiary treatment.[40] The design flow was 0.009 mgd. No major upgrades have occurred between 1970 and 2009 when the new sub-surface disposal system was installed. Even though the wastewater treatment facility is not actively used and does not discharge, the Bureau of Reclamation continues to maintain the permit in case they decide to reactivate the WWTP in the future.[41]

A design investigation was conducted in 2007 to look at alternatives to replacing the existing system with a system that does not discharge to the river. The WWTP now discharges to an infiltration/percolation cell after UV disinfection and has a maximum discharge rate of 300,000 gpd (DEQ 2008d).

The WWTP is permitted to discharge effluent to the South Fork Flathead River from one outfall (#001) to the infiltration/percolation field (DEQ 2008d). The most recent MPDES permit limits for the outfall are shown in Table 52. A nested pair of monitoring wells is also required to be installed and groundwater quality must be monitored.

Table 53. Hungry Horse WWTP permit limits

Constituent	Units	Daily maximum	30-day average
Nitrate as N	mg/L	7.5	--
	lb/d	--	18.77
Total Phosphorus as P	lb/d	--	2.5
E. coli bacteria	organisms/100 mL	< 1	--

Source: DEQ 2007d.
Note: lb/d = pounds per day; mg/L = milligrams per liter; mL = milliliters; N = nitrogen; P = phosphorus.

U.S. EPA (2013b) obtained all available DMR data for the Flathead Lake basin; however, data were not available for this facility.

[39] Melee K. Valett, water quality specialist, DEQ – Permitting and Compliance Division – Water Protection Bureau – Water Quality Discharge Permits Section, personal communication, March 10, 2010.
[40] Dennis Philmon, Facility Manager, Hungry Horse Dam, personal communication, July 24, 2008.
[41] Melee K. Valett, water quality specialist, DEQ – Permitting and Compliance Division – Water Protection Bureau – Water Quality Discharge Permits Section, personal communication, March 10, 2010.

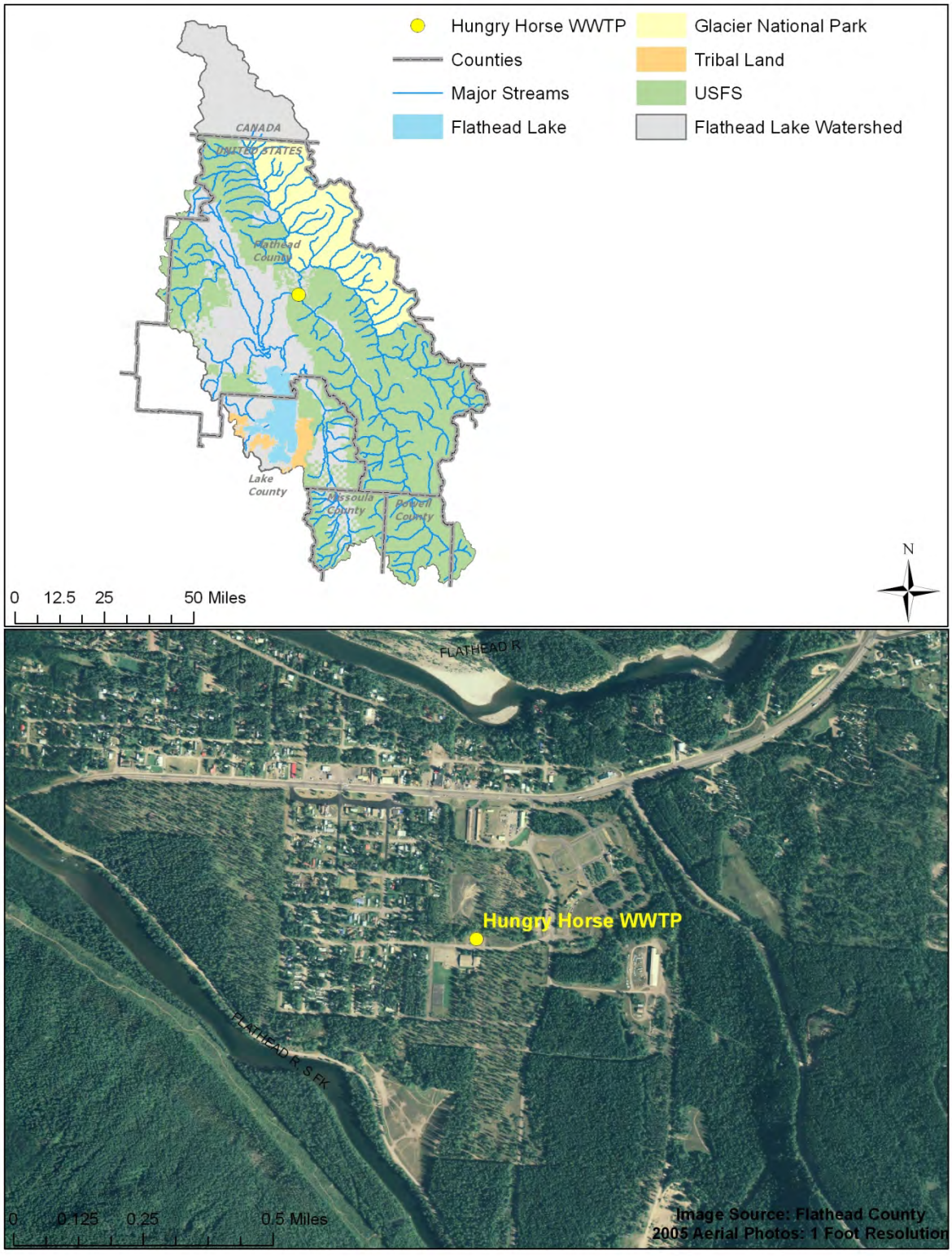


Figure 54. Hungry Horse WWTP.

3.8 Cove Creek Ridge Subdivision (MTX000199)

The Cove Creek Ridge Subdivision (aka TLW Properties, LLC) is a proposed 32-dwelling unit subdivision in Flathead County northeast of the unincorporated community of Evergreen and west of Lake Blaine (Figure 55). Wastewater would be discharged to two sub-surface drainfields to Class I groundwater (DEQ 2008e). The wastewater treatment works would include a sequencing batch reactor, coagulation injection system, gravity sand filtration system, two ultraviolet light disinfection units, 3,000 gallon feet tank, 8,000 gallon sludge tank, and 4, 000 gallon dose tank.

The MGWPCS permit limits are shown in Table 53. In addition to the limits listed below, the permit states that the average daily flow of effluent to outfall #001a and outfall #001b (combined) shall not exceed 11,200 gpd (DEQ 2008e). The permit also requires construction of a groundwater monitoring well and requires quarterly monitoring.

Table 54. Cove Creek Ridge Subdivision permit limits for outfalls 001a and 001b

Constituent	Daily maximum concentration (mg/L) per outfall	90-day average load (lb/d) per outfall
Total Nitrogen	7.5	0.7
Total Phosphorus	10.5	0.98

Source: DEQ 2008e.
Note: lb/d = pounds per day; mg/L = milligrams per liter.

U.S. EPA (2013b) obtained all available DMR data for the Flathead Lake basin; however, data were not available for this facility.

