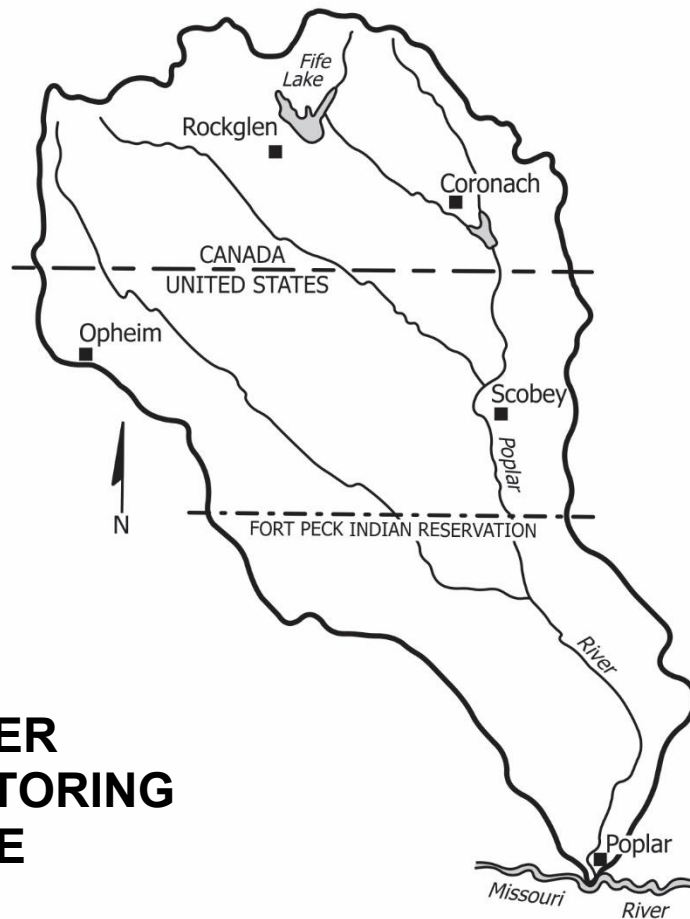


**2024 ANNUAL REPORT**  
**to the**  
**GOVERNMENTS OF CANADA, UNITED STATES,**  
**SASKATCHEWAN, AND MONTANA**



by the  
**POPLAR RIVER  
BILATERAL MONITORING  
COMMITTEE**

**COVERING CALENDAR YEAR 2024**

**September 9, 2025**

## Poplar River Bilateral Monitoring Committee

Department of State  
Washington, D.C., United States

Global Affairs Canada,  
Ottawa, Ontario, Canada

Governor's Office  
State of Montana  
Helena, Montana, United States

Water Security Agency  
Moose Jaw, Saskatchewan, Canada

Herein is the 42<sup>nd</sup> Annual Report of the Poplar River Bilateral Monitoring Committee. This report summarizes Committee activities in 2024 and presents the Technical Monitoring Schedules for the year 2026.

During 2024, the Poplar River Bilateral Monitoring Committee continued to fulfill the responsibilities assigned by the governments under the Poplar River Cooperative Monitoring Agreement dated September 23, 1980. Through exchange of Diplomatic Notes, the Arrangement was extended in March 1987, July 1992, July 1997, March 2002, April 2007, March 2012, March 2017 and March 2022. The Monitoring Committee is currently extended to April 2027.

Regarding water quality activities, the enclosed report summarizes observed water-quality conditions and compares them to guidelines for specific parameter values that were developed by the International Joint Commission (IJC) under the 1977 Reference from Canada and the United States. After evaluation of the monitoring information for 2024, the Committee found that the measured conditions meet the recommended objectives.

Regarding apportionment activities, based on the March 1 to May 31, 2023 runoff volume of 15,920 cubic decameters (12,900 acre-feet) recorded at the Poplar River at International Boundary gauging station, the IJC apportionment recommendation entitles Montana to an additional release of 1,230 dam<sup>3</sup> (1,000 acre-feet) from Cookson Reservoir during the succeeding twelve-month period commencing on June 1, 2023. Montana requested this release be made between April 12 and May 31, 2024. The request was fully met.

During 2024, monitoring continued in accordance with Technical Monitoring Schedules outlined in the 2023 Annual Report of the Poplar River Bilateral Monitoring Committee.

Yours sincerely,

Cherneski,  
Patrick

Digitally signed by Cherneski,  
Patrick  
Date: 2025.09.12 08:31:33 -06'00'

Patrick Cherneski  
Chair, Canadian Section

Kei Lo

Digitally signed by Kei Lo  
Date: 2025.09.15 15:14:58 -06'00'

Kei Lo  
Member, Canadian Section

MELISSA  
SCHAAR

Digitally signed by  
MELISSA SCHAAR  
Date: 2025.09.15  
14:43:36 -06'00'

Melissa Schaar  
Chair, United States Section

Anna Pakenham  
Stevenson

Digitally signed by Anna  
Pakenham Stevenson  
Date: 2025.09.15 15:34:26 -06'00'

Anna Pakenham Stevenson  
Member, United States Section

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## HIGHLIGHTS FOR 2024

The Poplar River Power Station (PRPS) is a coal-fired power plant located in south-central Saskatchewan and consists of two power units, PR1 and PR2. In 2024, the PRPS was operated as a base load plant supplying the system-required production except when system constraints and outages dictated otherwise. There was a scheduled maintenance outage for both units in the spring so as not to coincide with system peak demand period that occur over the summer and winter periods.

Between January 1 and December 31, 2024, the PRPS generated 3,301,937 megawatt-hours (MWh). During this time approximately 2,657,842 tonnes of coal and 3,070 m<sup>3</sup> of fuel oil were consumed. The average capacity factors for Unit No. 1 and Unit No. 2 were 58.8% and 60.6% respectively.

Monitoring information collected in both Canada and the United States during 2024 was exchanged in the spring of 2025.

Based on the March 1 to May 31, 2023, runoff volume of 15,920 cubic decameters (12,900 acre-feet) recorded at the Poplar River at International Boundary gauging station, the IJC apportionment recommendation entitles Montana to an additional release of 1,230 dam<sup>3</sup> (1,000 acre-feet) from Cookson Reservoir during the succeeding twelve-month period commencing June 1, 2023. Montana requested this release be made between April 12 and May 31, 2024. The volume of 1,238 dam<sup>3</sup> (1,003 acre-feet), in addition to the minimum flow, was fully delivered during this period.

Based on the recorded volume at Poplar River at International Boundary from March 1 to May 31, 2024. The IJC recommendation entitles the United States to a minimum discharge on the East Poplar River of 0.057 cubic metres per second (m<sup>3</sup>/s) (2.0 cubic feet per second (ft<sup>3</sup>/s) for the period June 1, 2024, to August 31, 2024, and 0.028 cubic metres per second (m<sup>3</sup>/s) (1.0 cubic feet per second (ft<sup>3</sup>/s) for the period September 1, 2024, to May 31, 2025.

Despite drought conditions in and around the basin, daily flows on the East Poplar River at the International Boundary gage met or exceeded the recommended minimum flow during 2024, except for short periods in January, July, and August.

The 2024 five-year estimated flow-weighted total dissolved solids (TDS) concentrations were below the long-term objective of 1,000 milligrams per litre (mg/L). The maximum monthly five-year estimated flow-weighted TDS concentration value in 2024 was 865 mg/L. The 2024 five-year estimated flow-weighted boron concentrations remained below the long-term objective of 2.5 mg/L. The maximum monthly five-year estimated flow-weighted boron concentration was 1.67 mg/L.

## 1.0 INTRODUCTION

The Poplar River Bilateral Monitoring Committee was authorized for an initial period of five years by the Governments of Canada and the United States under the Poplar River Cooperative Monitoring Arrangement dated September 23, 1980. A copy of the Arrangement is attached to this report as Annex 1. Through exchange of Diplomatic Notes, the Arrangement was extended in March 1987, July 1992, July 1997, March 2002, April 2007, March 2012, March 2017 and March 2022. The Monitoring Committee is currently extended to April 1, 2027. A more detailed account of the historical background of the Monitoring Arrangement is contained in the 1990 Annual Report of the Poplar River Bilateral Monitoring Committee<sup>1</sup>.

The Committee oversees monitoring programs designed to evaluate the potential for transboundary impacts from SaskPower's (formerly Saskatchewan Power Corporation) coal-fired thermal generating station and ancillary operations near Coronach, Saskatchewan. Monitoring is conducted in Canada and the United States at or near the International Boundary for quantity and quality of surface and ground water and for air quality. Participants from both countries, including Federal, State and Provincial agencies, are involved in monitoring.

The Committee submits an annual report to Governments which summarizes the monitoring results, evaluates apparent trends, and compares the data to objectives or standards recommended by the International Joint Commission (IJC) to Governments, or relevant State, Provincial, or Federal standards. The Committee reports to Governments on a calendar year basis. The Committee is also responsible for drawing to the attention of Governments definitive changes in monitored parameters which may require immediate attention.

A responsibility of the Committee is to review the adequacy of the monitoring programs in both countries and make recommendations to Governments on the Technical Monitoring Schedules. The Schedules are updated annually for new and discontinued programs and for modifications in sampling frequencies, parameter lists, and analytical techniques of ongoing programs. The Technical Monitoring Schedules listed in the annual report (Annex 2) are given for the year 2026. The Committee will continue to review and propose changes to the Technical Monitoring Schedules as information requirements change.

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<sup>1</sup> Paper and electronic copies of this report are stored at the USGS office in Helena, Montana and ECCC office in Regina, Saskatchewan and are available upon request.

## **2.0 COMMITTEE ACTIVITIES**

### **2.1 Membership**

The Committee is composed of representatives of the Governments of the United States of America and Canada, the State Government of Montana, and the Provincial Government of Saskatchewan. In addition to the representatives of Governments, two ex-officio members serve as local representatives for the State of Montana and Province of Saskatchewan.

During 2024, the members of the Committee included: Mr. John Kilpatrick, U.S. Geological Survey, United States representative Co-Chair; Mr. Patrick Cherneski, Environment and Climate Change Canada, Canadian representative Co-chair; Ms. Anna Pakenham Stevenson, Montana Department of Natural Resources and Conservation, Montana representative; Mr. Kei Lo, Saskatchewan Water Security Agency, Saskatchewan representative; and Mr. Michel Thievin, Daniels County Commissioner of Scobey, Montana has been recommended as the local ex-officio representative (pending official confirmation by the Governor). The Saskatchewan local ex-officio representative has been vacant for several years.

### **2.2 Meetings**

The Committee met virtually on June 13, 2024, and the meeting was hosted by Canada. Delegated representatives of Governments, except for the ex-officio members, attended. In addition to Committee members, several technical advisors representing Federal, State, and Provincial agencies also participated. Committee members reviewed the operational status of the Poplar River Power Station and associated coal-mining activities; examined data collected in 2023, including surface-water quality and quantity, groundwater quality and quantity, and air quality; discussed proposed discrete water-quality sampling; and established the Technical Monitoring Schedules for 2025.

### **2.3 Review of Water-Quality Objectives**

The IJC, in its 1981 Report to Governments titled “Water Quality in the Poplar River Basin”, recommended that the Committee periodically review the water-quality objectives within the overall Basin context and recommend new and revised objectives as appropriate. In 1991, an action item from the annual Committee meeting set in motion the review and revision of the water-quality objectives.

In 1993, the Committee approved changes in water-quality objectives recommended by the subcommittee that was formed in 1992 to review the objectives. The Committee also discussed the water-quality objectives for 5-year and 3-month flow-weighted concentrations for total dissolved solids and boron. Although the Committee agreed that calculation procedures to

determine flow-weighted concentrations are time consuming and probably scientifically questionable, no consensus was reached on alternative objectives or procedures.

In 1997, the Committee agreed to suspend the monitoring and reporting of several parameters. The parameters affected were: dissolved aluminium, un-ionized ammonia, total chromium, dissolved copper, mercury in fish tissues, fecal coliform, and total coliform. The Committee also agreed to other minor revisions for clarification purposes; for example, changing the designation for pH from “natural” to “ambient”.

In 1999, the Committee replaced the term “discontinued” with “suspended” in Table 2.1.

In 2001, the Committee suspended the monitoring of dissolved mercury and total copper. This decision was based on data indicating concentrations or levels well below or within the objectives. Current objectives approved by the Committee are listed in Table 2.1. The Committee also agreed to periodically review all parameters for which monitoring has been suspended.

From 2001 to 2023, objectives for dissolved aluminum, unionized ammonia, total chromium, dissolved copper, total copper, dissolved mercury and mercury in fish tissue remained suspended. Recommendations regarding sampling for the other parameters were to "Continue as is." However, much of the water quality sampling program was suspended in 2003, with the USGS continuing quarterly sampling until 2010. Quarterly sampling for TDS and boron was also conducted from 2019 to 2022 by the USGS using funding from the Montana Department of Environmental Quality.

In 2021, the Water Quality working group agreed that the current list of parameters and objectives in Table 2.1 are reasonable. If future funding does become available for water quality sampling (for all constituents) on the East Poplar River, current water quality objectives should be re-evaluated at that time.

During the 2022 Annual Meeting the water quality working group was tasked to make recommendations concerning:

- Future sampling, including existing constituents in Table 2.1 as well as potential new constituents; and
- Evaluation of existing boron and TDS models once all quarterly discrete sampling is completed.

In May of 2023, the working group discussed that three years of quarterly sampling for all constituents in Table 2.1 would be sufficient to capture most conditions to evaluate existing state of water quality. The group agreed to recommend the following changes to Table 2.1: remove Total Coliform, replace Fecal Coliform with E. coli, and add Selenium, however further discussion was needed to identify suitable objectives. A formal recommendation was not made.

The recommended sampling is dependent on a source of funds; there is no identified source of funds.

The working group also recommended in 2023, that reevaluation of the boron equation is not a high priority based on current conditions. However, if funding and staff time can be secured, reevaluation of the boron regression equation may improve the model.

During the 2023 annual meeting, the recommendations of the water quality working group were supported in concept by the Committee and next steps identified were to seek funding options for discrete water quality samples. The Water Security Agency and MT DEQ were tasked to investigate and make recommendations back to the Committee.

During 2024, discussion continued around suitable objectives for E. coli and selenium. The Montana DEQ proposed objectives for both during the 2024 annual meeting, after review WSA supported the proposed objectives in May of 2025. The discussion of the additional parameters and the recommended objectives is expected to continue at the Committee’s 2025 annual meeting. Ultimately the recommendations will need to be approved by the Committee and then Governments prior to implementation.

During 2024 the water quality working group has also worked to update Table 2.1, to reflect recommended parameters and objectives, and to clarify sampling recommendations.

Table 2.1 Water-Quality Objectives for surface water of the East Poplar River.

<b>Parameter</b>	<b>Original Objective</b>	<b>Current Objective</b>
Boron, total	3.5/2.5 <sup>1</sup>	3.5/2.5 <sup>1</sup>
TDS <sup>1</sup>	1,500/1,000 <sup>1</sup>	1,500/1,000 <sup>1</sup>
Aluminium, dissolved	0.1	---
Ammonia, un-ionized	0.02	---
Cadmium, total	0.0012	0.0012
Chromium, total	0.05	---
Copper, dissolved	0.005	---
Copper, total	1	---
Fluoride, dissolved	1.5	1.5
Lead, total	0.03	0.03
Mercury, dissolved	0.0002	---
Mercury, fish (mg/kg)	0.5	---
Nitrate, dissolved (as N)	10	10
Oxygen, dissolved	4.0/5.0 <sup>2</sup>	4.0/5.0 <sup>2</sup>

SAR (units)	10	10
Selenium	*	** 0.0031
Sulfate, dissolved	800	800
Zinc, total	0.03	0.03
Water temperature (C)	30.0 <sup>3</sup>	30.0 <sup>3</sup>
pH (units)	6.5 <sup>4</sup>	6.5 <sup>4</sup>
E.coli	*	<p>** April 1 to Oct 31: the geometric mean number of E-coli may not exceed 126 colony forming units per 100 milliliters and 10 percent of the total samples may not exceed 252 colony forming units per 100 milliliters during any 30-day period</p> <p>Nov 1 to Mar 31: the geometric mean number of E-coli may not exceed 630 colony forming units per 100 milliliters and 10 percent of the samples may not exceed 1,260 colony forming units per 100 milliliters during any 30-day period</p>
<p><u>Notes on Parameters:</u> Units in mg/L except as noted.</p> <ol style="list-style-type: none"> <li>Five-year average of flow-weighted concentrations (March to October) should be &lt;2.5 boron, &lt;1,000 TDS. Three-month average of flow-weighted concentration should be &lt;3.5 boron and &lt;1,500 TDS.</li> <li>5.0 (minimum April 10 to May 15), 4.0 (minimum remainder of year - Fish Spawning).</li> <li>Natural temperature (April 10 to May 15), &lt;30 degree Celsius (remainder of year). Natural - minimal anthropogenic influence</li> <li>Less than 0.5 pH units above natural, minimum pH=6.5. *Natural - minimal anthropogenic influence</li> </ol> <p><u>New Parameter Notes:</u> * Parameters and objectives added in 2024, previous objectives do not exist. ** Current objectives are proposed and not formally adopted by the PRBMC at the time of publication.</p> <p><u>Frequency of Sampling:</u> Recommended sampling frequency for all parameters is for 3-year sets of quarterly sampling to be undertaken periodically for all objectives except mercury in fish tissue. Sampling needs for mercury in fish tissue to be evaluated as needed by the Committee. Currently, recommended sampling for parameters is unfunded.</p>		

Another responsibility of the Water Quality working group has included an ongoing exchange of data acquired through the monitoring programs. Exchanged data and reports are available for public viewing at the agencies of the participating governments or from Committee members.