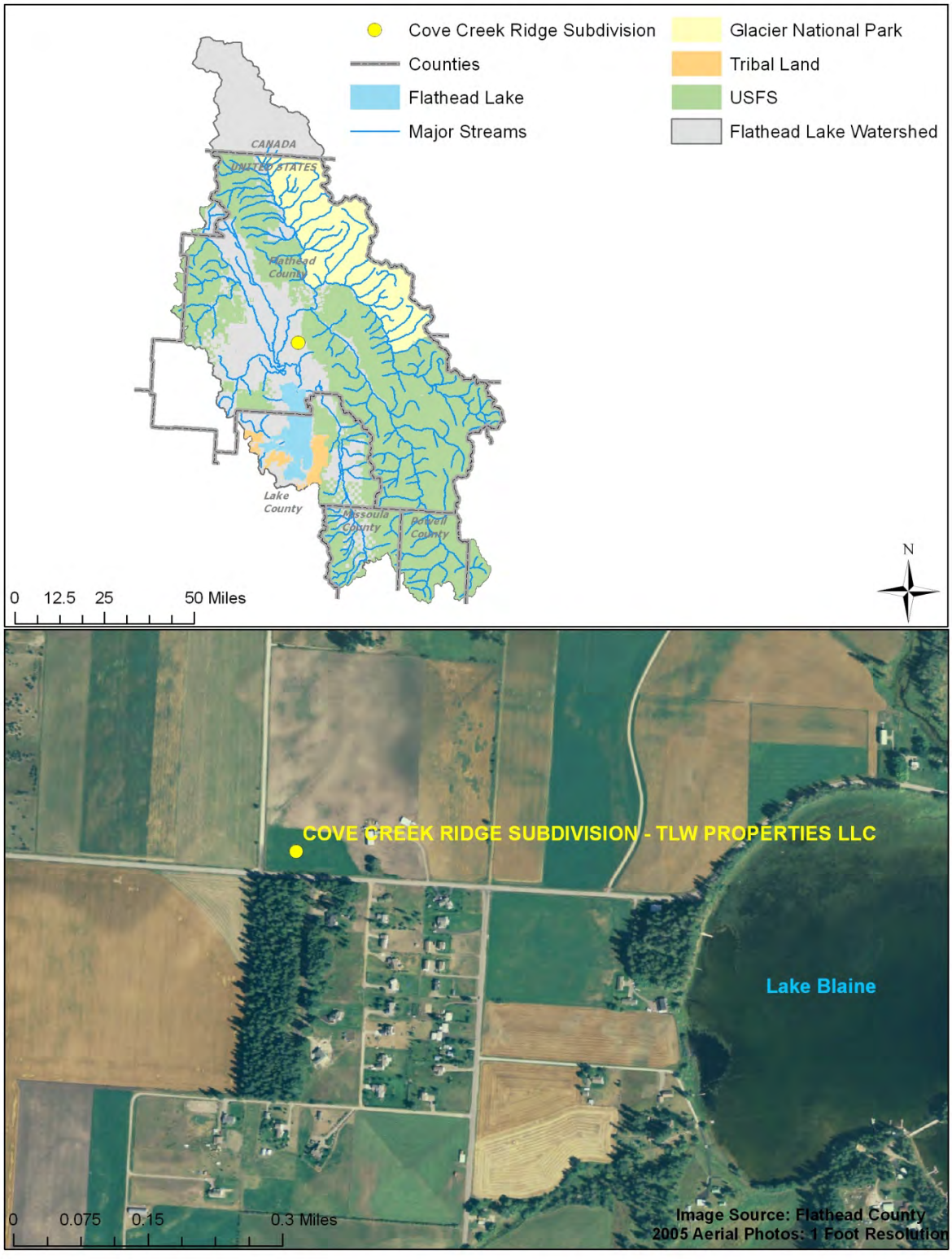


Figure 55. Proposed Cove Creek Ridge Subdivision.

3.9 Point of Pines Wastewater Treatment System (MTX000214)

The Point of Pines wastewater treatment system (aka Point of Pines Neighborhood Association, Inc.) is a subdivision in Flathead County northwest of Whitefish Lake (Figure 55). Information regarding the subdivision and wastewater treatment works was not reported in the MPDES permit. The facility is authorized to discharge to its sub-surface disposal system located in Flathead County to Class I groundwater at a maximum rate of 8,750 gpd (MTX000214). The most recent MGWPCS permit limits are show in Table 53.

Table 55. Point of Pines Wastewater Treatment System permit limits

Constituent	Units	Daily maximum	Annual maximum
Total nitrogen as N	mg/L	24	--
Total phosphorus as P	lb/y	--	99

Source: DEQ 2010c.
Note: lb/y = pounds per year; mg/L = milligrams per liter; N = nitrogen; P = phosphorus.

Monitoring data were obtained from ICIS (U.S. EPA 2013b) and are summarized in Table 54. Data for the monitoring well show an average total nitrogen concentration of 8.42 mg/L and an average total phosphorus concentration of 4.84 mg/L.

Table 56. Point of Pines Wastewater Treatment System data summary

Constituent	Start date	End date	No. of records	Avg.	Min.	Max.
Flow rate (cfs)	10/28/2012	1/28/2013	2	0.000503	0.000408	0.000598
Nitrogen (total) (mg/L)	10/28/2012	1/28/2013	2	8.42	0.04	16.8
NO_2+NO_3 (total as N) (mg/L)	10/28/2012	1/28/2013	2	12.9	11.6	14.1
Phosphorus (total) (mg/L)	10/28/2012	1/28/2013	2	4.84	4.45	5.22
TKN (total as N) (mg/L)	10/28/2012	1/28/2013	2	5.53	5.24	5.82

Source of data: ISIS (U.S. EPA 2013b)
Notes
DMR records from ICIS are monthly averages.
cfs = cubic feet per second; mg/L = milligrams per liter; N = nitrogen; NO_2+NO_3 = nitrite plus nitrate; TKN = total Kjeldahl nitrogen.

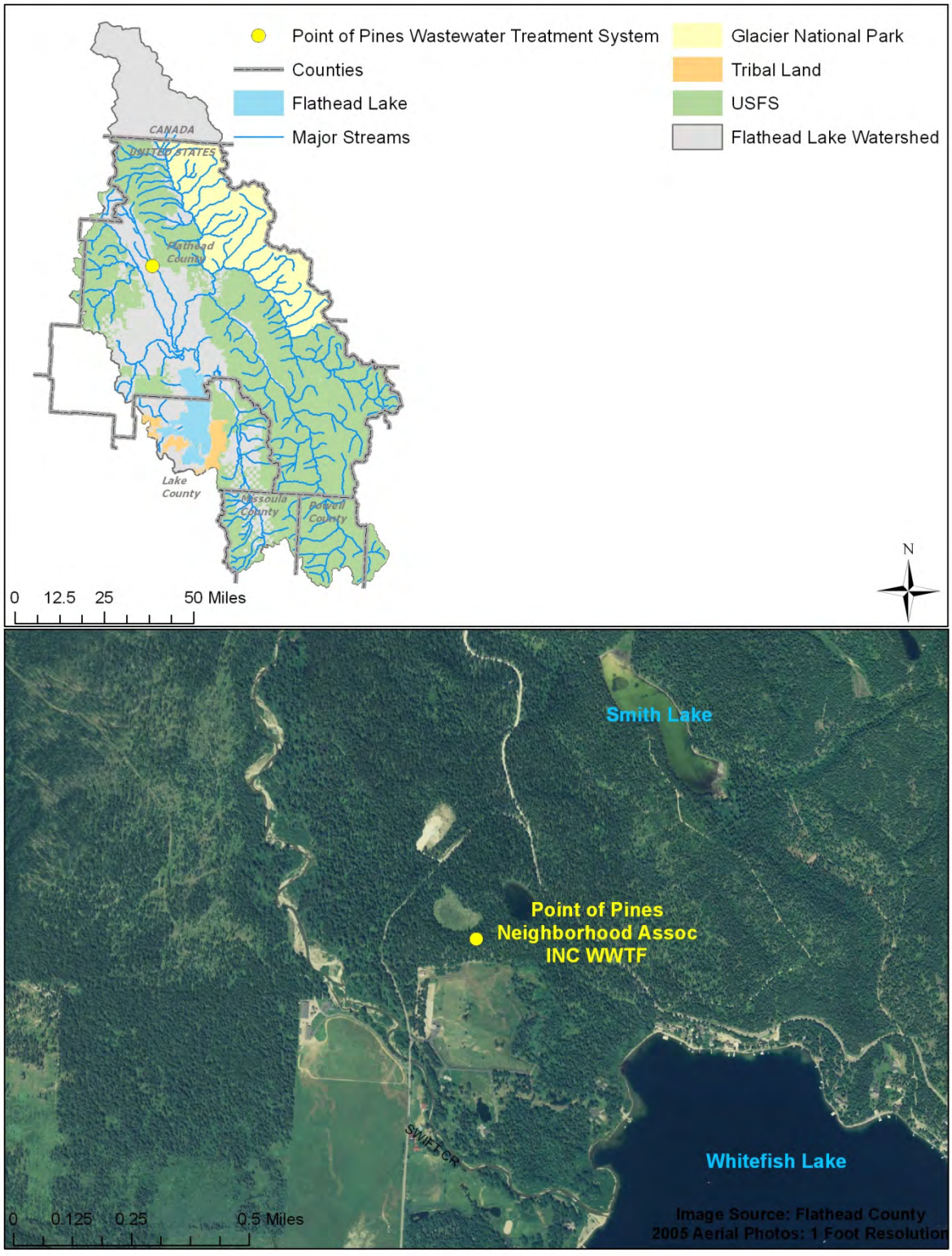


Figure 56. Point of Pines Wastewater Treatment System.

3.10 Glacier International Airport Rental Car Facility Car Wash (MTX000220)

The Glacier International Airport Rental Car Facility Car Wash (aka FCA Rentals LLC.) is a carwash at the Glacier International Airport in Flathead County northeast of Kalispell, Montana (Figure 56). The wastewater treatment system is composed of primary treatment and filtration (DEQ 2011b). The facility is authorized to discharge to its sub-surface disposal system located in Flathead County to Class I groundwater (MTX000220).

The wastewater treatment system is composed of a reverse osmosis system and HydroKleen filter and the system discharges to an infiltration pond (DEQ 2011b). The permit limits are for lead and total dissolved solids.

U.S. EPA (2013b) obtained all available DMR data for the Flathead Lake basin; however, data were not available for this facility.

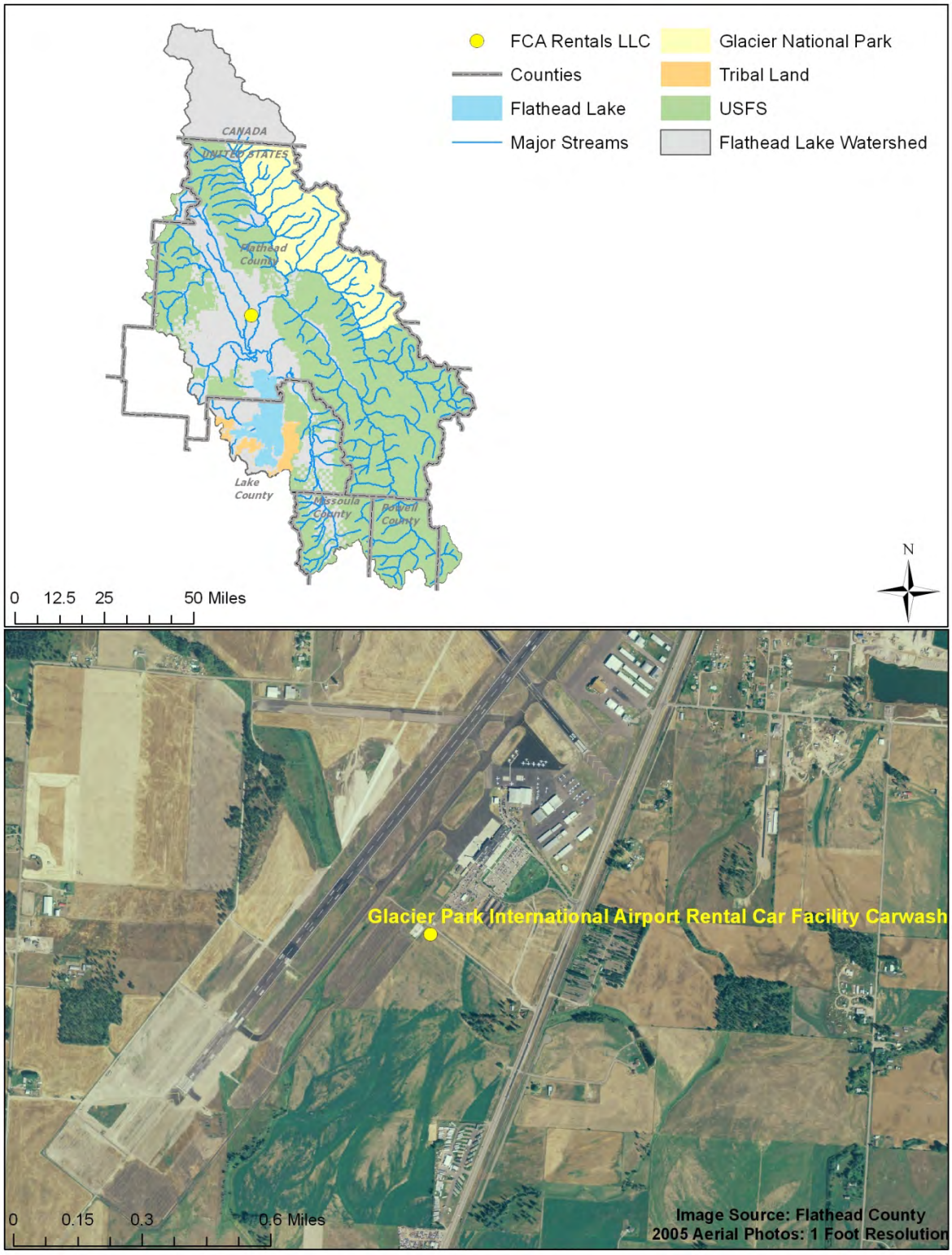


Figure 57. Glacier Park International Airport Rental Car Facility Carwash.

4.0 Non-Stormwater General MPDES Permits

Twenty-nine facilities are permitted to discharge to surface waters in the Flathead Lake basin under general, non-stormwater permits (Table 55, Table 56, Table 57, Table 58, Table 59, Table 60, and Table 61). The surface water discharges are issued general permits that begin with MTG.

Concentrated animal feeding operations (Table 55; Section 4.1) and biosolids operations (Table 58) are potential sources of nutrients and TSS. Additional information regarding biosolids operations at each WWTP is presented in Section 2.0 with the discussion of each WWTP's individual MPDES permit. Construction dewatering (Table 56), disinfected waters (e.g., swimming pools, hydrostatic test waters; Table 59), and petroleum cleanup (Table 60) are not likely significant sources of nutrients. General permits for construction dewatering and disinfected waters include turbidity and TSS limits; such facilities may be sources of TSS. Pesticide application varies by pesticide and target species; pesticides may be sources of nutrients. Fish farms are sources of nutrients and TSS and are further discussed in Sections 4.1 and 4.2.

Table 57. General MPDES permit for concentrated animal feeding operations in the Flathead Lake basin

Permit no.	Name
MTG010253	TUTVEDT FARMS

Table 58. General MPDES permits for construction dewatering in the Flathead Lake basin

Permit no.	Name
MTG070572	BIGFORK COUNTY WATER AND SEWER DIST. BAY DRIVE - SWAN RIVER PROJ.
MTG070574	NORTHSTAR ASSOCIATES LLC - THREE MILE DRIVE PROJ.
MTG070582	COP CONSTRUCTION LLC - 2001 AIRPORT ROAD PROJECT
MTG070594	JOHNSON WILSON CONSTRUCTORS NEW EFFLUENT TREATMENT SYSTEM
MTG070595	COP CONSTRUCTION LLC - HWY 93 WATER & WW SYSTEM EXTENSIONS
MTG070618	JOHNSON WILSON CONSTRUCTORS CRESTON NATIONAL FISH HATHERY
MTG070632	HUTTON RANCH PLAZA ASSOC LLC
MTG070634	SANDRY CONSTRUCTION - GLACIER RANCH SUBDIVISION
MTG070651	AMES CONSTRUCTION - KALISPELL BYPASS FOYS LAKE RD
MTG070663	MONTANA DEPT OF TRANSPORTATION - SWAN RIVER BRIDGE
MTG070676	MONTANA DEPT OF TRANSPORTATION FLATHEAD RIVER 3MI NW OF BIGFORK

Table 59. General MPDES permits for fish farms in the Flathead Lake basin

Permit no.	Name
MTG130007	Creston National Fish Hatchery
MTG130014	Flathead Lake Salmon Hatchery

Table 60. General MPDES permits for biosolids in the Flathead Lake basin

Permit no.	Name
MTG650009	Columbia Falls WWtP
MTG650010	Kalispell WWTP
MTG650020	Bigfork Water and Sewer District WWTF
MTG650045	Lake McDonald WWTP (Glacier National Park)
MTG650059	Whitefish WWTF
MTG651004	Yellow Bay WWTP (Flathead Lake Biological Station)

Table 61. General MPDES permits for disinfected waters in the Flathead Lake basin

Permit no.	Name
MTG770022	93 AND CHURCH SILVERBROOK CHLORINATION PROJECT
MTG770029	CITY OF KALISPELL LOWER ZONE DRINKING WATER TANK DRAIN LINE

Table 62. General MPDES permits for petroleum cleanup in the Flathead Lake basin

Permit no.	Name
MTG790012	BEARGRASS HOLDINGS LLP - MICHAEL'S WEST EXXON

Table 63. General MPDES permits for pesticide in the Flathead Lake basin

Permit no.	Name
MTG870016	FLATHEAD COUNTY MOSQUITO CONTROL
MTG870029	AFFORDABLE YARD SERVICE SUBDIVISIONS PESTICIDE
MTG870033	EAGLE BEND YACHT HARBOR ASSOC PESTICIDE
MTG870051	THE LAKES MASTER HOA PESTICIDE
MTG870055	DNRC BEAVER LAKE PESTICIDE
MTG870059	CITY OF WHITEFISH RIVERSIDE SW RETENTION POND WEED CONTROL

4.1 Tutvedt Farms (MTG010253)

Tutvedt Farms is in Flathead County northwest of Kalispell (Figure 58). The agricultural operations include a CAFO with approximately 2,200 head of cattle (DEQ 2012d). The CAFO is situated on 40 acres and the CAFO drains to an evaporation pond underlain by clay (DEQ 2012d). An additional 5 acres of land that is not part of the CAFO also drains to the evaporation pond. The evaporation pond is approximately 8 feet deep and has a capacity of 785,000 gallons. Approximately 200 tons of the 750 tons of manure produced annually is land-applied in the spring and fall. The manure is dried and then land applied via a manure spreader to 1,100 acres of irrigated wheat/alfalfa crops that are also part of Tutvedt Farms.