## **2.4 Data Exchange**

The Committee is responsible for assuring exchange of data between governments. The exchange of monitoring information was initiated in the first quarter of 1981 and was an expansion of the informal quarterly exchange program initiated between the United States and Canada in 1976. Until 1991, data were exchanged quarterly. At the request of the Committee, the United States and Canada agreed to replace the quarterly exchange of data with an annual exchange effective at the beginning of the 1992 calendar year. Henceforth, data will be exchanged once each year as soon after the end of the calendar year as possible. However, unusual conditions or anomalous data will be reported and exchanged whenever warranted. No unusual conditions occurred during 2024 which warranted special reporting.

## **2.5 Water-Quality Monitoring Responsibilities**

In 2003, the United States Geological Survey agreed to take responsibility for maintaining the continuous water-quality monitor installed at the East Poplar station at the International Boundary. The continuous water-quality monitor records daily specific conductance values which are used in the computation of TDS and boron values to monitor water quality in the East Poplar River. In the absence of regular discrete monthly water-quality samples, the Committee has agreed to utilize the data collected by the continuous water-quality monitor for its surface-water-quality monitoring program.

## **3.0 WATER AND AIR: MONITORING AND INTERPRETATIONS**

### **3.1 Poplar River Power Station Operation**

Saskatchewan Power Corporation operates the Poplar River Power Station near the town of Coronach, Saskatchewan. The Poplar River Power Station is comprised of two lignite-burning power generating units designated Unit No. 1 and Unit No. 2. Unit No. 1 is rated as a 315 MW generating unit and Unit No. 2 is rated as a 315 MW generating unit. Both units share a common 122-meter stack.

In 2024 both units were operated as base load units. There were scheduled maintenance outages in the spring so as not to coincide with system peak demand period that occur over the summer and winter periods. Poplar River has changed the scheduling of Unit No. 1 and Unit No. 2 outages. Outages are scheduled approximately every 12 months.

Between January 1 and December 31, 2024, the PRPS generated 3,301,937 megawatt-hours (MWh). During this time approximately 2,657,842 tonnes of coal and 3,070 m<sup>3</sup> of fuel oil were consumed. The average capacity factors for Unit No. 1 and Unit No. 2 were 58.8% and 60.6% respectively.

### 3.2 Surface Water

#### 3.2.1 Streamflow

Streamflow in the Poplar River was below normal in 2024 due to drought conditions across the southern Prairie region of Saskatchewan. The March to October recorded flow of the Poplar River at International Boundary, an indicator of natural flow in the basin, was 7,964 cubic decametres (dam<sup>3</sup>) (6,457 acre-feet), which was 76 percent of the 1931-2023 median seasonal flow of 10,500 dam<sup>3</sup> (8,510 acre-feet). A comparison of 2024 monthly mean discharge with the 1931-2023 median monthly mean discharge is shown in Figure 3.1.

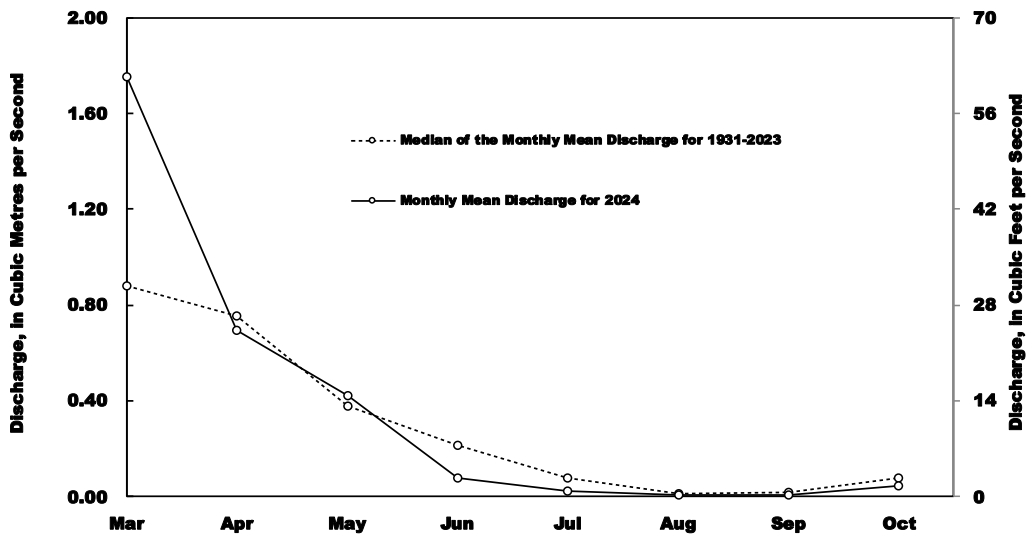


Figure 3.1 Monthly Mean Discharge During 2024 as Compared with the Median Monthly Mean Discharge from 1931-2023 for the Poplar River at International Boundary.

The January 1- December 31, 2024, recorded flow volume of the East Poplar River at International Boundary was 3,330 dam<sup>3</sup> (2,700 acre-feet). This volume is 108 percent of the median annual flow of 3,080 dam<sup>3</sup> (2,500 acre-feet) for 1976-2023 (since the completion of Morrison Dam).

### 3.2.2 Apportionment

In 1976 the International Souris-Red Rivers Engineering Board, through its Poplar River Task Force, completed an investigation and made a recommendation to the Governments of Canada and the United States regarding the apportionment of waters of the Poplar River basin. Although the recommendations have not been officially adopted, the Province of Saskatchewan has adhered to the apportionment recommendations. Annex 3 contains the apportionment recommendations.

### 3.2.3 Minimum Flows

According to the 2023 determination of natural flow of the Poplar River at International Boundary, the minimum entitled flow for the period January 1 to May 31, 2024, was  $0.057 \text{ m}^3/\text{s}$  ( $2.0 \text{ ft}^3/\text{s}$ ), determined based on the Poplar River flow volume from March 1 to May 31, 2023.

The recorded volume of the Poplar River at International Boundary from March 1 to May 31, 2024, was  $7,560 \text{ dam}^3$  (6,130 acre-feet). Based on IJC recommendations and the assumption that the recorded flow is the natural flow, the United States was entitled to a minimum discharge on the East Poplar River of:

- $0.057 \text{ cubic metres per second (m}^3/\text{s)}$  ( $2.0 \text{ cubic feet per second (ft}^3/\text{s)}$ ) for the period June 1, 2024, to August 31, 2024.
- $0.028 \text{ cubic metres per second (m}^3/\text{s)}$  ( $1.0 \text{ cubic feet per second (ft}^3/\text{s)}$ ) for the period September 1, 2024, to May 31, 2025.

A hydrograph for the East Poplar River at International Boundary and the minimum flow as recommended by the IJC are shown in Figure 3.2. Daily flows during 2024 exceeded the minimum flow recommended by the IJC during the year, except for short periods in January, July and August.

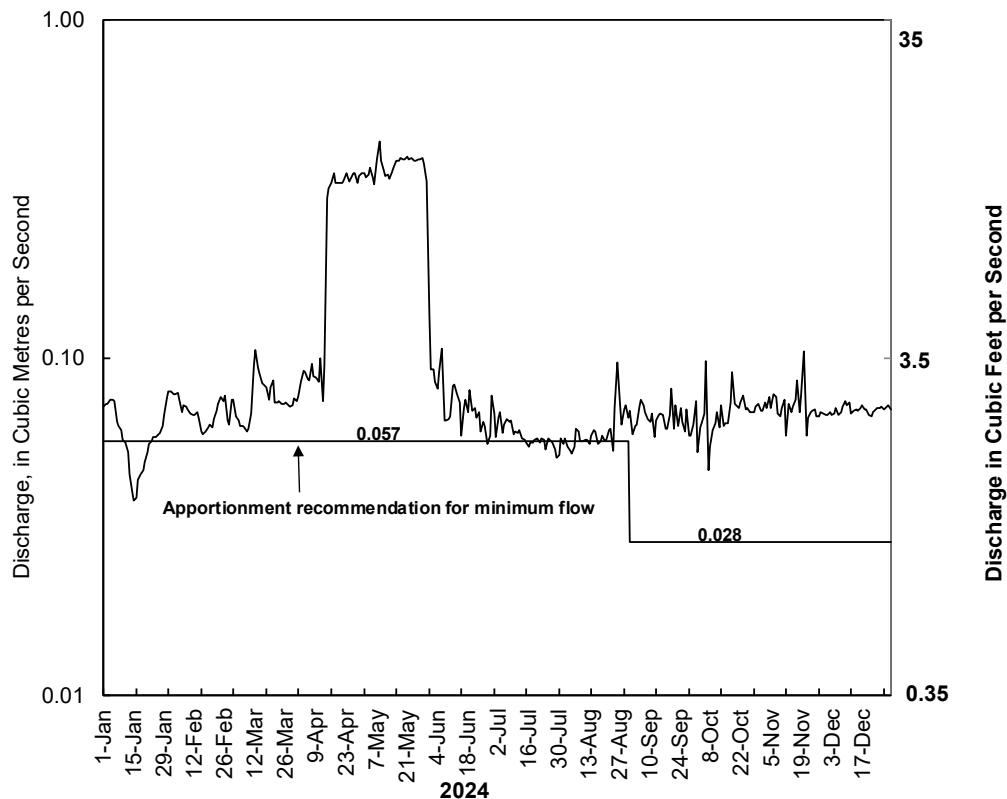


Figure 3.2 Flow Hydrograph of the East Poplar River at International Boundary.

### 3.2.4 On-Demand Release

Based on the March 1 to May 31, 2023, runoff volume of 15,920 dam<sup>3</sup> (12,900 acre-feet) was recorded at the Poplar River at International Boundary gauging station. Montana was entitled to an additional release of 1,230 dam<sup>3</sup> (1,000 acre-feet) from Cookson Reservoir during the succeeding twelve-month period commencing June 1, 2023, according to the apportionment recommended by the Poplar River Task Force of the International Souris-Red Rivers Engineering Board (1976, Annex 3). Montana requested this release to be made between April 12 and May 31, 2024.

Coupled with below average spring runoff and Montana’s entitlement to the largest demand release (condition 2.b.iv of the recommended apportionment), Montana, in consultation with stakeholders, requested that the demand release be extended over a longer period to increase stock water and fisheries benefits. A volume of 1,238 dam<sup>3</sup> (1,003 acre-feet), in addition to the minimum flow, was delivered during this period. A hydrograph showing cumulative volume of the on-demand release request and on-demand release delivery made at the East Poplar River at International Boundary is shown in Figure 3.3.

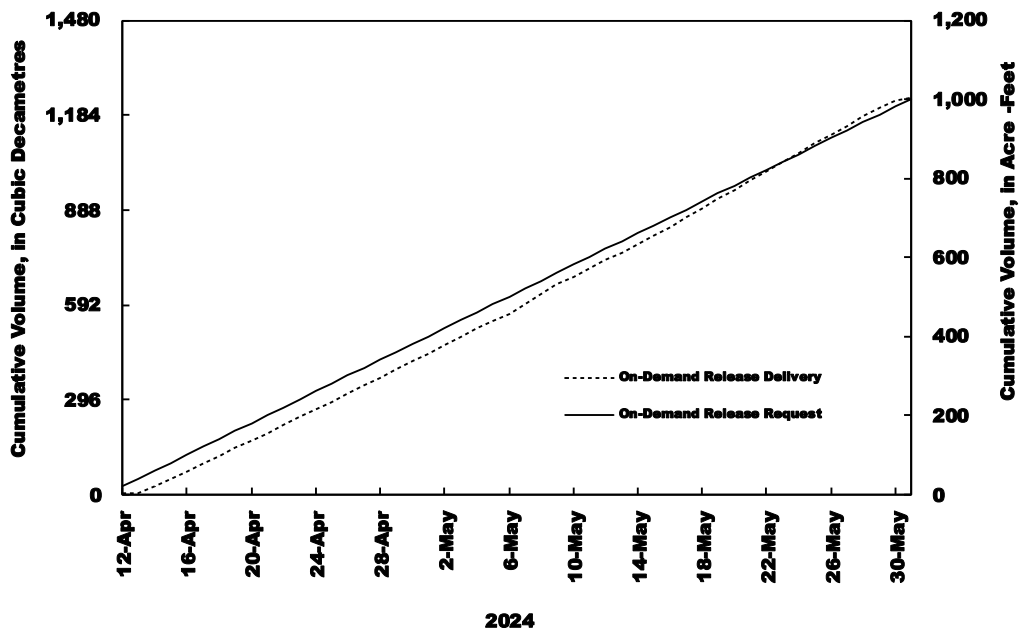


Figure 3.3 Cumulative Volume Hydrograph of On-Demand Release.

### 3.2.5 Surface-Water Quality

The 1981 report by the IJC to Governments recommended:

*For the March to October period, the maximum flow-weighted concentrations should not exceed 3.5 milligrams per litre (mg/L) for boron and 1,500 mg/L for TDS for any three consecutive months in the East Poplar River at the International Boundary. For the March to October period, the long-term average of flow-weighted concentrations should be 2.5 mg/L or less for boron, and 1,000 mg/L or less for TDS in the East Poplar River at the International Boundary.*

For the period prior to 1982, the three-month moving flow-weighted concentration (FWC) for boron and total dissolved solids (TDS) was calculated solely from monthly water-quality monitoring results.

Since the beginning of 1982, the USGS has monitored specific conductance daily in the East Poplar River at the International Boundary, making it possible to estimate boron and TDS concentrations using a linear regression relationship with specific conductance. Thus, the three-month FWC for boron and TDS for the period 1982 to 2002 was calculated from the results of monthly monitoring (discrete water-quality samples collected by both Canada and the United States) or from estimated monthly water-quality data based upon daily specific conductance data collected by the USGS during months when a discrete water-quality sample was not available.

Prior to 1988, long-term averages were calculated for a five-year period in which 2.5 years preceded and 2.5 years followed each plotted point. Beginning in 1988, the FWC was calculated from the 5-year period preceding each plotted point. For example, the FWC for December 1988 is calculated from data generated over the period December 1984 to December 1988. The calculations were based on the results of samples collected throughout the year and are not restricted to only those collected during the months bracketing the period of irrigation (March to October) each year. The Bilateral Monitoring Committee adopted the approach that, for the purpose of comparison with the proposed IJC long-term objectives, the boron and TDS data are best plotted as a five-year moving FWC which is advanced one month at a time.

In 2003, the Poplar River Bilateral Monitoring Committee decided to suspend much of the water-quality sampling program until it is warranted again. All surface-water-quality sample collection by Environment Canada Climate Change Canada has been suspended at the East Poplar River International Boundary station. After the monthly discrete sampling program was suspended in 2003, the USGS continued to collect four discrete samples per year until 2010, when sampling stopped due to a lack of funding. Using funding from the Montana Department of Environmental Quality, the USGS collected quarterly discrete samples for TDS and boron analysis from December 2019 to July 2022 (data presented in 2023 Annual Report). No further samples have been collected since 2022. Previous results are reported in table form in previous annual reports.

Since 2003, the Committee has agreed to use the continuous data collected by the specific-conductance monitor as a surrogate for the monthly water-quality sampling program. Hence, the three-month FWC for TDS and boron in 2024 were calculated using the two equations (shown later in text) and the continuous specific-conductance data collected at the East Poplar River at the International Boundary. In 2022, the Water Quality Working Group conducted a limited evaluation of the model's calculated values compared with recent discrete water quality sample concentrations. The group was comfortable with the model's ability to predict TDS and Boron, under the current conditions where concentrations calculated by the model and detected in recent discrete samples are below both short- and long-term objectives for boron and TDS.

Data gaps in the continuous monitoring of specific conductance occurred in 2024 at the East Poplar at International Boundary station due to deletion of erroneous data. Where missing data occurred, for periods of less than 10 days, data were estimated in the Water Quality Spreadsheet by straight line interpolation. One period greater than 10 days was left blank, June 22 to July 17. June and July monthly mean TDS and boron values were left blank due to the preceding and succeeding months being unavailable to produce an average monthly value. All missing data were handled per instructions in the Poplar River Water Quality Spreadsheet.

### 3.2.5.1 Total Dissolved Solids

TDS is inversely related to streamflow at the East Poplar River at the International Boundary station. During periods of high runoff, such as spring freshet, TDS decreases as the proportion of streamflow contributed by groundwater decreases. Conversely, during times of low streamflow (late summer, winter) the contribution of groundwater to streamflow is proportionally greater. Because groundwater entering the river has a higher ionic strength than surface water, the TDS of the stream increases markedly during low-flow conditions.

The March to October estimated monthly TDS concentrations during 2024 for East Poplar River at the International Boundary are shown in Figure 3.4. The estimated mean monthly TDS concentrations during this period ranged from 839 mg/L (April) to 919 mg/L (October). Monthly values for June and July could not be calculated due to missing specific conductance data. Estimated daily TDS concentrations during the 2024 calendar year ranged from 613mg/L (Apr 5) to 1090 mg/L (November 22).