U.S. EPA (2013b) obtained all available DMR data for the Flathead Lake basin; however, data were not available for this CAFO.

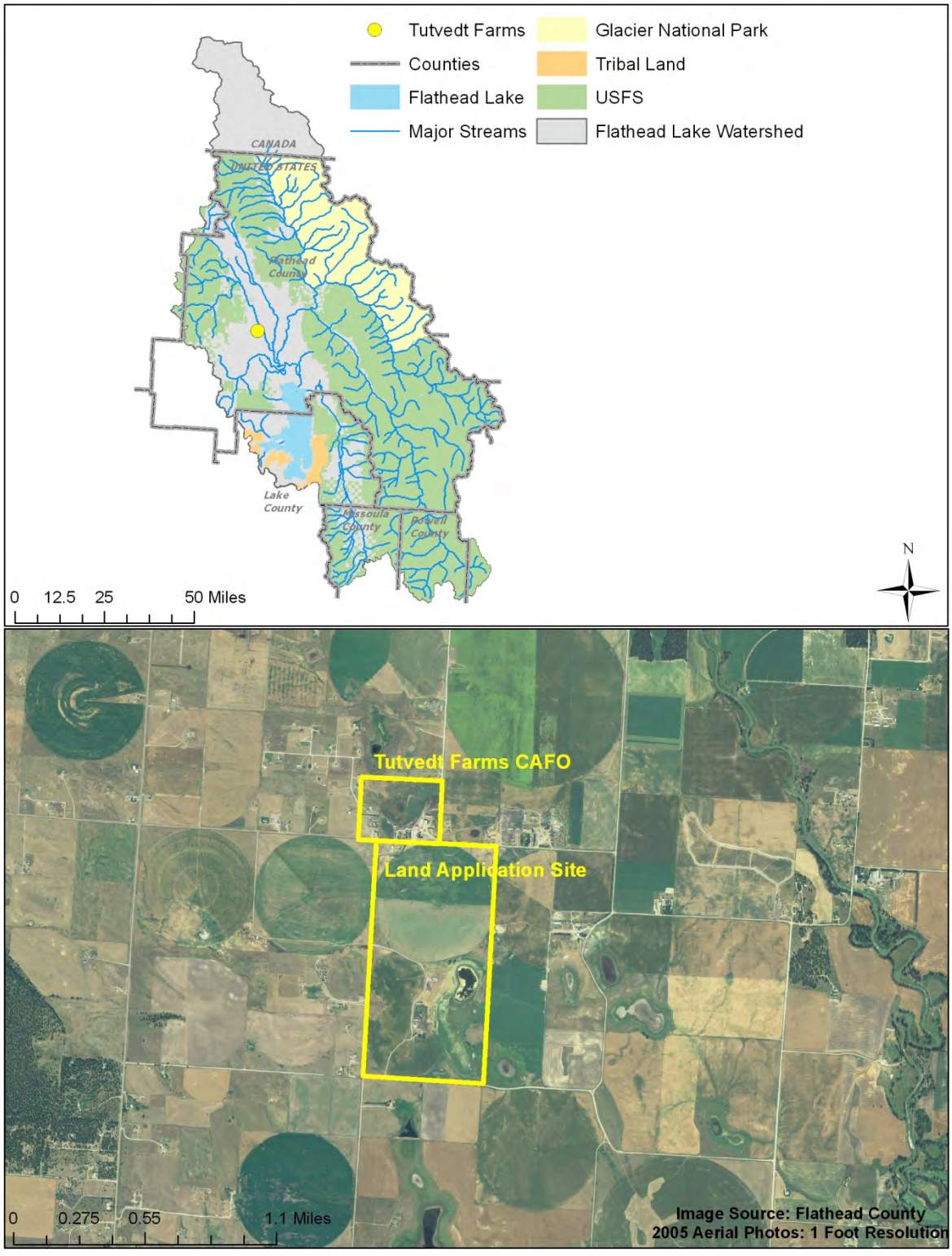


Figure 58. Tutvedt Farms CAFO and manure land application areas.

4.2 Creston National Fish Hatchery (MTG130007)

The Creston National Fish Hatchery is in Flathead County just east of the City of Kalispell (Figure 59). It is on Mill Creek and withdraws water from the Jessup Mill Pond, which is on Mill Creek just upstream of the fish hatchery. The fish hatchery is operated by the U.S. Fish and Wildlife Service and raises coldwater fish such as rainbow, cutthroat, and bull trout (DEQ Field Investigation Report 2005). The withdrawal/design flow of the facility is 19,000 gallons per minute. DEQ inspected the hatchery in July 2012 and ordered the hatchery to perform corrective actions to come into compliance with the general permit and its authorization letter (DEQ 2012c).

The hatchery is authorized to discharge wastewater to Mill Creek via several outfalls under Montana's Fish Farm General Permit (MTG130007; DEQ 2011a). The only permit limit is for polychlorinated biphenyls (PCBs) – less than 0.00065 µg/L in any sample. Facilities that produce more than 20,000 pounds per year are required to monitor TSS; Creston National Fish Hatchery produces 61,500 pounds per year, and thus, monitors TSS (DEQ 2011c).

The facility is required to monitor flow, PCBs, TSS, and fish food in its effluent. Monitoring data were obtained from ICIS (U.S. EPA 2013b) from 2007 to 2013 and are summarized in Table 62. Effluent flow data indicate an average of 14.1 cfs. TSS concentrations averaged 5.35 mg/L. No nutrient data were available.

Table 64. Creston National Fish Hatchery permit limits

Parameter	Start date	End date	No. of records	Avg.	Min.	Max.
Flow rate (cfs)	1/29/2007	1/28/2013	13	14.1	11.8	16.7
TSS (mg/L)	1/29/2007	1/28/2013	11	5.35	1	22.7

Source of data: ICIS (U.S. EPA 2013b).
Nots
DMR records from ICIS are monthly averages.
avg. = average (arithmetic mean); cfs = cubic feet per second; max. = maximum; mg/L = milligrams per liter; min. = minimum.

In a study of fish hatcheries in Washington State, the water quality within the receiving waters varied considerably but TSS and nutrient concentrations tended to increase, sometimes significantly (Kendra 1989). The researchers observed statistically-significant increases of ammonia (fish excretion), nitrogen (feed component), and phosphorus (feed component) in fish hatchery wastewater and that the "effects were more pronounced when dilution was poor and effluent was discharged to an oligotrophic waterscourse (Kendra 1989, p. 11). A review of published research by the authors found that "[effects] were variable, but included oxygen depression, solids deposition, and nutrient enrichment" (Kendra 1989, p. 15).

Readily-available literature that present nutrient loads derived from fish hatcheries is limited. Kendra (1989) converted phosphorus loading rates to population equivalents of domestically-treated wastewater. The results were that hatcheries discharged phosphorus loads at equivalents rates to communities of 300 to 2,300 people that have secondary treatment of domestic sewage (Kendra 1989, p.12).

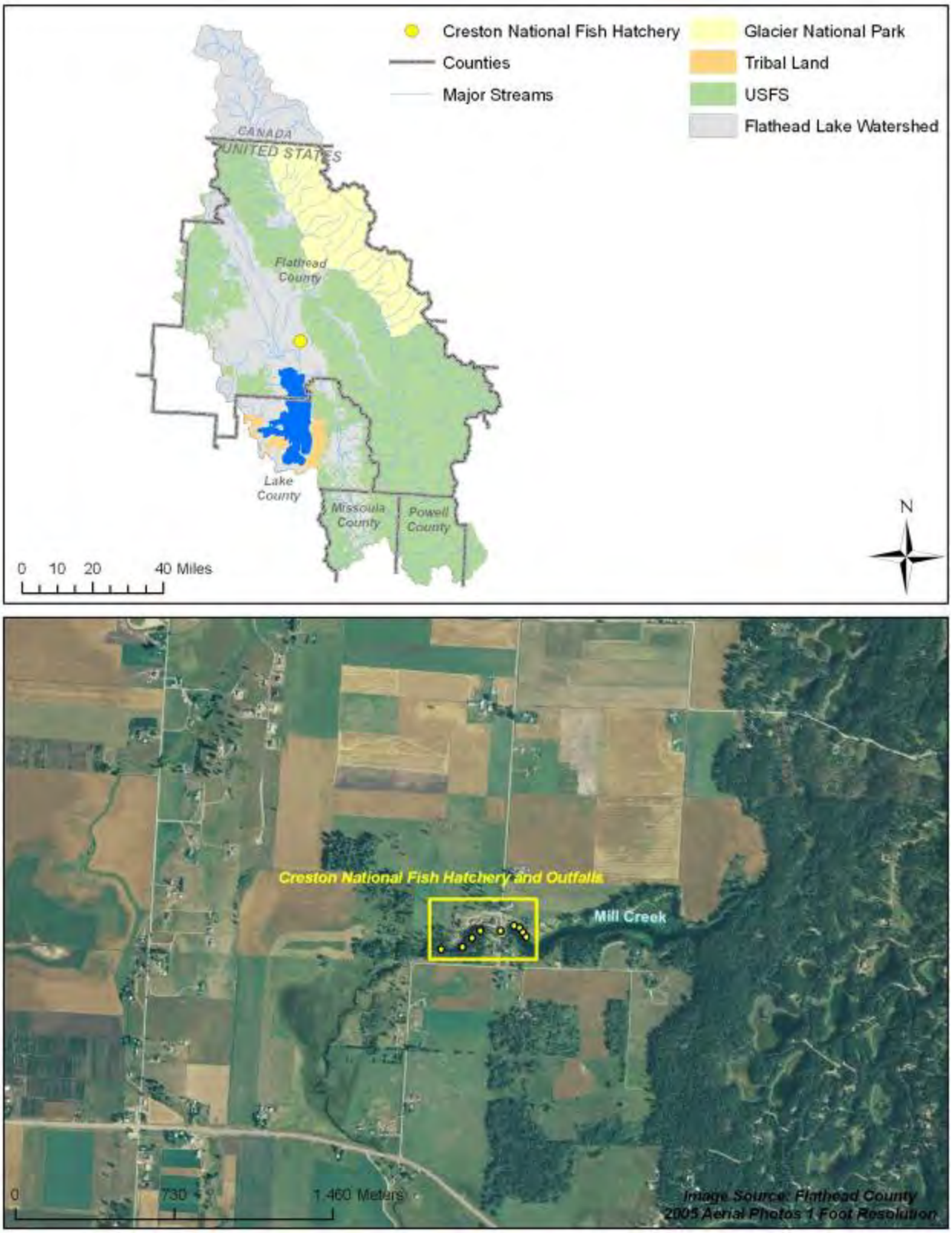


Figure 59. Creston National Fish Hatchery and permitted outfalls.

4.3 Flathead Lake Salmon Hatchery (MTG130014)

The Flathead Lake Salmon Hatchery is in Flathead County near the town of Somers, Montana (Figure 58). The fish hatchery is operated by Montana Department of Fish, Wildlife, and Parks (DFWP) and raises various coldwater fish species (DFWP 2008). No design flow for the facility has been specified. DEQ inspected the hatchery in March 2012 and found the hatchery to be in compliance with the general permit and its authorization letter (DEQ 2012d).

The hatchery is authorized to discharge wastewater to Flathead Lake under Montana's General Permit for Concentrated Aquatic Animal / Fish Farms (MTG130000; DEQ 2011a). The only permit limit is for PCBs – less than 0.00065 µg/L in any sample. Facilities that produce more than 20,000 pounds per year are required to monitor TSS; Flathead Lake Salmon Hatchery produces 2,781 pounds per year, and thus, is not required to monitor TSS (DEQ 2011d).

Monitoring data were obtained from ICIS (U.S. EPA 2013b; available for 2007-2013) and are summarized in Table 63. Effluent flow data indicate an average of 0.248 cfs. No nutrient data were available.

Table 65. Flathead Lake Salmon Hatchery data summary

Parameter	Start date	End date	No. of records	Avg.	Min.	Max.
Flow rate (cfs)	3/6/2007	1/28/2013	13	0.248	0.0223	0.691

Source of data: ICIS (U.S. EPA 2013b)
Notes
DMR records from ICIS are monthly averages.
avg. = average (arithmetic mean); cfs = cubic feet per second; max. = maximum; min. = minimum.

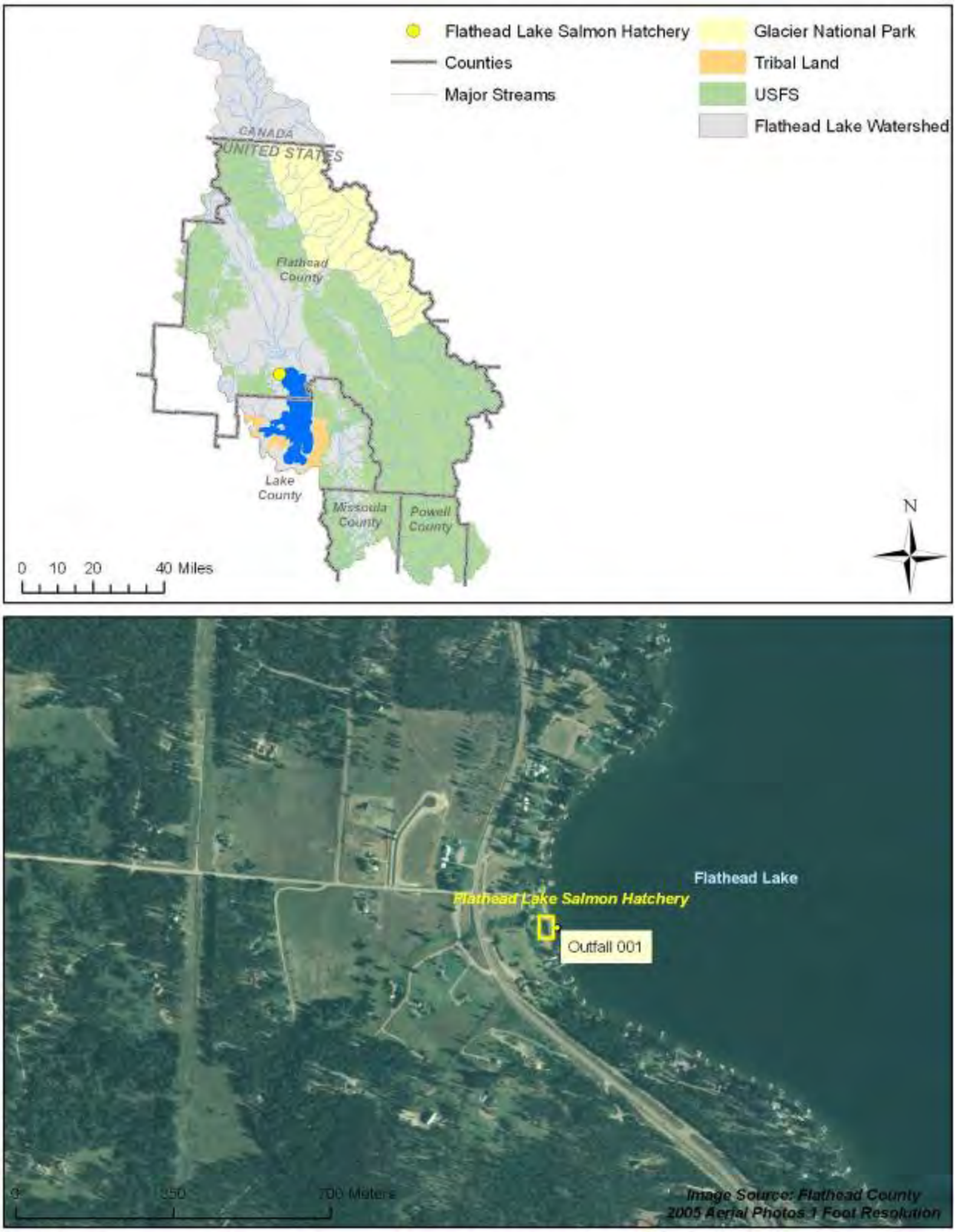


Figure 60. Flathead Lake Salmon Hatchery and permitted outfall.

5.0 Stormwater General MPDES Permits

Two hundred seventy facilities and sites are permitted to discharge stormwater to surface waters in the Flathead Lake basin under one of Montana's general MPDES permits for stormwater. The stormwater discharges are issued general permits that begin with MTR00 for industrial activities (Table 64), MTR04 for small multiple separate storm sewer systems (Table 65), and MTR10 for construction sites. The 255 permitees (as of February 2013) for stormwater discharges associated with construction sites are not presented herein because the permits are temporary as construction only occurs over a limited time frame. Five permits are for stormwater associated with industrial activities that does not discharge off-site and thus results in no exposure to pollutants (Table 66); these permits begin with MTRNE.