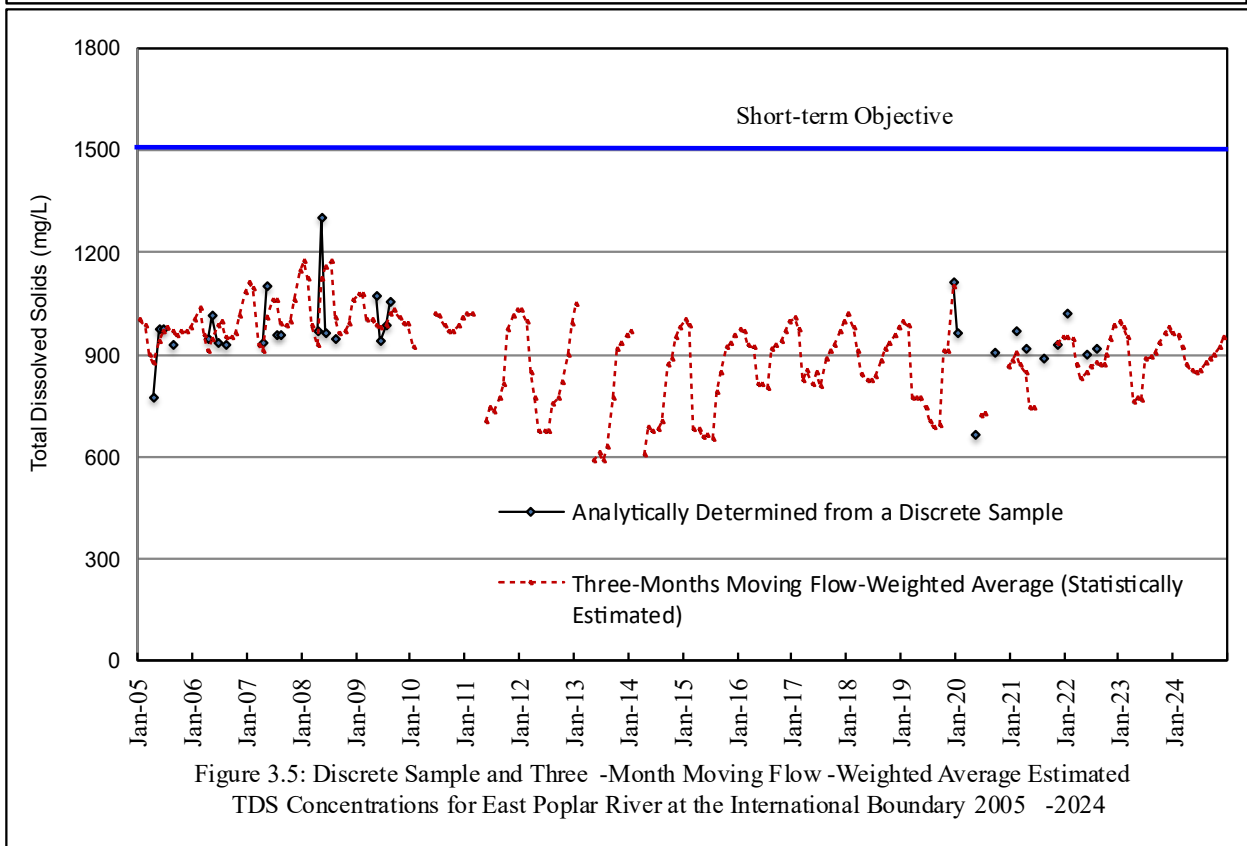
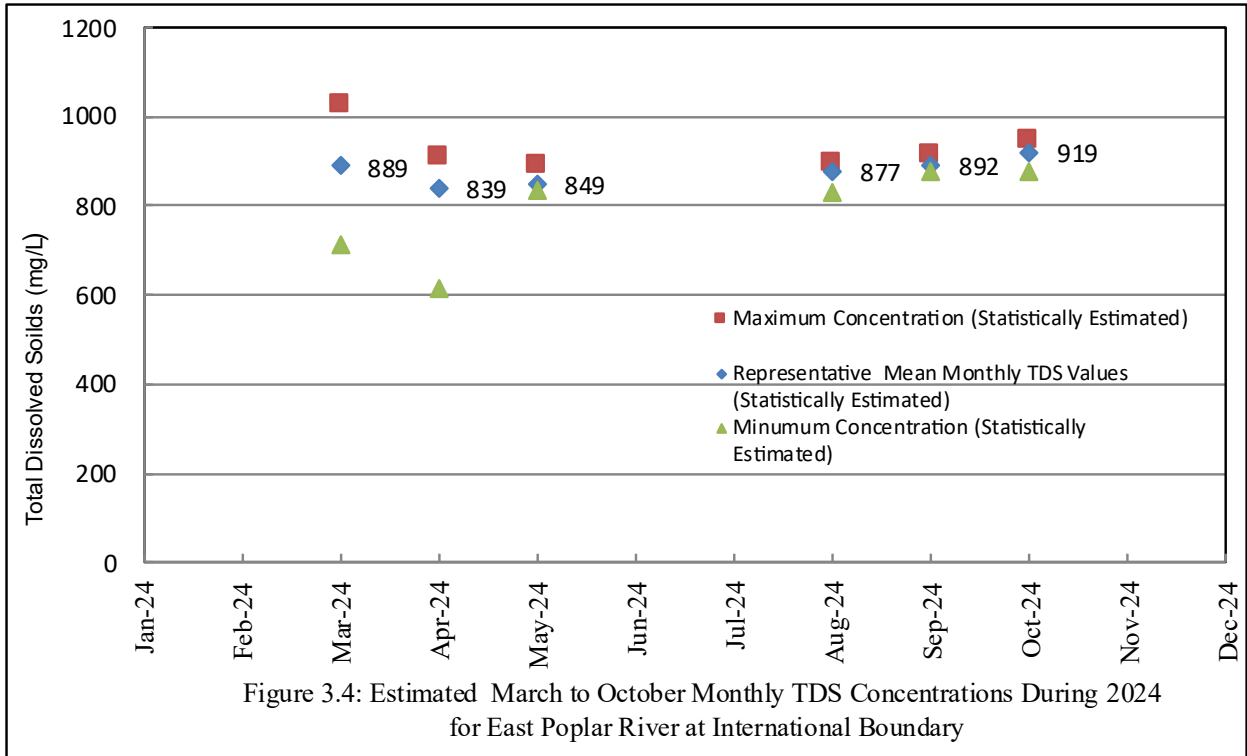
The three-month moving FWCs for TDS for the period of 2005-2024 are summarized in Figure 3.5. The short-term TDS objective was not exceeded during the period of record.

The five-year moving estimated FWC for TDS (Figure 3.6) did not exceed the long-term objective of 1,000 mg/L in 2024. The maximum monthly five-year estimated FWC in 2025 was 865 mg/L.

The daily TDS values, as estimated by linear regression from the daily specific-conductance measurements, for the period January 2005 through December 2024 are shown in Figure 3.7. The figure shows a decrease in estimated TDS corresponding to the snowmelt runoff occurring during the spring of each year. In general, estimated TDS concentrations in 2024 followed similar seasonal trends to most years from 2005-2024.

The relationship between TDS and specific conductance, developed using data collected during the March to October period from 1974 to 2009, is as follows:

$$\text{TDS} = (0.6205645 \times \text{specific conductance}) + 34.843914$$
$$(R^2 = 0.89, n = 363)$$



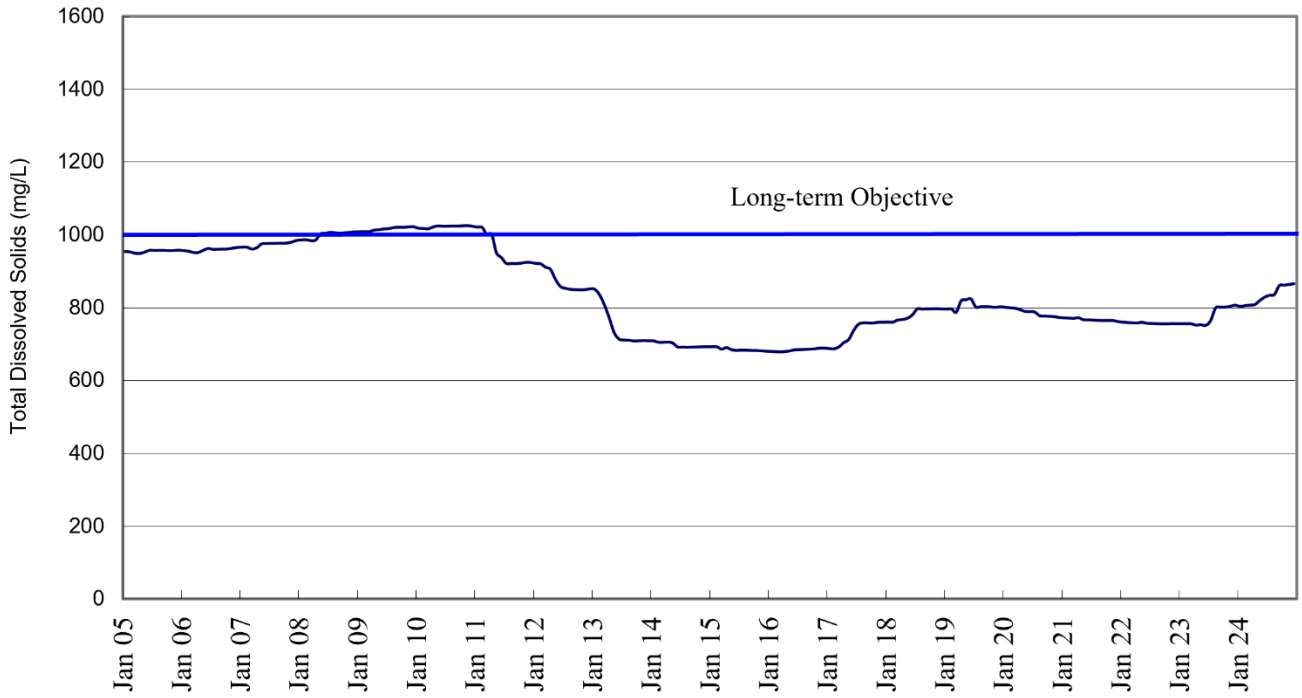


Figure 3.6: Five-Year Moving Flow-Weighted Average Estimated TDS Concentration for East Poplar River at the International Boundary

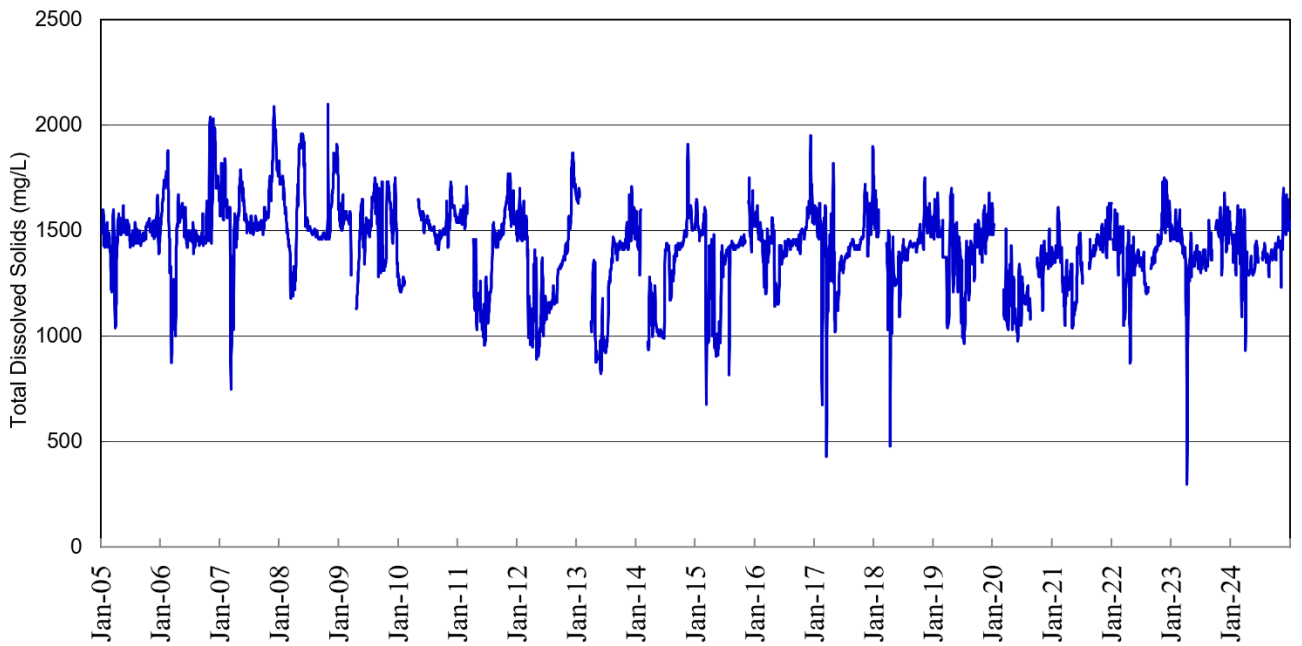


Figure 3.7: Daily TDS Concentration (Statistically Estimated), Calendar Years 2005 to 2024 for East Poplar River at the International Boundary

### 3.2.5.2 Boron

Daily, monthly, and moving average boron concentrations presented below were estimated using the boron equation that was developed from water-quality samples collected during the months of March through October from 1974-2009 and daily specific conductance data.

The March to October estimated monthly boron concentrations during 2024 for East Poplar River at the International Boundary are shown in Figure 3.8. The estimated mean-monthly boron concentrations during this period ranged from 1.63 mg/L (April) to 1.80 mg/L (October). Estimated daily boron concentrations during the 2024 calendar year ranged from 1.15 mg/L (Apr 4) to 2.16 mg/L (Nov 22).

The 3-month flow-weighted concentrations (FWC) for boron for the period of 2005-2024 are shown in Figure 3.9. Discrete data collected from 2020-2022 and three-month flow-weighted data do not appear to correlate as well as data collected from 2004 to 2010. The short-term objective of 3.5 mg/L has not been exceeded during the period of record. The 5-year moving FWC for boron (Figure 3.10) remained well below the long-term objective of 2.5 mg/L during 2024. The maximum monthly five-year estimated FWC in 2024 was 1.67 mg/L.

Boron concentrations are not as well-correlated with specific conductance as TDS. Boron is a relatively minor ion and does not in itself contribute to a large degree to the total load of dissolved constituents in the water. Accordingly, it appears likely that the standard deviation of dissolved boron (relative to the long-term mean boron concentration) may be greater than that of the major cations (sodium, potassium, and magnesium) and anions (sulphate, bicarbonate, and chloride) around their respective long-term mean concentrations. Therefore, the  $R^2$  (statistical measure of fit) is lower than that of TDS. The general pattern shows an increase in the five-year boron FWC in since early 2023. Estimated concentrations in 2024 are lower than values from 2005-2012 and remain below the objective.

The daily boron values, as estimated by linear regression from the daily specific-conductance readings, for the period January 2005 through December 2024 are shown in Figure 3.11. The trend in 2024 follows other years.

$$\text{Boron} = (0.0013081 \times \text{specific conductance}) - 0.0677588$$
$$(R^2 = 0.66, n = 363)$$

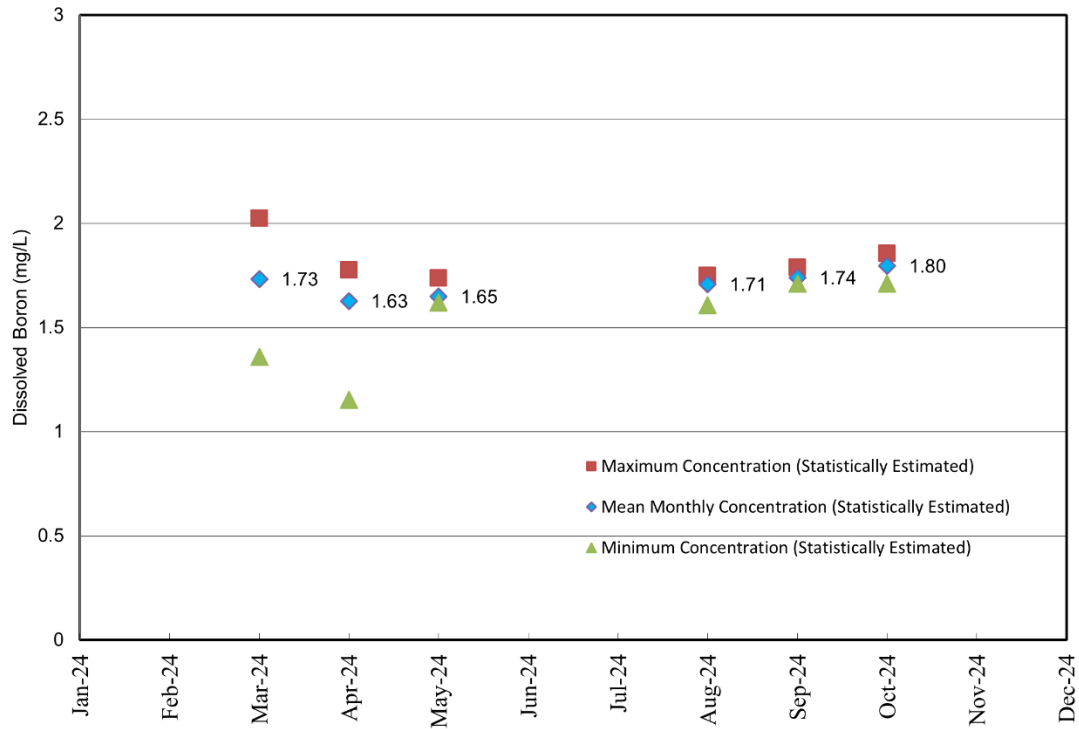


Figure 3.8: Estimated March to October Monthly Boron Concentrations During 2024 for East Poplar River at the International Boundary