Table 66. General NPDES permits stormwater discharges associated with industrial activities in the Flathead Lake basin

Permit no.	Name
MTR000019	F H STOLTZE LAND AND LUMBER CO
MTR000251	WISHER'S AUTO RECYCLING
MTR000309	GLACIER PARK INTERNATIONAL AIRPORT
MTR000367	KALISPELL WRECKING
MTR000404	CITYSERVICEVALCON PLANT
MTR000419	BUILDING MATERIALS HOLDING CORP. - BMC WEST TRUSS PLANT
MTR000447	UPS - KALISPELL
MTR000465	GLACIER GOLD LLC
MTR000476	FLATHEAD COUNTY SOLID WASTE DISTRICT

Table 67. General NPDES permit for stormwater discharges associated with multiple separate storm sewer systems in the Flathead Lake basin

Permit no.	Name
MTR040005	CITY OF KALISPELL SMALL MS-4

Table 68. General NPDES permits for stormwater that does not discharge off-site in the Flathead Lake basin

Permit no.	Name
MTRNE0011	BMC MILLWORK INDUSTRIAL NO EXPOSURE
MTRNE0023	FEDEX EXPRESS CORPORATION - KALISPELL
MTRNE0028	FEDEX GROUND PACKAGE SYSTEM INC KALISPELL
MTRNE0031	CITY OF KALISPELL WWTP NO EXPOSURE
MTRNE0054	WHITEFISH WWTF

6.0 Montana Permits

Montana DEQ has issued two types of short-term permits under the authority of the Montana Water Quality Act that are not part of the MPDES program.

6.1 Section 308 Permits

Eleven facilities have short-term exemptions from surface water quality standards for emergency remediation (Table 67). Such short-term exemptions are authorized under section 308 of the Montana Water Quality Act. The exemptions are issued permits that begin with MTE but are not MPDES permits. No monitoring data are available for these facilities.

Table 69. Section 308 permits in the Flathead Lake basin

Permit no.	Name
MTE000112	MONTANA FWP NECKLACE CHAIN OF LAKES SMOKY CREEK
MTE000207	USFS - KOOTENAI NATIONAL FOREST BLUE LAKE
MTE000211	FWP WILDCAT LAKE ROTENONE TREATMENT PROJECT
MTE000307	STEVENSON POND
MTE000308	MT FISH WILDLIFE & PARKS - GRAVES CREEK DRAINAGE
MTE000311	LAKE POINTE HOA BIGFORK
MTE000510	FWP - MARGARET LAKE AND FOREST CREEK
MTE000610	FWP - CLAYTON LAKE AND CREEK
MTE000807	EAGLE BEND YACHT HARBOR BOATSLIP OWNERS ASSOC.
MTE002009	LAKE POINTE HOMEOWNERS ASSOC POND TREATMENT
MTE002108	LAKE POINTE HOMEOWNERS ASSOC MAN MADE POND

6.2 Section 318 Permits

Seventy-five facilities have short-term turbidity water quality standards for construction sites. Such short-term standards are authorized under section 318 of the Montana Water Quality Act. The exemptions are issued permits that begin with MTB but are not MPDES permits. The 75 permitees (as of February 2013) for surface water discharges with short-term turbidity water quality standards for construction sites are not presented herein because the permits are temporary as construction only occurs over a limited time frame. No monitoring data are available for these facilities.

7.0 Facilities that Do Not Need Permit Coverage

This section provides a summary of non-discharging facilities.

7.1 Unpermitted Facilities

Five non-discharging facilities that were evaluated by DEQ are in the Flathead Lake basin (Table 68). Such facilities, with an MPDES identifier of "MTU0 or MTUs" for tracking compliance, do not have MPDES permit coverage and are not allowed to discharge to waters of the United States. DEQ has verified that these five facilities do not discharge.

Table 70. Unpermitted facilities in the Flathead Lake basin

Permit no.	Name
MTU000019	Glacier Gold
MTUS00005	Andy Silvers
MTUS00006	Empire Estates
MTUS00130	Buffalo Mountain Estates
MTUS00131	Kalispell Wrecking

7.2 Elmo

Elmo is an unincorporated community in Flathead County on the western shores of the Big Arm of Flathead Lake (Figure 59). Elmo operates a lagoon system with aerated and storage lagoons and land applies treated effluent via spray irrigation (FCCHD 2012). Original unlined, facultative lagoons were replaced with lined lagoons through a Rural Development grant to the Confederated Salish and Kootenai Tribes of the Flathead Reservation. The facility is estimated to treat 229,000 gpd. The facility does not discharge, and thus, is not permitted under the MPDES program. The facility is discussed in this report because it is an important wastewater management facility in the Flathead Lake basin that has the potential to impact nutrient loading.

No additional information or data for this facility are available.

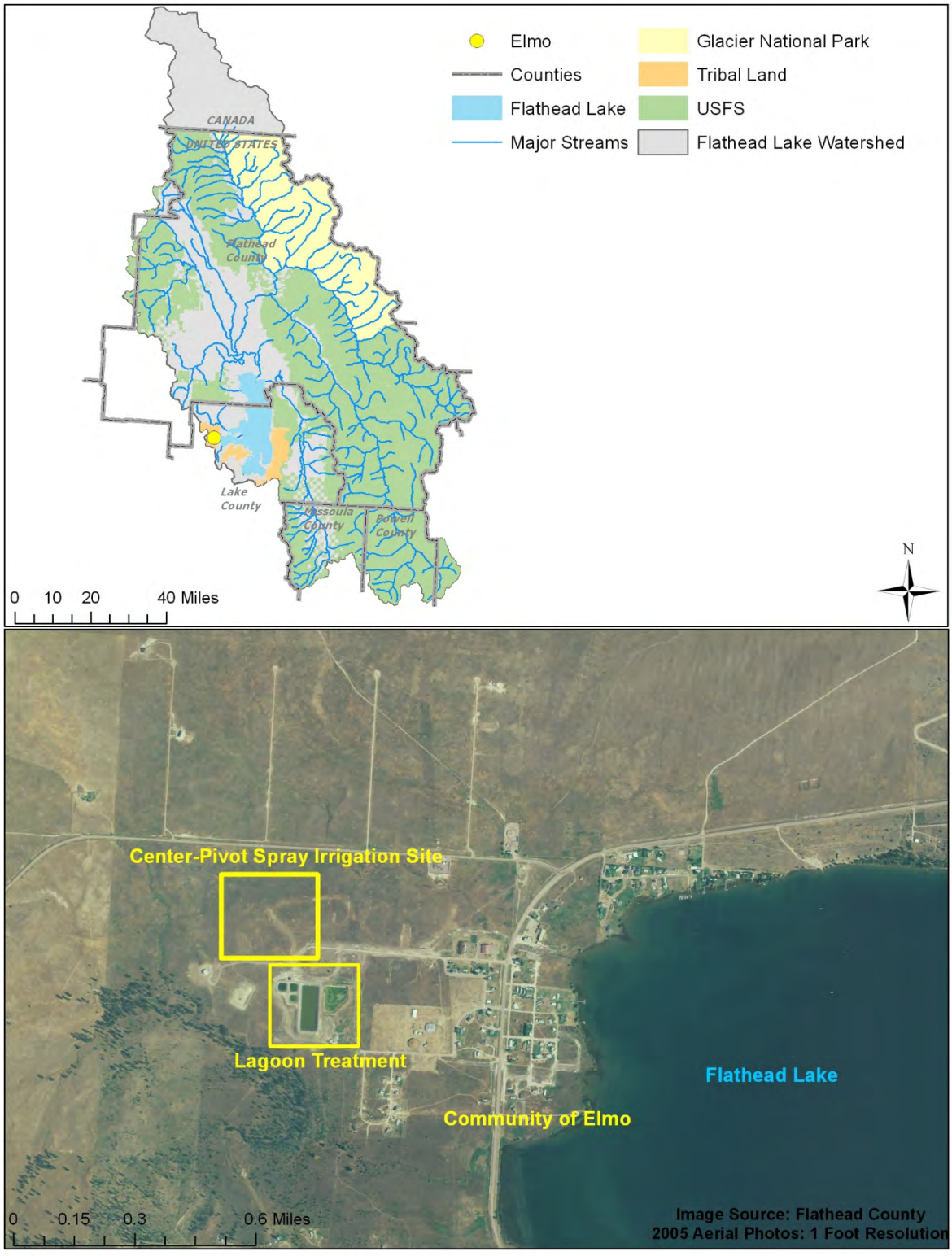


Figure 61. Elmo irrigation site and ponds

7.3 Lakeside/Somers

The Lakeside County Water and Sewer District (LCWSD) operates an aerated-lagoon treatment facility, land application facility, and wastewater collection system infrastructure (e.g., lift stations, force transmission lines) (Figure 60). The facility does not, however, discharge to surface water or groundwater, and therefore does not have an MPDES permit. The facility is discussed in this report because it is an important wastewater management facility in the Flathead Lake basin that has the potential to impact nutrient loading.

The system serves the communities of Lakeside and Somers and the areas between the two communities (Figure 61). As of 2007, the LCWSD WWTP served 1,165 equivalent dwelling units, with 925 in Lakeside and 240 in Somers (RPA 2007, p. 2-8). In 2005 and 2006, 51.3 million gallons and 56.3 million gallons (respectively) of wastewater were transmitted to the treatment facility (RPA 2007, p. 2-16). The inter-local agreement allows Somers to discharge up to 45,000 gpd of wastewater to the Lakeside WWTP (FCCHD 2012).

Much of the original facilities and system were constructed in 1987 and 1988. The LCWSD collection system includes 61,000 feet of 8-inch PVC and 500 feet of 10-inch PVC gravity main lines (RPA 2007, p. 2-9). The Somers County Water and Sewer District (SCWSD) maintains their own collection system. The wastewater treatment facility consists of two aerated treatment lagoons and two storage lagoons, for winter storage of treated effluent. Each treatment pond has a surface area of approximately 2.35 acres, includes three three-horse power and three five-horse power aspirators, and can treat 5.18 million gallons (RPA 2007, p. 2-12). It should be noted that many of the customers served by LCWSD are not connected to the public water supply (RPA 2007, p. 2-14).

The land application facility and storage ponds are located just north of the aerated cells. The Lakeside storage pond has a capacity of 46.9 million gallons and the Somers storage pond has a capacity of 24.0 million gallons (RPA 2007, p. 2-9). The pump is located adjacent west side of the storage ponds and pumps treated effluent to a nearby center pivot irrigation system on a 160-acre parcel of land (RPA 2007, p. 2-14). Alfalfa is currently grown but LCWSD had previously grown mint and corn (RPA 2007, p. 2-24).

Though not required to monitor water quality, because the facility is not permitted, LCWSD has monitored BOD and TSS (Table 69).

Table 71. BOD and TSS at the Lakeside treatment facility

Month	BOD			TSS		
	Influent (mg/L)	Effluent (mg/L)	Removal (%)	Influent (mg/L)	Effluent (mg/L)	Removal (%)
June 2001	268	9	94	243	25	90
June 2002	290	16	94	192	4	98
September 2002	310	5	98	289	28	90
August 2003	240	3	99	314	7	98
May 2004	311	5	98	263	8	97
October 2004	352	51	99	238	46	81
May 2006	220	14	98	--	--	--
October 2006	243	6	98	198	4	98

Source: RPA 2007, p. 2-23, Table 2-5 and Table 2-6.
Note: BOD = biological oxygen demand; mg/L = milligram per liter; TSS = total suspended solids.

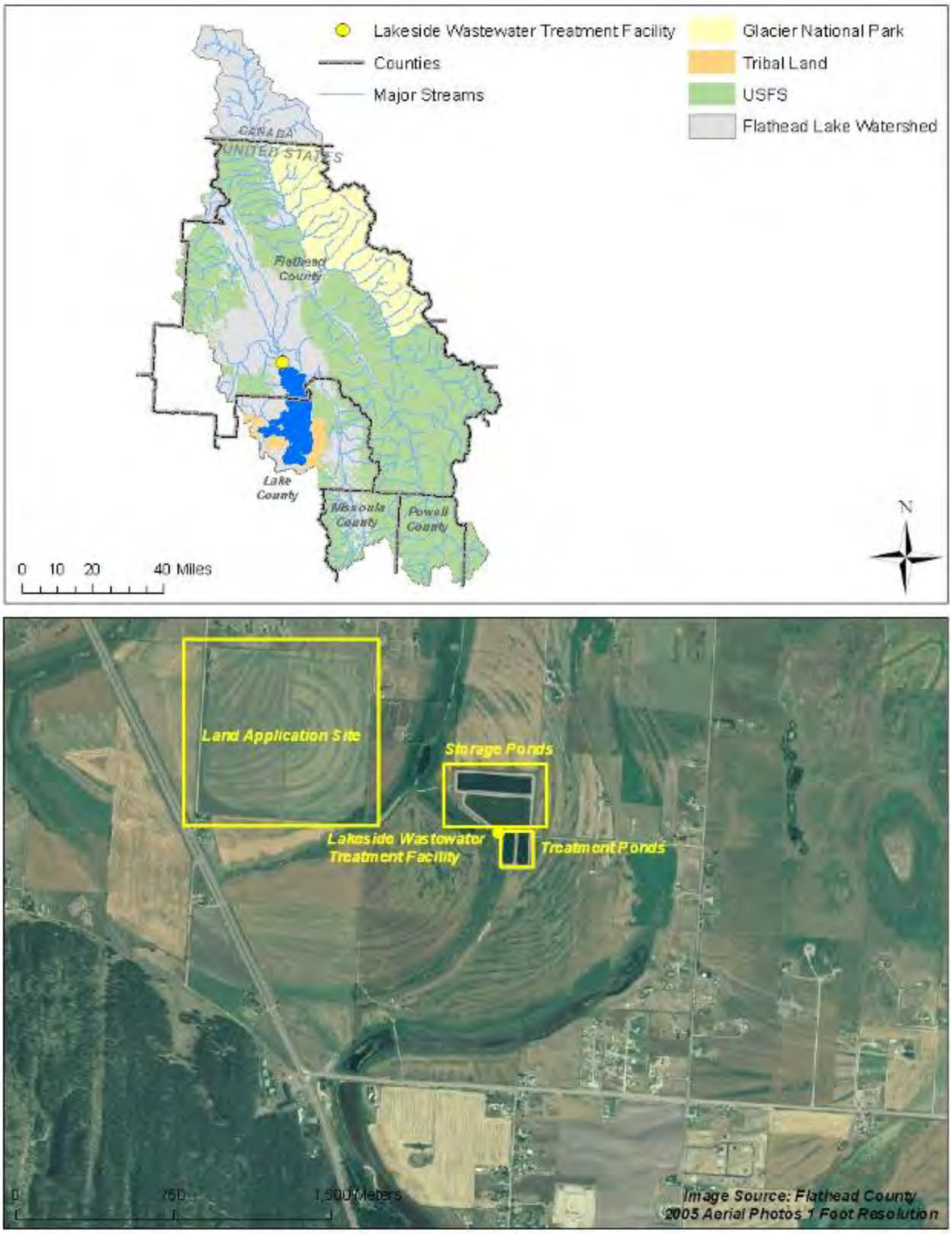


Figure 62. Lakeside WWTP, land application site, and ponds

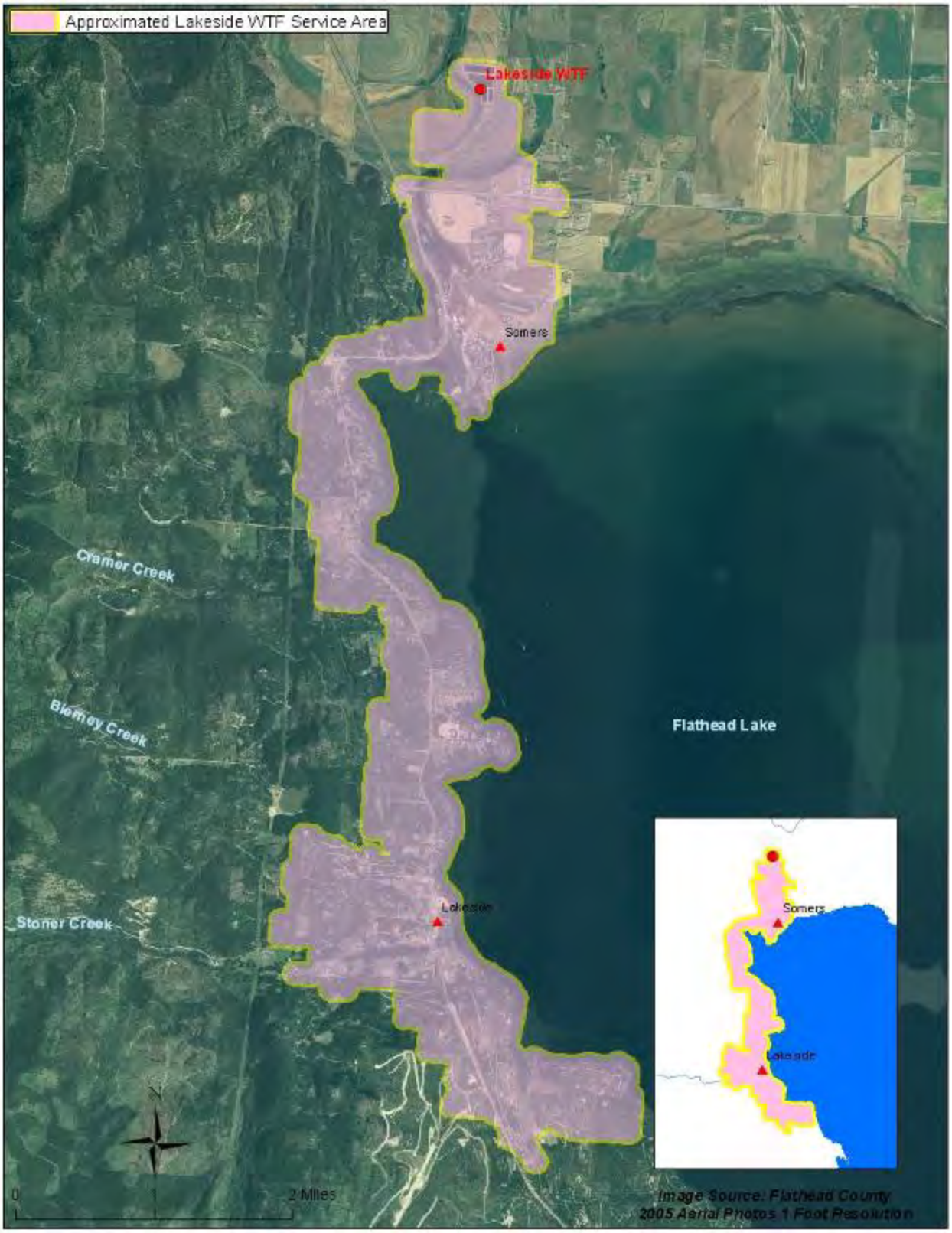


Figure 63. Lakeside and Somers service area.