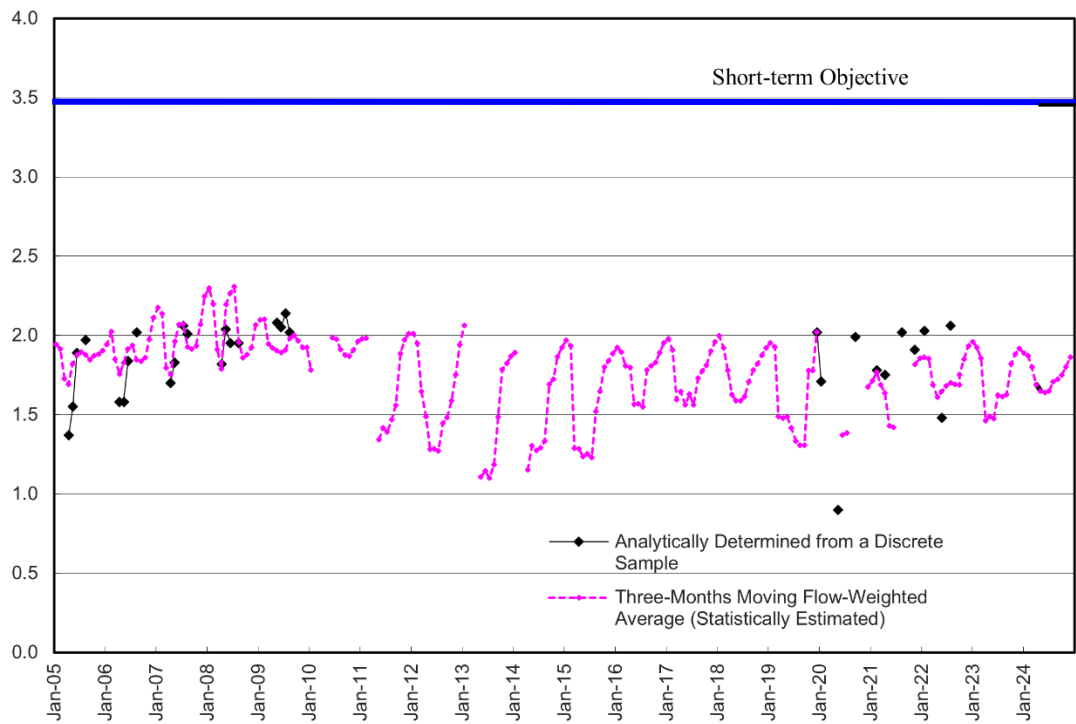


Figure 3.9: Discrete Sample and Three-Month Moving Flow-Weighted Average Estimated Boron Concentrations for East Poplar River at the International Boundary 2005 -2024

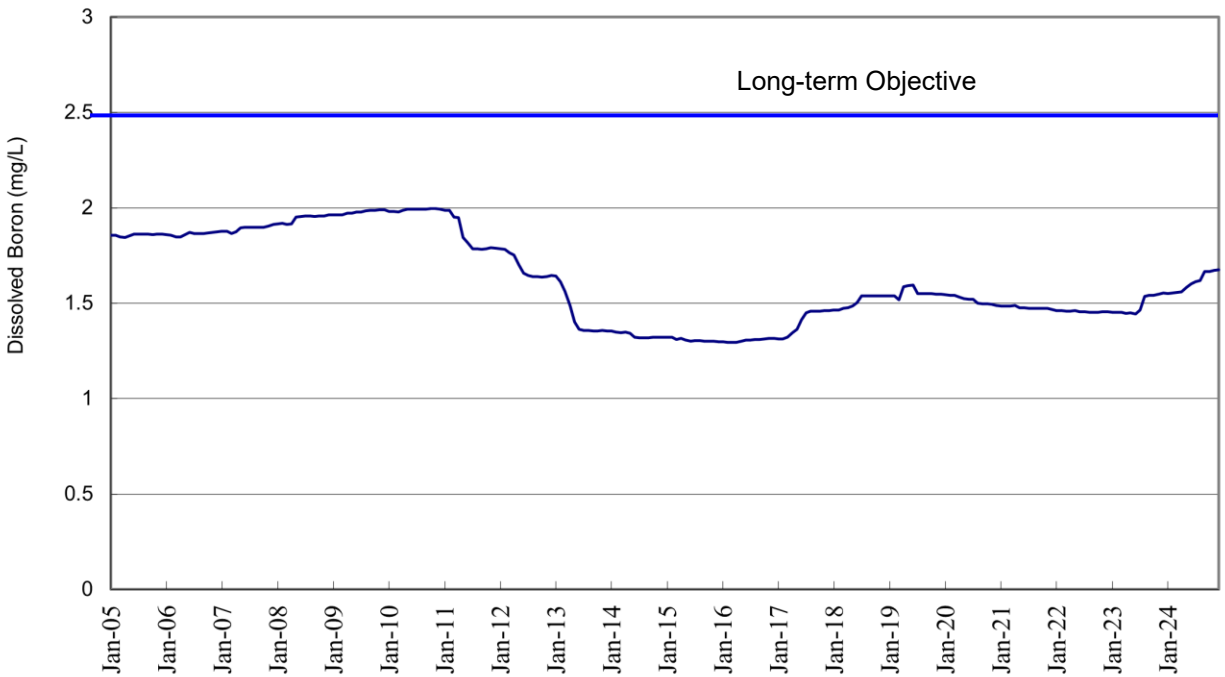


Figure 3.10: Five-Year Moving Flow-Weighted Average Estimated Boron Concentration for East Poplar River at the International Boundary (Statistically Estimated) 2005-2024

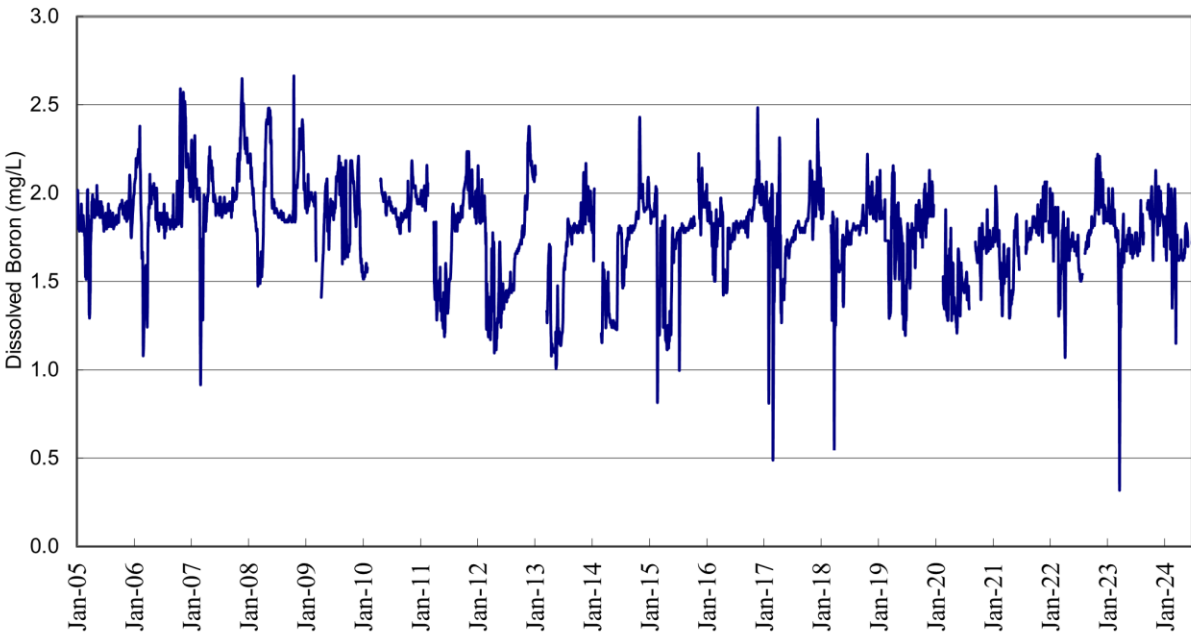


Figure 3.11: Daily Boron Concentration (Statistically Estimated), Calendar Years 2005-2024, for East Poplar River at the International Boundary

### **3.2.5.3 Other Water-Quality Objectives**

Table 3.1 summarizes the multipurpose water-quality objectives for the East Poplar River at International Boundary. These objectives were recommended by the International Poplar River Water Quality Board in 1979 to the IJC. No samples were collected in 2024; the last samples were collected in 2022. When sample collection occurs, multiple replicate samples collected for quality control are only counted as a single sample in the table. If an objective is exceeded in replicate samples, only one exceedance is counted. If a sample or parameter has not been collected during the reporting year these parameter and related excursions from the recommended objectives are shown as not applicable (N/A) in the table.

Table 3.1 Recommended Water-Quality Objectives and Excursions, 2024 Sampling Program, East Poplar River at International Boundary (units in mg/L, except as otherwise noted)

Parameter	Objective	No. of Samples		Excursions
		USA	Canada	
<b>Objectives recommended by IJC to Governments</b>				
Boron, dissolved	3.5/2.5 (1)	N/A	N/A	N/A
Total Dissolved Solids	1,500/1,000 (1)	N/A	N/A	N/A
<b>Objectives recommended by Poplar River Bilateral Monitoring Committee to Governments</b>				
Cadmium, total	0.0012	N/A	N/A	N/A
Fluoride, dissolved	1.5	N/A	N/A	N/A
Lead, total	0.03	N/A	N/A	N/A
Nitrate, dissolved (as N)	10.0	N/A	N/A	N/A
Oxygen, dissolved	4.0/5.0 (2)	N/A	N/A	N/A
Sodium adsorption ratio	10.0	N/A	N/A	N/A
Sulphate, dissolved	800.0	N/A	N/A	N/A
Zinc, total	0.03	N/A	N/A	N/A
Water temperature (Celsius)	30.0 (3)	N/A	N/A	N/A
pH (pH units)	6.5 (4)	N/A	N/A	N/A
(1) Three-month average of flow-weighted concentrations should be <3.5 mg/L boron and <1,500 mg/L TDS. Five-year average of flow-weighted concentrations (March to October) should be <2.5 mg/L boron and <1,000 mg/L TDS. (2) 5.0 (minimum April 10 to May 15), 4.0 (minimum, remainder of the year). (3) Natural temperature (April 10 to May 15), <30 degrees Celsius (remainder of the year). (4) Less than 0.5 pH units above natural, minimum pH = 6.5.				

N/A – Not applicable

### **3.3 Groundwater**

#### **3.3.1 Operations – Saskatchewan**

SaskPower’s supplementary supply continues to operate, with an annual withdrawal of 1,461 cubic decameters (dam<sup>3</sup>) in 2024. The volume represents an increase of 393 dam<sup>3</sup> from 2023, Figure 3.12 illustrates the annual withdrawal by the Poplar River Power Station. The average volume withdrawn from 1990 to 2024 was 3,457 dam<sup>3</sup> per year. Prior to 1991, the well network was part of a dewatering network for coal mining operations, which resulted in the high production levels experienced in the early to mid 1980's. With the drought of the late 1980's and early 1990's it was

evident that there was a continued need for groundwater to supplement water levels in Cookson Reservoir. As a result, the wells were taken over by SaskPower for use as a supplementary supply.

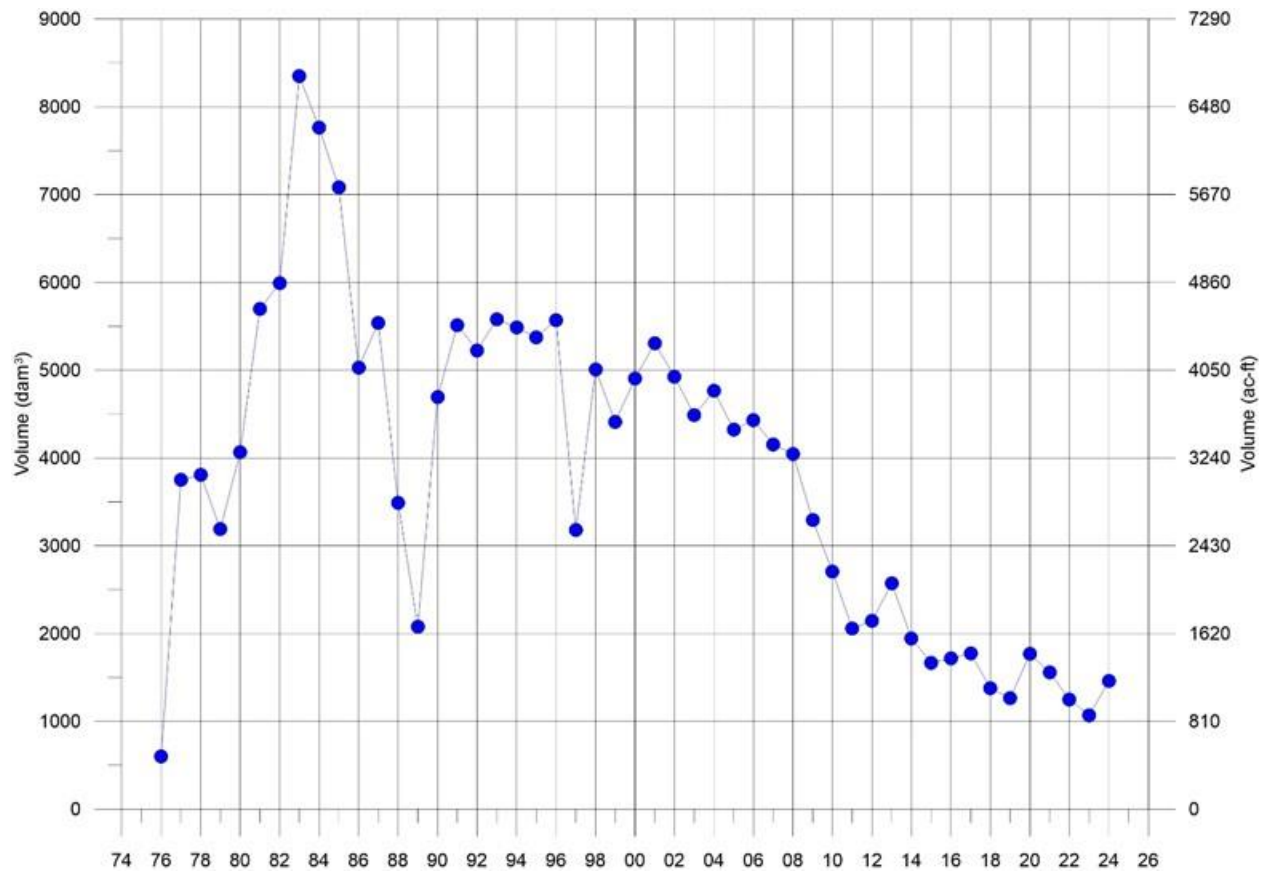


Figure 3.12. Annual Pumping from the Poplar River Power Station Supplementary Supply.

SaskPower has an approval for the supplementary supply project to produce an annual volume of 5,500 dam<sup>3</sup>/year (4,459 acre-feet/year). The supplementary supply well network consisted of 21 wells with 10 discharge points. However, one production well, PW11A, was converted to a farm well to supply groundwater to a local resident in 2014 and three production wells (38, 48, and 58) were decommissioned in fall 2016. To date, there are 17 production wells in operation.

In addition to the supplementary supply, SaskPower also operates the Soil Salinity Project south of Morrison Dam. The impoundment of water behind Morrison Dam caused a 2 to 3 metre rise in groundwater levels. The increase in the groundwater levels raised the salinity of the soil and reduced crop yield. To reduce the groundwater levels south of Morrison Dam, 8 production wells were constructed in 1989 and 1990. Of the 8 production wells, 4 are located on the east side of the East Poplar River and 4 on the west side of the river. Water from the production wells is discharged into the cooling water canal, which is in turn discharged directly to Cookson Reservoir. Withdrawals from the production wells varied from a maximum of 1,095.10 dam<sup>3</sup> in 1994 to a minimum of 359.86 dam<sup>3</sup> in 2017 (Figure 3.13).

The total water produced from the Soil Salinity Project in 2024 was 610.615 dam<sup>3</sup>, which was

lower than 2023 of 615.313 dam<sup>3</sup>. The 2024 production rate was from two production wells, PW87104 (432.168 dam<sup>3</sup>) and well PW87105 (178.647 dam<sup>3</sup>), both of which are on the east side of the Poplar River. Production since operation of this network began in 1990 has averaged 638.15 dam<sup>3</sup>/yr.

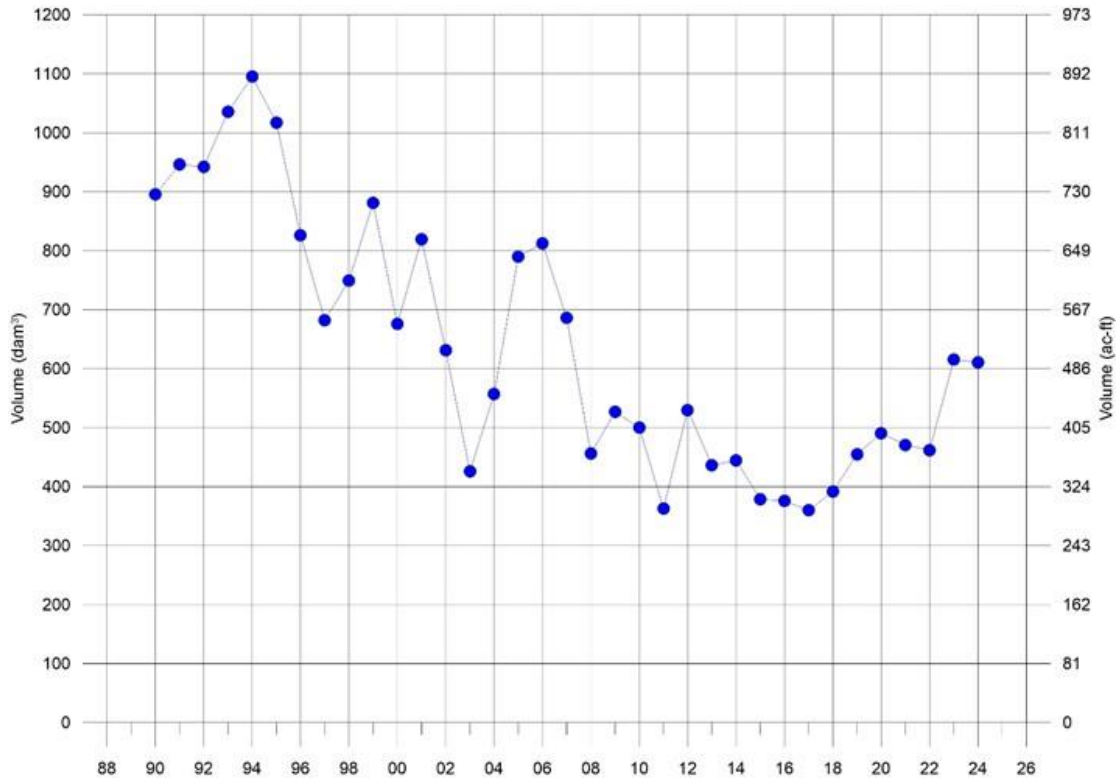


Figure 3.13. Annual Pumping from SaskPower's Soil Salinity Project.