8.0 Data Gaps

While this report has focused on MPDES permitted facilities in the Flathead Lake basin, there are a number of smaller, non-MPDES permitted facilities in the basin that dispose of wastewater via non-discharging ponds or spray irrigation. These facilities are not required to have a MPDES permit because they do not directly discharge to surface or ground water. However, they have the potential to collect or move wastewater over long distances from a variety of different households or businesses. An example of this type of facility is the Lakeside WWTP discussed in Section 7.3. In modeling the Flathead Lake basin, it is important to understand how these systems operate so that flow and pollutant loadings can be routed correctly. Additional information on any existing non-permitted facilities would improve model performance and TMDL development.

9.0 References

Bigfork Water and Sewer District. 2006. Wastewater Facilities Preliminary Engineering Report (PER). Morrison Maierle, INC. May 2006.

DEQ (Montana Department of Environmental Quality). 1996a. Authorization to Discharge under the Montana Ground Water Pollution Control System (MGWPCS) – Permit No.: MTX00066 – Meadow Gold Dairy, Inc. Montana Department of Environmental Quality (DEQ), Water Protection Bureau (WQPB), Permitting & Compliance Division (PCD). Helena, Montana.

DEQ. 1996b. Authorization to Discharge under MGWPCS – Permit No.: MTX000092 – Plum Creek Manufacturing. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 1997. Authorization to Discharge under the MGWPCS – Permit No.: MTX000100 – Stampede Packing Company. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 1999b. Authorization to Discharge under the Montana Pollutant Discharge Elimination System (MPDES) – Permit No.: MT0000019 – Burlington Northern Whitefish Facility. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 1999c. Authorization to Discharge under the MPDES – Permit No.: MT0030066 – Columbia Falls Aluminum Company. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2001. Authorization to Discharge under the MPDES – Permit No.: MT0020397 – Bigfork Water and Sewer District WWTP. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2002a. Authorization to Discharge under the MGWPCS – Permit No.: MTX000120 – International RV LLC. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2002b. Authorization to Discharge under the MGWPCS – Permit No.: MTX000133 – Ehrman Nine Lease Subdivision (Glacier Partners, Inc.). DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2003. Authorization to Discharge under the MPDES – Permit No.: MT0030651 – Don Abbey Household. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2007a. Authorization to Discharge under the MPDES – Permit No.: MT0020184 – City of Whitefish Wastewater Treatment Plant. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2007b. Authorization to Discharge under the MPDES – Permit No.: MT0030414 – City of Whitefish Water Treatment Plant. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2007c. Authorization to Discharge under the MGWPCS – Permit No.: MTX000120 – Kootenai Lake Lodge. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2007d. Authorization to Discharge under the MGWPCS – Permit No.: MTX000164 – Glacier Ranch Subdivision. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2008a. Authorization to Discharge under the MPDES – Permit No.: MT0022578 – Hungry Horse Dam. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2008b. Authorization to Discharge under the MPDES – Permit No.: MT0030601 – Lake McDonald WWTP. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2008ca. Authorization to Discharge under the MPDES – Permit No.: MT0021938 – City of Kalispell WWTP. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2008d. Authorization to Discharge under the MGWPCS – Permit No.: MTX000193 – Hungry Horse WWTP (Hungry Horse Development Partners, LLC). DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2008e. Authorization to Discharge under the MGWPCS – Permit No.: MTX000199 – Cove Creek Ridge Subdivision (TLW Properties, LLC). DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2009. Authorization to Discharge under the MPDES – Permit No.: MT0000019 – BNSF Railway Company. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2010a. Authorization to Discharge under the MPDES – Permit No.: MT0020036 – City of Columbia Falls WWTP. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2010b. Authorization to Discharge under the MGWPCS – Permit No.: MT0031658 – John Collins. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2010c. Authorization to Discharge under the MGWPCS – Permit No.: MTX000214 – Point of Pines Wastewater Treatment System. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2011a. Authorization to Discharge under the MPDES –Fish Farm General Permit MTG130000. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2011b. Authorization to Discharge under the MPDES – Permit No.: MTX000220 – Glacier International Airport Rental Car Facility Car Wash. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2011c. Re: Authorization MTG130007 to Discharge under the "Concentrated Animal Production General Permit". Letter to Mark Maskill (United States Fish and Wildlife Service, Creston National Fish Hatchery) from DEQ-WQPB, dated August 23, 2011.

DEQ. 2011d. Re: Authorization MTG130014 to Discharge under the "Concentrated Animal Production General Permit". Letter to Mark Kornick (Flathead Lake Salmon Hatchery) from DEQ-WQPB, dated August 23, 2011.

DEQ. 2012a. Authorization to Discharge under the MPDES – Permit No.: MT0031739 – KRY Site. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2012b. Authorization to Discharge under the MGWPCS – Permit No.: MTX000100 – Meat Production Inc. DEQ-WQPB-PCD. Helena, Montana.

DEQ. 2012c. Inspection Report: Creston National Fish Hatchery. DEQ-WQPB-PCD. Helena, Montana. August 1, 2012.

DEQ. 2012c. Inspection Report: Flathead Lake Salmon Hatchery. DEQ-WQPB-PCD. Helena, Montana. May 10, 2012.

DEQ. 2012d. Re: Authorization MTG010253 to Discharge under the "Concentrated Animal Feeding Operation General Permit". Letter to Bruce Tutvedt (Tutvedt Farms) from DEQ-WQPB, dated May 4, 2012.

DEQ. 2013. Authorization to Discharge under the MPDES – Permit No.: MT0030654 – Donald R. Abbey. DEQ-WQPB-PCD. Helena, Montana.

DFWP (Montana Department of Fish Wildlife and Parks). 2008. Flathead Lake Salmon Hatchery.. http://fwp.mt.gov/lands/site_279749.aspx. Accessed August 15, 2008.

FCCHD (Flathead City-County Health Department). 2009. *Flathead County Wastewater Study*. FCCHD, Environmental Health. Kalispell, Montana.

FCCHD. 2012. *Sewage Treatment in the Flathead Basin*. DNRC Contract No. RRG-10-1440. Prepared by Carver Engineering. FCCHD, Flathead Regional Wastewater Management Group, Kalispell, Montana.

Kendra, Will. 1989. Quality and Fate of Fish Hatchery Effluents During the Summer Low Flow Season. 89-17. Washington State Department of Ecology, Environmental Investigations Laboratory Services Program, Surface Water Investigations Section. Olympia, Washington. May 1989.

Montana Department of Health and Environmental Sciences Water Quality Bureau, 1991. Draft Environmental Assessment for Meadow Gold Dairies Inc. September 04, 1991.

Newman, Howard. 1991. Compliance plan for on-site land application of wastewater by Meadow Gold Dairy, Kalispell, Mt. Unpublished report to Borden Packaging and Industrial Products.

RPA (Robert Peccia and Associates). 2007. Lakeside Wastewater System: 2007 Preliminary Engineering Report. Prepared for Lakeside County Water and Sewer District. June 2007. http://lakesidesandw.com/lakesidewastewaterreport.pdf. Accessed March 12, 2010.

U.S. EPA (United States Environmental Protection Agency). 2012. Authorization to Discharge under the National Pollutant Discharge Elimination System – Permit No.: MT-0023388 – Flathead Lake Biological Station WWTP. U.S. Environmental Protection Agency. Helena, Montana.

U.S. EPA. 2013a. Authorization to Discharge under the National Pollutant Discharge Elimination System – Polson Wastewater Treatment Facility – Statement of Basis – NPDES Permit # MT0020559. U.S. Environmental Protection Agency. Helena, Montana.

U.S. EPA. 2013b. DMR data ISIS for Flathead, Lake, and Missoula Counties. Jason Gildea, U.S. EPA Region 8 Montana Operations Office, downloaded the data from ISIS on February 1, 2013.