### 3.3.2 Groundwater Monitoring

Equivalent geologic formations present in Saskatchewan and Montana have different names. A list of the corresponding formation names is provided in Table 3.2.

Table 3.2 Geologic Formation Name Equivalence between Saskatchewan and Montana

System	Series	Group	Lithostratigraphic Units		Hydrogeologic unit	Principal aquifer system
			United States	Canada		
			Montana	Saskatchewan		
Quaternary	Pleistocene		Glacial deposits	Saskatoon Sutherland Empress	Till <sup>Glacial aquifers</sup>	Glacial aquifer system
Tertiary	Paleocene	Fort Union Formation <sup>e</sup>	Tongue River Member	Ravenscrag Formation	Upper Fort Union aquifer	Lower Tertiary aquifer system
			Lebo Shale Member	Ravenscrag Formation	Middle Fort Union hydrogeologic unit	
			Ludow and Tullock Members	Ravenscrag Formation	Lower Fort Union aquifer	
Cretaceous	Upper Cretaceous		Hell Creek Formation (upper part)	Frenchman Formation	Upper Hell Creek hydrogeologic unit	Upper Cretaceous aquifer system
			Hell Creek Formation (lower part)	Frenchman Formation	Lower Hell Creek aquifer	
		Montana Group	Fox Hills Sandstone	Whitemud Formation Eastend Formation	Fox Hills aquifer	
			Bearpaw Shale	Bearpaw Formation	Basal confining unit	

#### 3.3.2.1 Saskatchewan

In 2003, SaskPower reduced its monitoring network from 180 to about 85 piezometers. The Water Security Agency approved this reduction based on modelling studies undertaken by SaskPower.

Figure 3.14 illustrates selected piezometers completed in the Hart Coal Seam near the International Boundary. The hydrograph illustrates that there have been no significant changes in water levels in the Hart Coal Seam near the boundary in the past 37 years.

The goal of the Soil Salinity Project (See section 3.3.1) is to lower groundwater levels in the Empress Sands below Morrison Dam to pre-reservoir levels of approximately two to three metres. Groundwater pumping from 1990 to 1995 ranged between 895.7 and 1,017.1 dam<sup>3</sup>/year and consequently the drawdown objectives were achieved in 1995 and 1996. Despite the decline in well production, with the high reservoir levels and increased precipitation, the drawdown in the Empress Sands is below the two to three metre drawdown objectives.

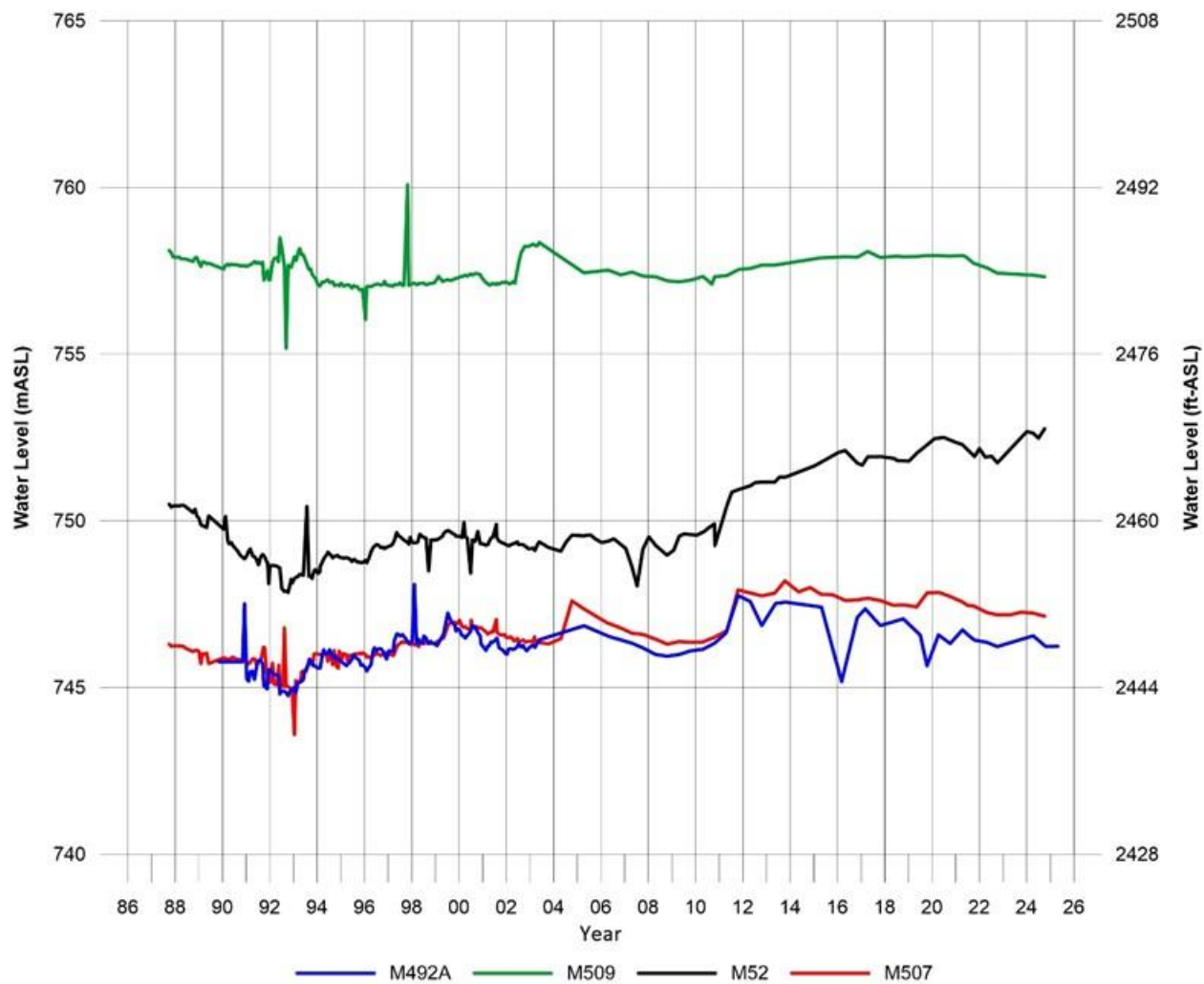


Figure 3.14. Hydrograph of Selected Wells completed in the Hart Coal Seam.

### 3.3.2.2 Montana

In 2024, the Montana Bureau of Mines and Geology (MBMG) continued quarterly monitoring of water levels in 14 wells in Montana and along the Montana-Canada border. The quarterly water-level monitoring is generally done in March, June, September, and December. Water Quality samples were collected from 3 of the 14 wells in September. Due to weather conditions, travel to the monitoring wells in December 2024 was canceled. These wells were visited in early January 2025, but snow still prevented access to eight of the wells.

Of the fourteen wells monitored by MBMG, seven of these wells are completed in the Upper Fort Union-Hart Coal aquifer, five are completed in till/outwash, one is in the Lower Hell Creek-Fox Hills

aquifer, and one is in Flaxville gravel deposits. The Flaxville gravels are Tertiary age deposits overlying the Fort Union Formation that are not shown in Table 3.2.

#### *Monitoring Wells in the Fort Union Formation or Hart Coal*

Figure 3.15 shows hydrographs from the seven monitoring wells completed in the Upper Fort Union-Hart Coal aquifer. Offsets noted in the legend are applied to make it easier to compare the hydrograph patterns. These wells have exhibited two general patterns, that appear to be related to the depth of the screened intervals of the wells. The deeper wells, screened from 179 to 274 ft below ground surface (bgs), have fluctuated less than 7 ft (2.1 m) since monitoring began in 1979 for well 9, and 1984 for wells 13, 17, and 19 (fig. 3.15). An exception is well 9, which is screened over a wide range (53 to 203 ft bgs), but still shows the same water-level trends as the other deeper well in the Fort Union Formation. For the deeper wells, water levels generally declined slightly between 1985 and 1994. From 1994 through 2010 the water levels were stable or increased slightly. From 2011 through 2014 water levels in these wells steadily increased by 2 to 3 ft, and from 2015 through 2024 the water levels have either been stable or shown slight increases or decreases (< 2 ft).

Shallower wells completed in the Upper Fort Union-Hart Coal aquifer (fig. 3.15; wells 6, 7, and 16), show more dynamic water level fluctuations. These wells are screened at depths of 63 to 146 ft bgs. Water levels have varied by more than 6 ft in these wells: 6.4 ft in well 7, 11.6 ft in well 6, and 17.7 ft in well 16. Water levels in these wells generally declined from the beginning of monitoring in 1979 (wells 6 and 7) and 1985 (well 16) until the mid-1990s. Since then, water levels have generally risen, but have been more stable since 2014. Water levels in all three wells have been declining since late 2019-early 2020. Significant peaks in water levels in these wells are attributed to heavy winter snow accumulation, associated melt, and positive departures from average annual precipitation in 2004, 2011, and 2013 (National Oceanic and Atmospheric Administration's northeast MT climate division). Hydrographs for wells 6 and 7 (fig. 3.15) demonstrate the more dynamic fluctuations.

#### *Monitoring Wells in Till (Drift and Outwash)*

Figure 3.16 shows hydrographs from the five monitoring wells completed in outwash deposits within the glacial till (wells 5, 8, 10, 23, and 24). These wells have total depths of 31 to 53 ft. They show seasonal changes caused by variations in precipitation, with rapid increases in water levels after significant precipitation periods, followed by gradual declines to a more stable water level. This is best illustrated by wells 5 and 10 (fig. 3.16). Heavy snow accumulation and melt in 2004 and 2011 caused upward water-level response during the remainder of those years. Since the 2011 peaks, water levels in these wells have remained fairly stable, with some slight increases and decreases.

#### *Monitoring Well in the Fox Hills-Hell Creek Aquifer*

The potentiometric surface in the Lower Hell Creek-Fox Hills artesian aquifer (fig. 3.16, well 11) has shown little fluctuation during the 1979-2024 monitoring period. In 2015 the water level dropped about 2 feet and then recovered for an unknown reason. This well has a measuring point 1.5 ft above and the water level is often near or above ground surface, and at times water is weeping over the casing. In the winter the well is usually frozen, and a water level can't be obtained.

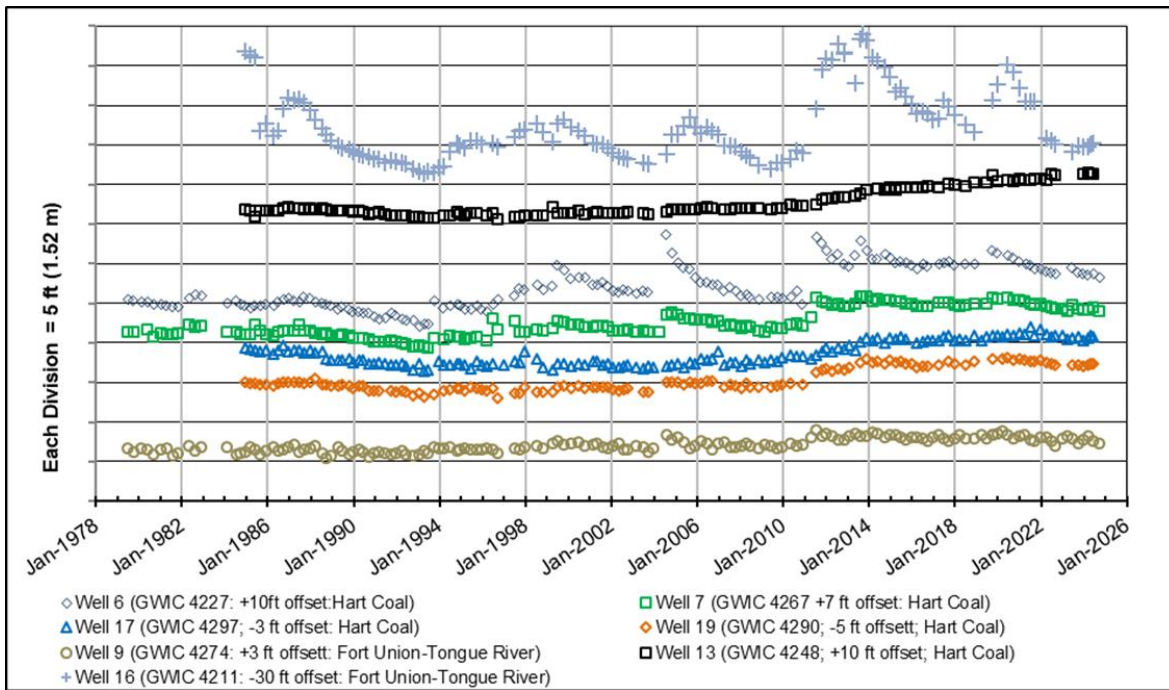


Figure 3.15 Hydrographs of selected wells in Fort Union-Hart Coal aquifer, showing data through December 2024. Water-level data used to construct these hydrograph are accessible through the Montana Ground Water Information Center (GWIC) database at <http://mbmggwic.mtech.edu>.

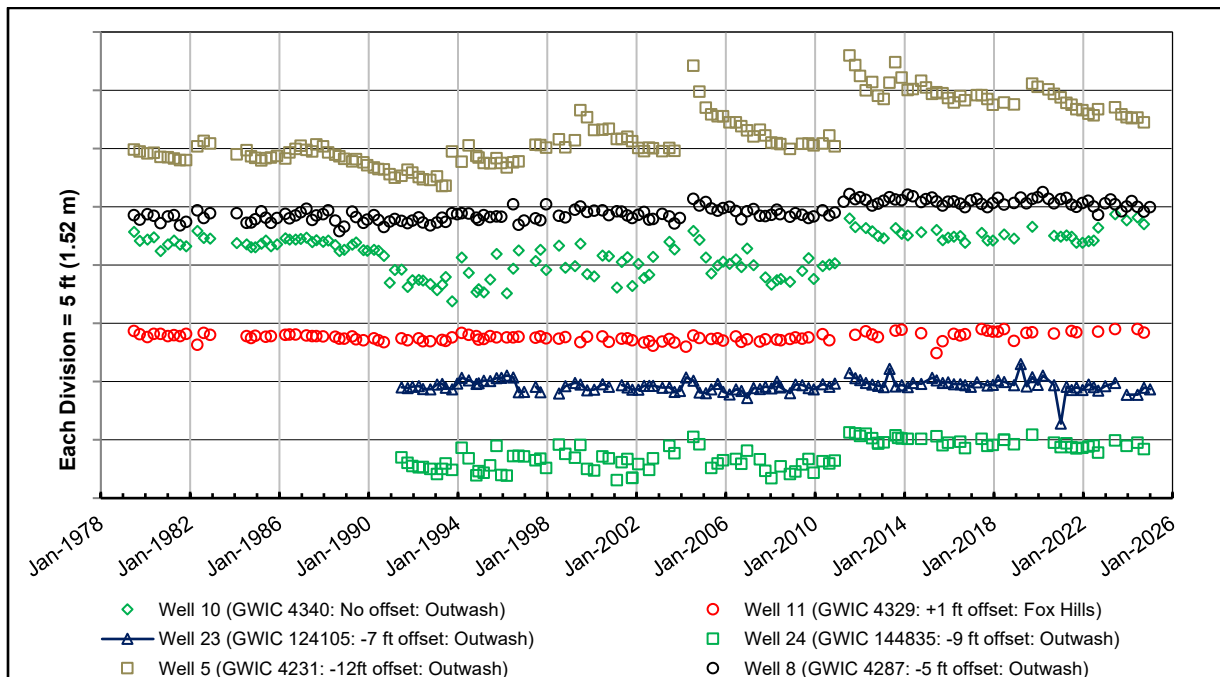


Figure 3.16 Hydrographs of selected wells in till (outwash) and the lower Hell Creek-Fox Hills aquifer, showing data through December 2024. Water-level data used to construct these hydrograph are accessible through the Montana Ground Water Information Center (GWIC) database at <http://mbmggwic.mtech.edu>

### 3.3.3 Groundwater Quality

#### 3.3.3.1 Saskatchewan

The water quality from the Supplementary Supply Project discharge points has been consistent since pumping began in 1992 with no significant trends indicated to date. A summary of the more frequently tested parameters during 2024 are provided in Table 3.3. Result averages for the 1992-2023 periods are also included in this table for comparison.

**TABLE 3.3 Water-Quality Statistics for Water Pumped from Supplementary Water Supply Project Wells\***

	<b>2024 Average</b>	<b>1992 to 2023 Average</b>
<b>pH (units)</b>	8.2	8.1
<b>Conductivity (µs/cm)</b>	1320	1255
<b>Total Dissolved Solids</b>	1030	889
<b>Total Suspended Solids</b>	4	9.2
<b>Boron</b>	0.9	1.0
<b>Sodium</b>	178	164
<b>Cyanide (µg/L)</b>	0.00	1.95
<b>Iron</b>	0.2	0.4
<b>Manganese</b>	0.0	0.1
<b>Mercury (µg/L)</b>	0.0	0.1
<b>Calcium</b>	44	65
<b>Magnesium</b>	47	51
<b>Sulfate</b>	302	275
<b>Nitrate</b>	0.10	0.13

All units mg/L unless otherwise noted.

\*Sampled at Site “C3” on Girard Creek.

Average results from the common discharge point for the Salinity Control Project for 2024, plus an average of the 1992-2023 results are provided in Table 3.4. Results have remained consistent since 1992.

**TABLE 3.4 Water-Quality Statistics for Water Pumped from Salinity Control Project Wells Sampled at the Discharge Pipe\***

**Salinity Project Water Supply to Cookson Reservoir  
Discharge Pipe Analysis**

	<b>2024</b>	<b>1992 - 2023</b>
	<b>Average</b>	<b>Average</b>
<b>pH (units)</b>	7.5	7.7
<b>Conductivity (µs/cm)</b>	1669	1591
<b>Total Dissolved Solids</b>	1177	1137
<b>Boron</b>	1.5	1.7
<b>Calcium</b>	106	110
<b>Magnesium</b>	58	61
<b>Sodium</b>	181	196
<b>Potassium</b>	7.6	8.2
<b>Arsenic (µg/L)</b>	15.0	13.5
<b>Aluminum</b>	0.005	0.012
<b>Barium</b>	0.020	0.020
<b>Cadmium</b>	0.000	0.000
<b>Iron</b>	5.1	4.2
<b>Manganese</b>	0.130	0.119
<b>Molybdenum</b>	0.000	0.001
<b>Strontium</b>	1.600	1.747
<b>Vanadium</b>	0.000	0.001
<b>Uranium (µg/L)</b>	0.500	0.989
<b>Mercury (µg/L)</b>	0.05	0.06
<b>Sulfate</b>	440	396
<b>Chloride</b>	7.8	8.3
<b>Nitrate</b>	0.030	0.070

\*All concentrations are mg/L unless otherwise noted.

Leachate movement through the ash lagoon liner systems can potentially affect groundwater quality. Fly ash leachate and seepage is a concern that is actively monitored. The piezometers listed in Table 3.5 below are used to assess leachate movement and calculate seepage rates. Piezometric water level, boron, and chloride are the chosen indicator parameters to assess leachate movement.

**TABLE 3.5 Ash Lagoon Monitoring Piezometer’s Location and Completion Strata**

Piezo. Group No.	Piezo. No.	UTM		Location	Completion Strata
		Easting (ZONE13)	Northing (ZONE13)		
P5	C525	465397	5431580	Cookson	Empress Group
	C527	466284	5431575	Cookson	Empress Group
	C760	465850	5431580	Cookson	Coronach Coal
	C761	465828	5431582	Cookson	Hart Coal
P13	C536	465275	5433602	Lagoon	Empress Group
	C538	465054	5432397	Lagoon	Empress Group
	C653A	465071	5432396	Lagoon	Unoxidized Till
	C653B	465086	5432395	Lagoon	Unoxidized Till
	C740	464628	5432393	Lagoon	Empress Group
	C766	465522	5433448	Lagoon	Empress Group
	C771	465114	5432983	Lagoon	Embankment Fill
P14	C763A-RR	465986	5432781	Lagoon	Unoxidized Till
	C763B-RR	465986	5432777	Lagoon	Oxidized Till
	C763C-RR	465986	5432774	Lagoon	Unoxidized Till
	C763D-RR	465986	5432770	Lagoon	Unoxidized Till
	C763E-RR	465986	5432766	Lagoon	Empress Group
	C885B	466466	5432637	Lagoon	Oxidized Till
	C885C	466464	5432637	Lagoon	Oxidized Till
	C885D	466463	5432636	Lagoon	Oxidized Till
	C885E	466461	5432637	Lagoon	Empress Group
	C897	-	-	Lagoon	Hart Zone
P15	C894B	466828	5432566	Lagoon	Embankment Fill

	C894C	466827	5432564	Lagoon	Oxidized Till
	C894D	466827	5432563	Lagoon	Unoxidized Till
	C894E	466827	5432561	Lagoon	Empress Group
	C895C	466850	5432562	Lagoon	Oxidized Till
	C895E	466850	5432559	Lagoon	Empress Group
	C896	-	-	Lagoon	Hart Zone
P16					
	C711	465369	5433551	Lagoon	Oxidized Till
	C712A	465671	5433428	Lagoon	Unoxidized Till
	C712B	465655	5433429	Lagoon	Oxidized Till
	C712C	465640	5433429	Lagoon	Unoxidized Till
	C712D	465625	5433430	Lagoon	Oxidized Till
	C713	465949	5433296	Lagoon	Oxidized Till
	C714A	466366	5433055	Lagoon	Unoxidized Till
	C714B	466352	5433061	Lagoon	Unoxidized Till
	C714C	466338	5433067	Lagoon	Oxidized Till
	C714D	466325	5433073	Lagoon	Oxidized Till
	C714E	466310	5433080	Lagoon	Empress Group
	C717	465397	5433610	Lagoon	Oxidized Till
	C720	465964	5433316	Lagoon	Oxidized Till
	C721	466010	5433394	Lagoon	Oxidized Till
	C722	466344	5433075	Lagoon	Oxidized Till
	C723	466358	5433159	Lagoon	Oxidized Till
	C726A	465115	5432974	Lagoon	Oxidized Till
	C726B	465115	5432990	Lagoon	Unoxidized Till
	C726C	465115	5433005	Lagoon	Oxidized Till
	C726E	465113	5432960	Lagoon	Empress Group
	C728A-R	465114	5433359	Lagoon	Oxidized Till
	C728C-R	465114	5433366	Lagoon	Unoxidized Till
	C728D-R	465114	5433373	Lagoon	Oxidized Till
	C728E-R	465114	5433354	Lagoon	Empress Group
	C898	-	-	Lagoon	Hart Zone
P17					
	C715	466834	5432705	Lagoon	Oxidized Till
	C725	466977	5432741	Lagoon	Oxidized Clay
	C758	466907	5432719	Lagoon	Sand

The chemistry of water immediately above the liner systems is expected to differ from the surface water of the lagoons. Meaningful information is only available from piezometers installed within Ash Lagoon # 1 where ash had been deposited for many years. Future monitoring of all piezometers completed above the lagoon liner systems will continue to improve the understanding of leachate quality and flow from the ash lagoons.

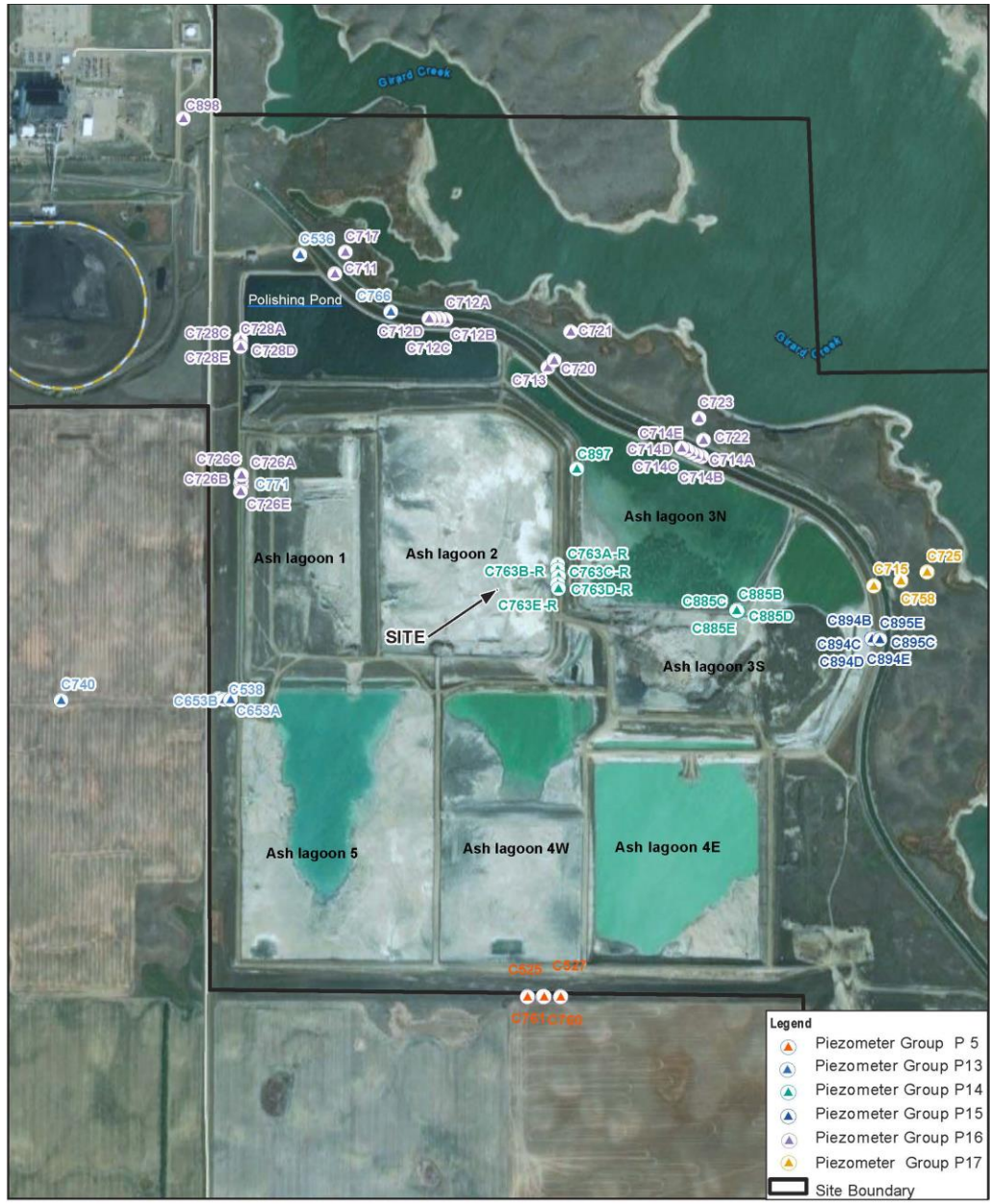


Figure 3.17 Location of piezometers surrounding the ash lagoons.

The piezometric surface measurements provided in the data exchange show the presence of a ground-water mound beneath the ash lagoons. The mound extends from the center of the Ash Lagoon # 1 to the southeast side of Ash Lagoon # 2. Isolated ground-water mounds have developed within the area. Review of the groundwater chemistry data from the piezometers surrounding the ash lagoon does not show any impacts outside the footprint of the site.

The area in proximity to the polishing ponds showed minimal groundwater level fluctuations. Although increasing water levels do not automatically suggest that the water affecting the piezometers is leachate, fluctuations of the piezometric levels do suggest ground-water movement. On the west side of the Polishing Pond, the boron levels have changed only slightly in piezometers C728A and C728D (year to year), where the chloride levels have significantly decreased with time. The average boron concentration from C728A decreased, from 10.75 mg/L in 2023 to 10.13 mg/L in 2024. For C728D, the dissolved boron concentration decreased from 8.8 mg/L in 2023 to 6.4 mg/L in 2024. The chloride level for C728A decreased from 403 mg/L in 1983 to 62.6 mg/L in 2024. The chloride level for C728D decreased from 185 mg/L in 1983 to 88.7 mg/L in 2024. Piezometer C721 is located between Girard Creek, the average concentration of dissolved boron from C721 was 0.65 mg/L and chloride of 118 mg/L in 2024.

Water impoundment from south of Morrison Dam resulted in an increase of the groundwater levels from the Empress Group aquifers. Continued monitoring indicates that the regional flow of the Empress Group is from northwest to southeast below Morrison Dam. Sampling results from the monitoring wells completed in the Empress Group did not indicate seepage activity with minimal variations of boron or chloride concentrations. Piezometer C26 located north of the dam remained consistent with dissolved boron concentration in 2023 and 2024 of 1.43 mg/L and 1.41 mg/L, respectively. Chloride concentration did not change between 2023 and 2024 of 9.6 mg/L. The groundwater chemistry sampling results and water level data are included in the annual data exchange.

Piezometer C712B has been monitored for several years. Prior to 1992 boron levels were below 1 mg/L. From 1992 to 2023, boron levels have remained relatively steady between 11.5 and 20 mg/L. In 2024 we saw a slight decrease from this range in boron for piezometer C712B which was 9.7 mg/L.

### **3.3.3.2 Montana**

Water quality samples were collected from monitoring wells 7, 9, and 24 in September 2023. Well 7 is completed in the Hart Coal Seam within the Upper Fort Union Formation. The Hart Coal Seam at this well is 134 to 143 ft bgs. Well 9 is completed in the Middle Fort Union hydrogeologic unit (table 3.2), and is screened in sandstones and shales from 53 to 203 ft bgs, with no coal seams reported. Well 24 is completed in glacial till (outwash) and is 38-ft deep.

Well 16, completed in an unconsolidated sand in the Upper Fort Union aquifer from 79 to 82 ft bgs, was sampled from 1986 through 2018. Sampling of well 16 was discontinued in 2019 because it was prone to flooding during spring snow melt, and did not produce enough water to properly purge and collect fresh groundwater samples. To resolve this problem well 9 was selected to replace well 16. Well 9 was regularly sampled from 1978 through 1992, and in 2008.

Total dissolved solids (TDS) concentrations from samples collected from wells 7,9, 16, and 24 are shown in Figure 3.18. Wells 7, 16, and 24 show annual variations in TDS <150 mg/L, and well 9 shows annual variations in TDS >300 mg/L. Between 1991 and 2008 TDS concentrations were relatively stable to slightly decreasing for wells 7, 16, and 24, and in 2009 concentrations decreased in all three wells. From 2010 through 2024 the TDS concentrations in wells 7 and 24 have been increasing, and the TDS concentrations measured in these two wells in 2024 are the higher than all, or almost all previous measurements.

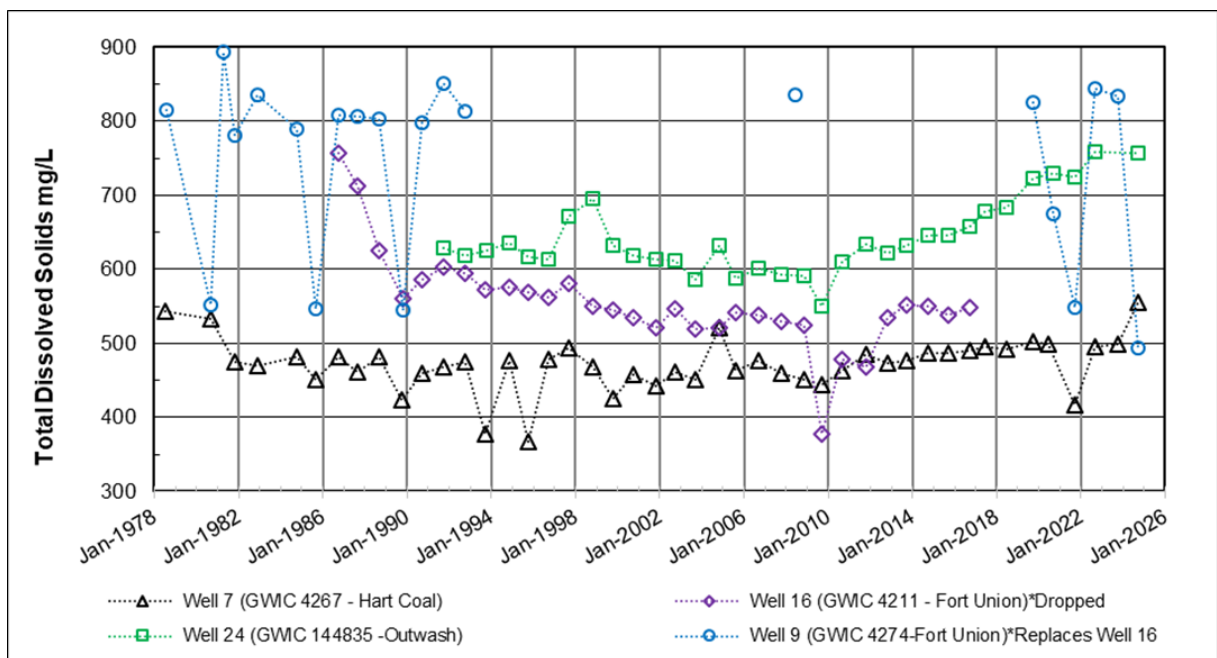


Figure 3.18 Total dissolved solids concentrations in select wells in Montana. The data used to construct this graph can be accessed through the Montana Ground Water Information Center (GWIC) database at <http://mbmggwic.mtech.edu>.

### **3.4 Cookson Reservoir**

#### **3.4.1 Storage**

Cookson Reservoir is located in a semi-arid part of Saskatchewan, and inflows could vary significantly from year to year in response to climate variations. In 2024, the Cookson Reservoir storage started at 85.9 % and ended at 74.0% of the full supply volume. The 2024 maximum, minimum (elevations and volumes), and associated dates are indicated in Table 3.3.6.

*Table 3.6. Cookson Reservoir Storage Statistics for 2024*

Date	Elevation (m)	Elevation (ft)	Contents (dam <sup>3</sup> )	Contents (acre-feet)	Contents % full
Jan 01	752.2	2467.8	35149	28496	85.9%
Apr 05 (Maximum)	752.5	2468.8	37208	30165	91.0%
Nov 19 (Minimum)	751.4	2465.3	30146	24440	73.7%
Dec 31	751.4	2465.4	30272	24542	74.0%
Full Supply Level	753.0	2470.5	40900	33158	100.0%

At the beginning of 2024, the Cookson reservoir started with a storage of 35,149 dam<sup>3</sup> (28,496 acre-feet) with water levels well above normal at 752.2 m (2,467.8 ft). The spring inflows in March did not have a strong impact on the water levels as in 2023, see comparison in Figure 3.19, reaching a maximum annual water level of 752.5 m (2,468.8 ft) on April 05<sup>th</sup>, 2024. After that, the water levels remained near normal conditions with a gradual reduction in water levels starting from the second half of April till the end of the year. The minimum annual water level was observed on November 31<sup>st</sup>, 2024, at 751.4 m (2,465.3 ft). By Dec 31<sup>st</sup>, 2023, the reservoir elevation was at 751.4 m (2,465.4 ft) or 1.6 m (5.1 ft) below the full supply level, with 40,900 dam<sup>3</sup> (33,158 acre-feet) stored in the Cookson Reservoir.

The Poplar River Power Station depends on water from Cookson Reservoir for cooling. The power plant operation is adversely affected once the reservoir levels drop below 749.0 m (2,457.3 ft). The dead storage level for cooling water used in the generation process is 745.0 m (2,444.2 ft).

The 2024 recorded levels and associated operating levels are illustrated in Figure 3.20 along with the 10-year daily median levels, estimated from the daily level records from 2015 to 2024. Likewise, the 2024 storage volumes associated with the operating levels are shown in Figure 3.20 along with the 10-year daily median levels, estimated from the daily storage records from 2015 to 2024.

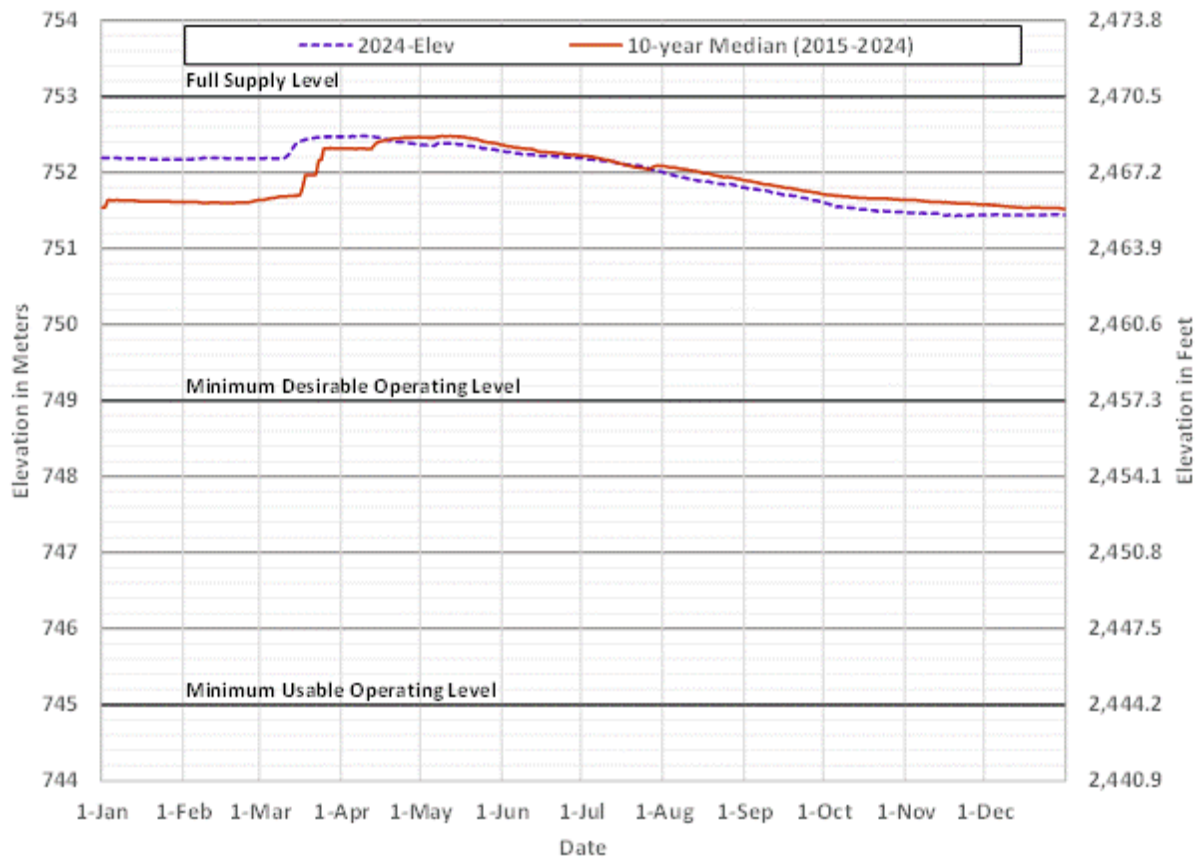


Figure 3.19 Cookson Reservoir Daily Mean Water Levels for 2024 and Median Daily Water Levels, 2015-2024

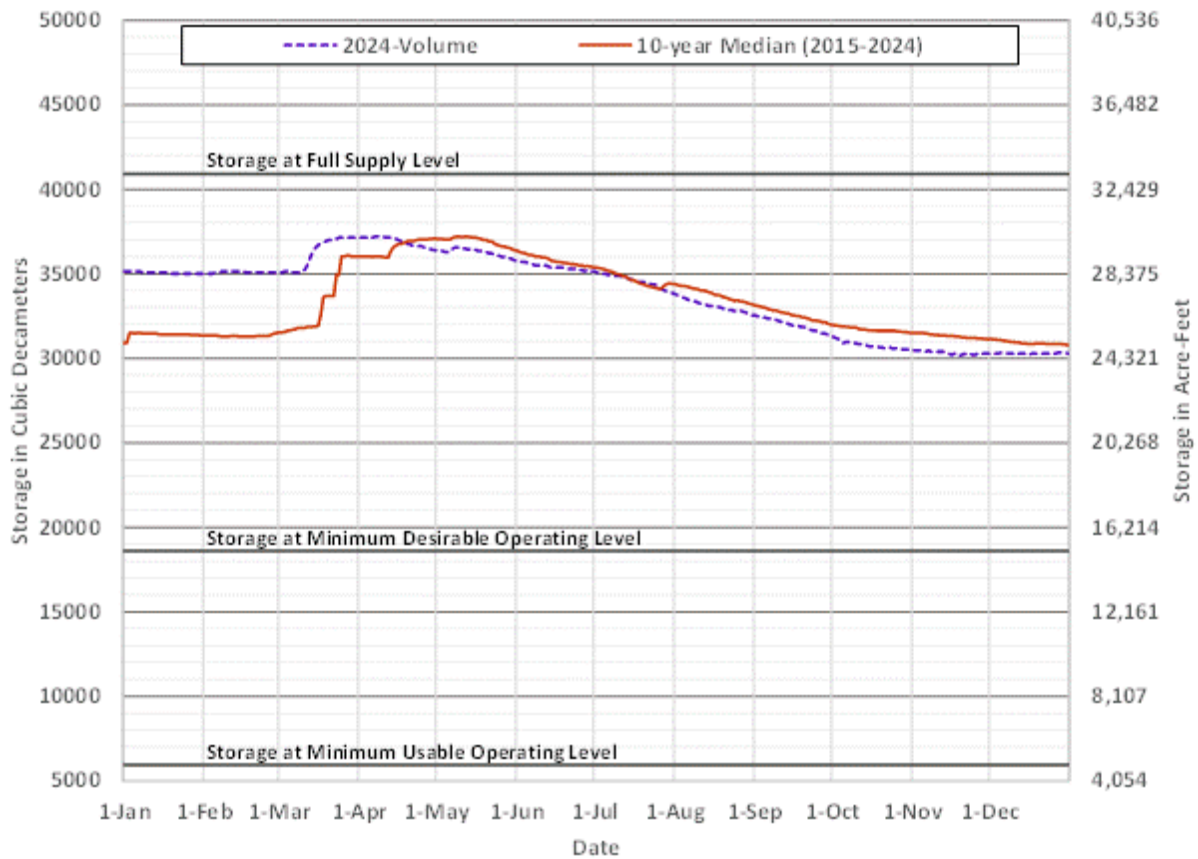


Figure 3.20 Cookson Reservoir Daily Mean Water Storage for 2024 and Median Daily Storage, 2015-2024

### 3.4.2 Water Quality

In 2024 sample points located at the inflow, outflow and within the Cookson Reservoir were sampled on a monthly basis to monitor water quality. A major factor affecting the water quality of Reservoir is volume. Low reservoir volumes will decrease the water quality while high volumes will improve the water quality. The reservoir volume is controlled by two factors: inflows and losses. Inflows increase reservoir volume and typically occur from spring runoff, precipitation, and supplementary water supply. Losses decrease reservoir volume, and typically occur from evaporation, water uses and apportionment releases.

For example, in 2008, the concentration of total dissolved solids had reached 1,540 mg/L. Significant runoff in 2009 reduced the total dissolved solids (TDS) to 1,160 mg/L. TDS concentrations increase throughout the year as the reservoir volume decreases. A slight decrease in TDS was seen in the 2010 runoff period followed by an increase as the reservoir volume decreased. The spilling that occurred during the 2011 runoff period significantly reduced the total dissolved

solids to 391 mg/L. TDS has steadily increased in the reservoir from 643 mg/L in the spring 2020 to 1080 mg/L in the spring of 2023. This steady increase can be attributed to the continued decrease in reservoir volumes over this period, this observation is further cemented by the rapid decrease in TDS to 350 mg/L during the above average 2023 spring runoff and the steady increase to 989 mg/L observed throughout the 2024 year as the reservoir volume decreased (Figure 3.21).

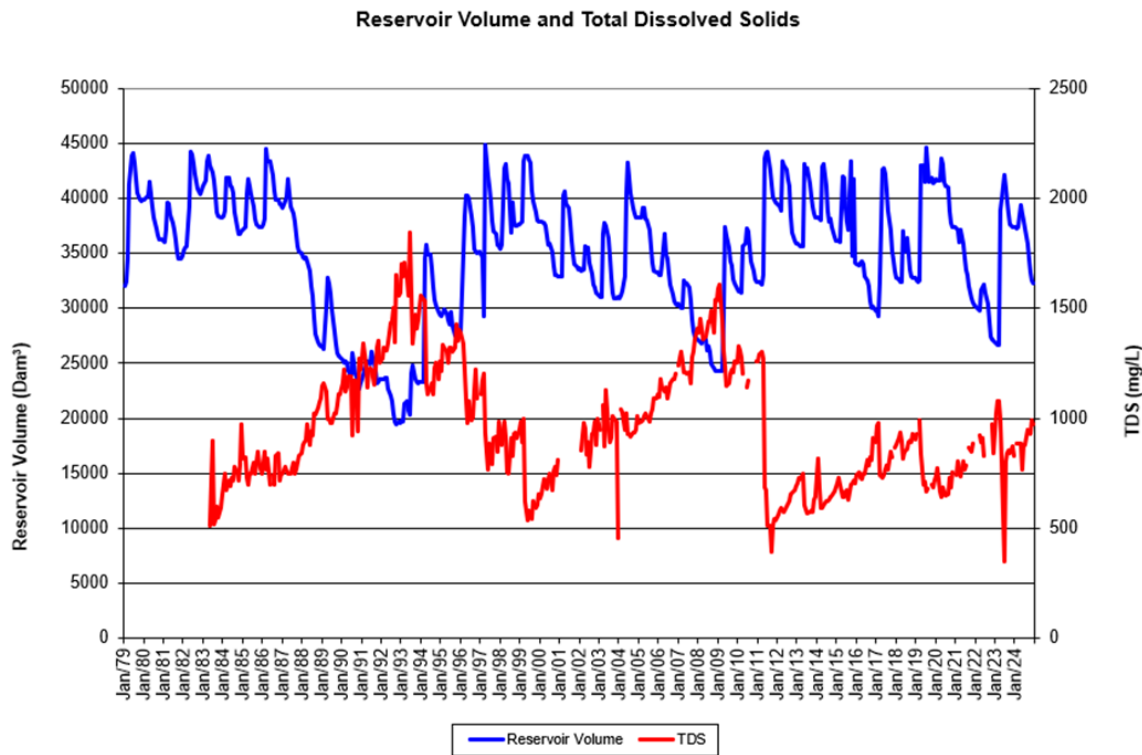


Figure 3.21 Reservoir Volume and Total Dissolved Solids Concentrations from 1979-2024 for Cookson Reservoir

### **3.5 Air Quality**

In 2021, SaskPower received approval from Saskatchewan Ministry of Environment to discontinue Continuous Emissions Monitoring System (CEMS) monitoring at Poplar River Power Station (PRPS). Over the course of their operation, CEMS data has proven to be inaccurate for quantification and provides little to no operational value. Current reporting of annual emissions uses coal quality data, mass balance calculations, stack testing data and operational data. Data for annual stack gas emissions for SO<sub>2</sub> and Oxides of Nitrogen (expressed as NO<sub>2</sub>) utilizing these methodologies has been provided in Table 3.7.

In 2024, the ambient air monitoring station was in full operation for the calendar year. SaskPower's ambient SO<sub>2</sub> monitoring one-hour average standard was 1.4 µg/m<sup>3</sup> with a minimum and maximum of 0 and 186 µg/m<sup>3</sup> respectively. There were 1 hours in exceedance of the 1-hour Saskatchewan Ambient Air Quality standards (SAAQ) of 450 µg/m<sup>3</sup>. SaskPower's ambient SO<sub>2</sub> monitoring 24-hour average was 1.4 µg/m<sup>3</sup> with a minimum and maximum of 0.0 µg/m<sup>3</sup> and 24.8 µg/m<sup>3</sup> respectively. There were 0 exceedances of the 24- hour SAAQS of 125 µg/m<sup>3</sup>. The 2024 geometric mean for the continuous suspended-particulate sampler was 8.6 µg/m<sup>3</sup>.

**TABLE NO. 3.7  
POPLAR RIVER POWER STATION  
2024 TOTAL ANNUAL STACK EMISSIONS**

**STACK GAS Sulfur Dioxide (SO<sub>2</sub>) & Oxides of Nitrogen (NO<sub>2</sub>)**

<b>Month</b>	<b>SO<sub>2</sub> (tonnes)</b>	<b>NO<sub>2</sub> (tonnes)</b>
<b>January</b>	<b>3498</b>	<b>1014</b>
<b>February</b>	<b>3193</b>	<b>1037</b>
<b>March</b>	<b>3704</b>	<b>1081</b>
<b>April</b>	<b>3033</b>	<b>976</b>
<b>May</b>	<b>2618</b>	<b>750</b>
<b>June</b>	<b>1954</b>	<b>530</b>
<b>July</b>	<b>3695</b>	<b>1167</b>
<b>August</b>	<b>3648</b>	<b>1141</b>
<b>September</b>	<b>3096</b>	<b>986</b>
<b>October</b>	<b>2292</b>	<b>899</b>
<b>November</b>	<b>2900</b>	<b>1020</b>
<b>December</b>	<b>2721</b>	<b>951</b>
<hr/>		
<b>2024</b>	<b>3029 (Average)</b>	<b>963 (Average)</b>

**TABLE NO. 3.8  
POPLAR RIVER POWER STATION  
TOTAL SUSPENDED PARTICULATE CONCENTRATIONS  
2024**

<b>CONCENTRATION (ug/m<sup>3</sup>/24 hours)</b>			
<b><u>Month</u></b>	<b><u>Mean</u></b>	<b><u>High</u></b>	<b><u>Low</u></b>
<b>January</b>	<b>6.5</b>	<b>29.8</b>	<b>1.7</b>
<b>February</b>	<b>4.6</b>	<b>20.4</b>	<b>2.4</b>
<b>March</b>	<b>7.7</b>	<b>23.0</b>	<b>1.7</b>
<b>April</b>	<b>14.0</b>	<b>33.0</b>	<b>3.3</b>
<b>May</b>	<b>14.1</b>	<b>96.9</b>	<b>2.1</b>
<b>June</b>	<b>11.9</b>	<b>26.8</b>	<b>3.9</b>
<b>July</b>	<b>27.8</b>	<b>78.3</b>	<b>8.4</b>
<b>August</b>	<b>29.9</b>	<b>84.1</b>	<b>8.9</b>
<b>September</b>	<b>21.5</b>	<b>66.0</b>	<b>5.0</b>
<b>October</b>	<b>14.9</b>	<b>48.1</b>	<b>2.8</b>
<b>November</b>	<b>4.9</b>	<b>18.3</b>	<b>2.2</b>
<b>December</b>	<b>**</b>	<b>**</b>	<b>**</b>
<b>2024</b>	<b>14.3</b>	<b>96.9</b>	<b>1.7</b>
	<b>(Geometric Mean)</b>	<b>(Maximum)</b>	<b>(Minimum)</b>

\*\*December total suspended particulate data had to be invalidated due to persistent leaks being detected in the unit. The unit was repaired for the January 2025 sampling period.

**POPLAR RIVER POWER STATION  
 AMBIENT Sulphur Dioxide DETECTED LEVELS  
 2024**

**Table No.3.9  
 Ambient Sulphur Dioxide Detected Levels  
 2024**

Month	SO <sub>2</sub> conc (ppb)	
	Hourly	Daily
January	1.5	1.5
February	1.9	1.9
March	3.8	3.8
April	0.5	0.5
May	3.9	4.0
June	1.2	1.2
July	3.1	3.0
August	1.5	1.5
September	1.0	1.0
October	0.5	0.5
November	1.1	1.1
December	1.0	1.0

**3.6 Quality Control**

**3.6.1 Streamflow**

Water Survey of Canada, Regina Office and the USGS were able to make comparison measurements at the East Poplar at International Boundary site on November 7, 2024. The measurement compared well within the measurement error based on conditions at the site.

The USGS exchanged streamflow records for the East Poplar and Poplar River at International boundary sites for 2024. The records were checked and approved by the Water Survey of Canada.

### **3.6.2 Water Quality**

No discrete surface water quality samples for the East Poplar River at the International Boundary were collected during 2024.

## **4.0 Conclusion**

In 2024, the Poplar River Bilateral Monitoring Committee continued to provide oversight in fulfillment of the obligations and arrangements in managing waters in the Poplar River watershed. All obligations and requirements were met at the international boundary. Discussion continued on the implications of a potential decommissioning of the power plant by 2030.

The Committee met multiple times during the year to discuss sampling activities, streamflow apportionment, monitoring and reporting. For the annual meeting, the committee met virtually in July and the meeting was hosted by Canada. All agencies participating in the Poplar River Bilateral Monitoring Committee were able to carry out planned activities during 2024.

Despite dry and drought conditions in and around the basin, the IJC-recommended apportionment of minimum flow and the demand release were fully met in 2024. The requested on-demand release period was significantly longer than usual, but this did not cause any issues.

The Committee's Water Quality Working Group recommended updating table 2.1 with two new parameters (Selenium and E.coli), suggested objectives for the two new parameters, and updated the frequency of recommended sampling for all parameters in the table. Discussion is ongoing regarding the two new objectives, and a potential source of funding for the proposed sampling frequency, and once completed, all the recommendations will be forwarded to the Committee. Ultimately, the recommendations will have to be approved by Governments prior to implementation. In 2024, both the statistically derived boron and TDS concentrations were below both the short- and long-term objectives at the East Poplar River International Boundary location.

**ANNEX 1**

**POPLAR RIVER**

**COOPERATIVE MONITORING ARRANGEMENT**

**CANADA-UNITED STATES**



POPLAR RIVER COOPERATIVE MONITORING ARRANGEMENT

I. PURPOSE

This Arrangement will provide for the exchange of data collected as described in the attached Technical Monitoring Schedules in water-quality, water quantity and air quality monitoring programs being conducted in Canada and the United States at or near the International Boundary in response to SaskPower development. This Arrangement will also provide for the dissemination of the data in each country and will assure its comparability and assist in its technical interpretation.

The Arrangement will replace and expand upon the quarterly information exchange program instituted between Canada and the United States in 1976.

II. PARTICIPATING GOVERNMENTS

Governments and government agencies participating in the Arrangement are:

Government of Canada: Environment Canada

Government of the Province of Saskatchewan:

Saskatchewan Environment and Resource Management

Government of the United States of America: United States Geological Survey

Government of the State of Montana: Executive Office

III. POPLAR RIVER MONITORING COMMITTEE: TERMS OF REFERENCE

A binational committee called the Poplar River Bilateral Monitoring Committee will be established to carry out responsibilities assigned to it under this Arrangement. The Committee will operate in accordance with the following terms of reference:

A. Membership

The Committee will be composed of four representatives, one from each of the participating Governments. It will be jointly chaired by the Government of Canada and the Government of the United States. There will be a Canadian Section and a United States Section. The participating Governments will notify each other of any changes in membership on the Committee. Co-chairpersons may by mutual agreement invite agency technical experts to participate in the work of the Committee.

The Governor of the State of Montana may also appoint a chief elective official of local government to participate as an ex-officio member of the Committee in its technical deliberations. The Saskatchewan Minister of the Environment may also appoint a similar local representative.

B. Functions of the Committee

The role of the Committee will be to fulfil the purpose of the Arrangement by ensuring the exchange of monitored data in accordance with the attached Technical Monitoring Schedules, and its collation and technical interpretation in reports to Governments on implementation of the Arrangement. In addition, the Committee will review the existing monitoring systems to ensure their adequacy and may recommend to the Canadian and United States Governments any modifications to improve the Technical Monitoring Schedules.

1. Information Exchange

Each Co-chairperson will be responsible for transmitting to his counterpart Co-chairperson on a regular annual basis, the data provided by the cooperative monitoring agencies in accordance with the Technical Monitoring Schedules.

## 2. Reports

- (a) The Committee will prepare a joint Annual Report to the participating governments, and may at any time prepare joint Special Reports.
- (b) Annual Reports will
  - i) summarize the main activities of the Committee in the year under Report and the data which has been exchanged under the Arrangement;
  - ii) draw to the attention of the participating governments any definitive changes in the monitored parameters, based on collation and technical interpretation of exchanged data (i.e. the utilization of summary, statistical and other appropriate techniques);
  - iii) draw to the attention of the participating governments any recommendations regarding the adequacy or redundancy of any scheduled monitoring operations and any proposals regarding modifications to the Technical Monitoring Schedules, based on a continuing review of the monitoring programs including analytical methods to ensure their comparability.
- (c) Special Reports may, at any time, draw to the attention of participating governments definitive changes in monitored parameters which may require immediate attention.
- (d) Preparation of Reports

Reports will be prepared following consultation with all committee members and will be signed by all Committee members. Reports will be separately forwarded by the Committee Co-chairmen to the participating governments. All annual and special reports will be so distributed.

### 3. Activities of Canadian and United States Sections

The Canadian and United States section will be separately responsible for:

- (a) dissemination of information within their respective countries, and the arrangement of any discussion required with local elected officials;
- (b) verification that monitoring operations are being carried out in accordance with the Technical Monitoring Schedules by cooperating monitoring agencies;
- (c) receipt and collation of monitored data generated by the cooperating monitoring agencies in their respective countries as specified in the Technical Monitoring Schedules;
- (d) if necessary, drawing to the attention of the appropriate government in their respective countries any failure to comply with a scheduled monitoring function on the part of any cooperating agency under the jurisdiction of that government, and requesting that appropriate corrective action be taken.

#### IV. PROVISION OF DATA

In order to ensure that the Committee is able to carry out the terms of this Arrangement, the participating governments will use their best efforts to have cooperating monitoring agencies, in their respective jurisdictions provide on an ongoing basis all scheduled monitored data for which they are responsible.

#### V. TERMS OF THE ARRANGEMENT

The Arrangement will be effective for an initial term of five years and may be amended by agreement of the participating governments. It will be subject to review at the end of the initial term and will be renewed thereafter for as long as it is required by the participating governments.

**ANNEX 2**

**POPLAR RIVER**

**COOPERATIVE MONITORING ARRANGEMENT**

**TECHNICAL MONITORING SCHEDULES**

**2026**

**CANADA-UNITED STATES**



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## **PREAMBLE**

The Technical Monitoring Schedule lists those water quantity, water-quality and air quality monitoring locations and parameters which form the basis for information exchange and reporting to Governments. The structure of the Committee responsible for ensuring the exchange takes place is described in the Poplar River Cooperative Monitoring Arrangement.

The monitoring locations and parameters listed herein have been reviewed by the Poplar River Bilateral Monitoring Committee and represent the basic technical information needed to identify any definitive changes in water quantity, water quality and air quality at the International Boundary. The Schedule was initially submitted to Governments for approval as an attachment to the 1981 report to Governments. Changes in the sampling locations and parameters may be made by Governments based on the recommendations of the Committee.

Additional information has been or is being collected by agencies on both sides of the International Boundary, primarily for project management or basin-wide baseline data purposes. This additional information is usually available upon request from the collecting agency and forms part of the pool of technical information which may be drawn upon by Governments for specific study purposes. Examples of additional information are water-quantity, water-quality, ground-water and air-quality data collected at points in the Poplar River basin not of direct concern to the Committee. In addition, supplemental information on parameters such as vegetation, soils, fish and waterfowl populations and aquatic vegetation has been collected on either a routine or specific-studies basis by various agencies.



POPLAR RIVER

COOPERATIVE MONITORING ARRANGEMENT

TECHNICAL MONITORING SCHEDULES

2026

CANADA

## STREAMFLOW MONITORING

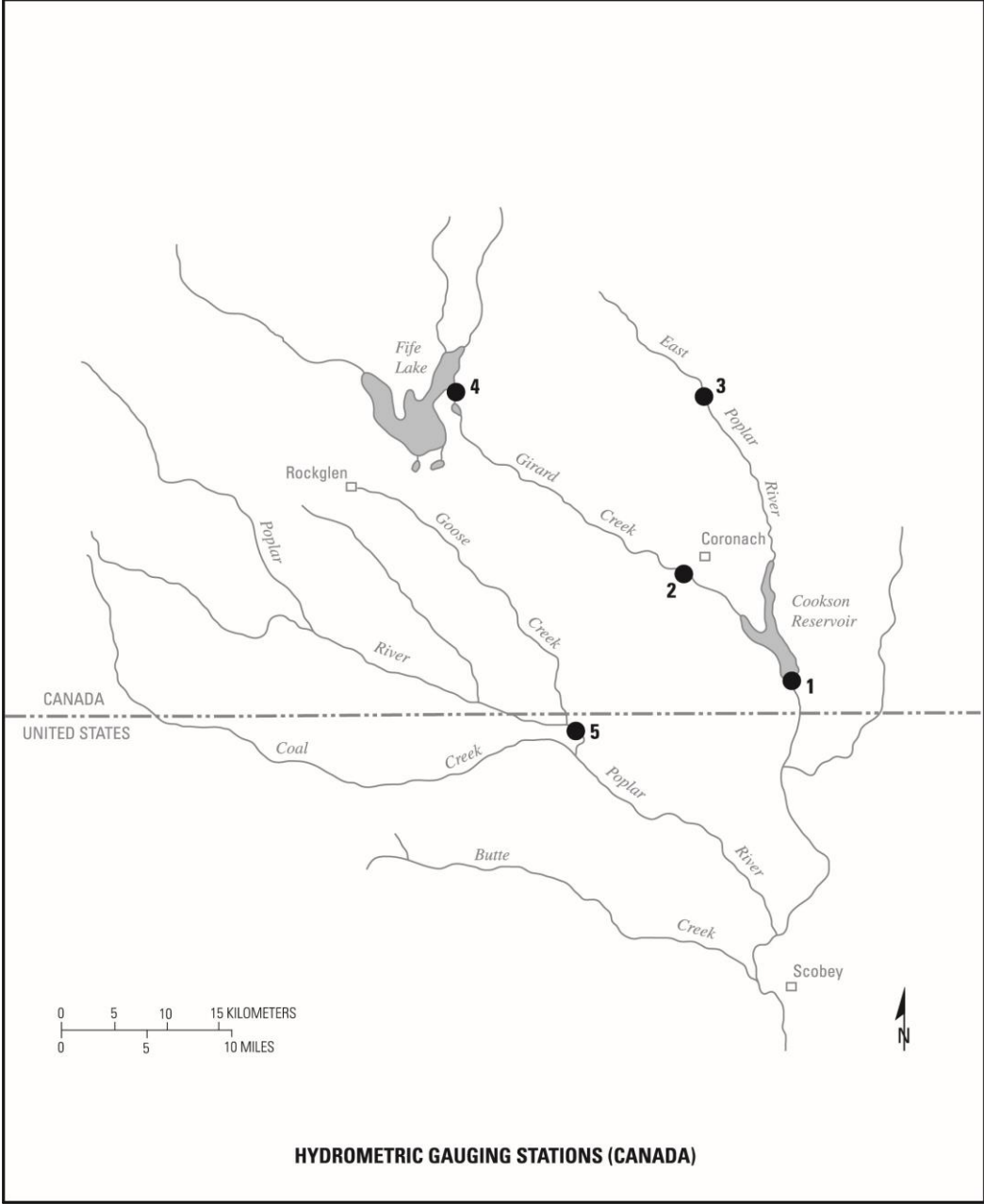
Daily mean discharge or levels and instantaneous monthly extremes as normally published in surface-water-data publications.

<b>Responsible Agencies: Environment Canada, Water Security Agency</b>		
<b>No. on Map</b>	<b>Station No.</b>	<b>Station Name</b>
1	11AE013**	Cookson Reservoir near Coronach
2	11AE015**	Girard Creek near Coronach Cookson Reservoir
3	11AE014**	East Poplar River above Cookson Reservoir
4	7904	Fife Lake Overflow***
5*	11AE008 (06178000)	Poplar River at International Boundary

\* International gauging station. Environment Climate Change Canada is publishing data in metric on the National Water Data Information Archive (HYDAT)

\*\* Water Security Agency (WSA) took over the monitoring responsibility effective July 1, 1992.

\*\*\* Miscellaneous measurements of outflow to be made by SaskPower during periods of outflow only.



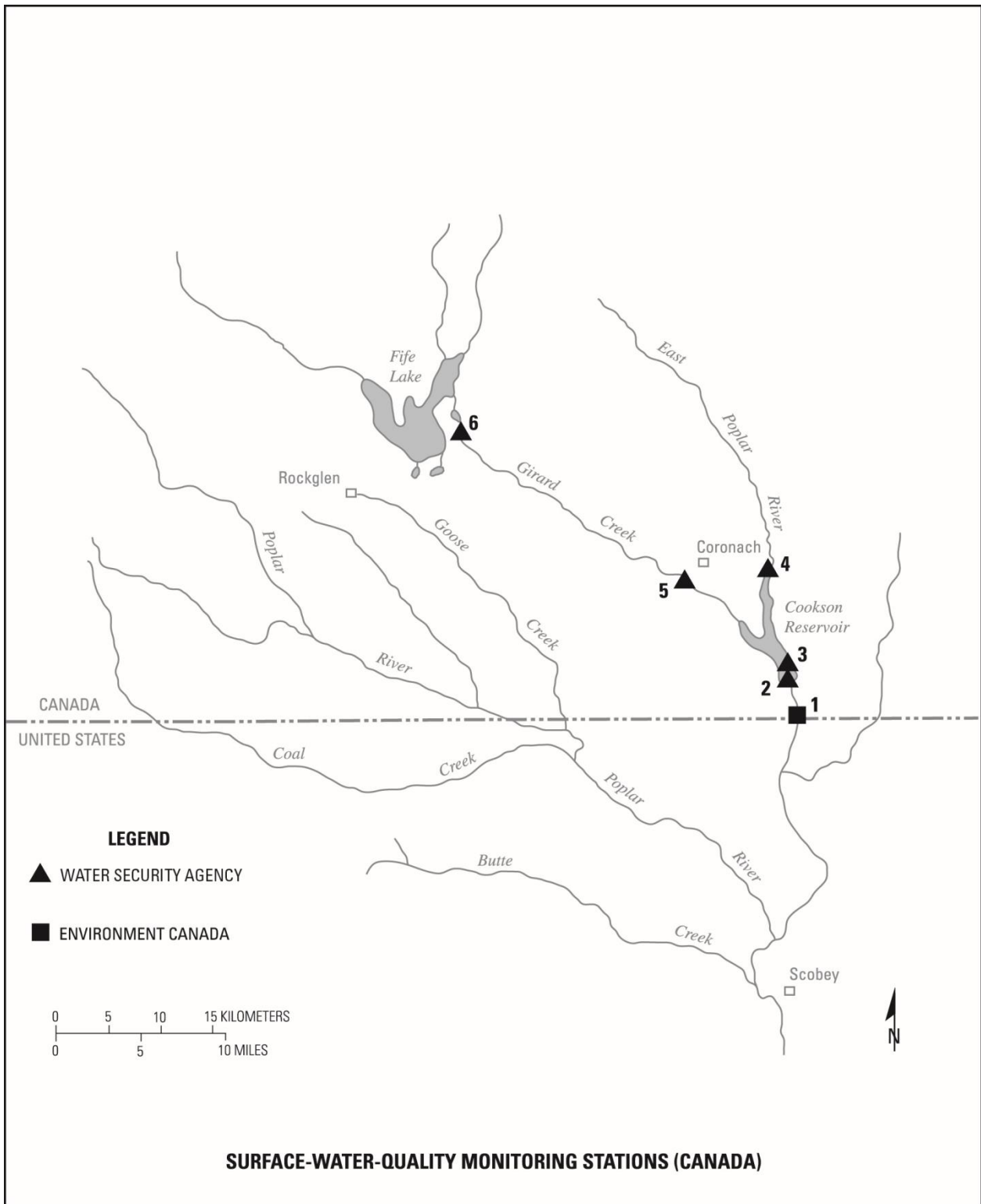
## SURFACE-WATER-QUALITY MONITORING

### Sampling Locations

<b>Responsible Agency: Environment Canada</b>		
<b>No. on Map</b>	<b>Station No.</b>	<b>Station Name</b>
1	00SA11AE0008 Suspended	East Poplar River at International Boundary

<b>Responsible Agency: Water Security Agency</b>		
<b>Data collected by: SaskPower</b>		
<b>No. on Map</b>	<b>Station No.</b>	<b>Station Name</b>
2	12386 Discontinued	East Poplar River at Culvert immediately below Cookson Reservoir
3	12368	Cookson Reservoir near Dam
4	12377 Discontinued	Upper End of Cookson Reservoir at Highway 36
5	12412 Discontinued	Girard Creek at Coronach, Reservoir Outflow
6	7904	Fife Lake Outflow*

\*Sampled only when outflow occurs for a 2-week period, which does not occur every year.



## PARAMETERS

Responsible Agency: Environment Canada			
ENVIRODAT* Code	Parameter	Analytical Method	Sampling Frequency Station No. 1
10151	Alkalinity-phenolphthalein	Potentiometric Titration	SUS
10111	Alkalinity-total	Potentiometric Titration	SUS
13102	Aluminum-dissolved	AA-Direct	SUS
13302	Aluminum-extracted	AA-Direct	SUS
07540	Ammonia-total	Automated Colourimetric	SUS
33108	Arsenic-dissolved	ICAP-hydride	SUS
56001	Barium-total	AA-Direct	SUS
06201	Bicarbonates	Calculated	SUS
05211	Boron-dissolved	ICAP	SUS
96360	Bromoxynil	Gas Chromatography	SUS
48002	Cadmium-total	AA Solvent Extraction	SUS
20113	Calcium	AA-Direct	SUS
06104	Carbon-dissolved organic	Automated IR Detection	SUS
06901	Carbon-particulate	Elemental Analyzer	SUS
06002	Carbon-total organic	Calculated	SUS
06301	Carbonates	Calculated	SUS
17206	Chloride	Automated Colourimetric	SUS
06717	Chlorophyll a	Spectrophotometric	SUS
24003	Chromium-total	AA-Solvent Extraction	SUS
27002	Cobalt-total	AA-Solvent Extraction	SUS
36012	Coliform-fecal	Membrane Filtration	SUS
36002	Coliform-total	Membrane Filtration	SUS
02021	Colour	Comparator	SUS
02041	Conductivity	Wheatstone Bridge	SUS
06610	Cyanide	Automated UV-Colourimetric	SUS
09117	Fluoride-dissolved	Electrometric	SUS
06401	Free Carbon Dioxide	Calculated	SUS
10602	Hardness	Calculated	SUS
17811	Hexachlorobenzene	Gas Chromatography	SUS
08501	Hydroxide	Calculated	SUS
26104	Iron-dissolved	AA-Direct	SUS
82002	Lead-total	AA-Solvent Extraction	SUS
12102	Magnesium	AA-Direct	SUS
25104	Manganese-dissolved	AA-Direct	SUS
07901	N-particulate	Elemental Analyzer	SUS
07651	N-total dissolved	Automated UV Colourimetric	SUS
10401	NFR	Gravimetric	SUS
28002	Nickel-total	AA-Solvent Extraction	SUS
07110	Nitrate/Nitrite	Colourimetric	SUS
07603	Nitrogen-total	Calculated	SUS
10650	Non-Carbonate Hardness	Calculated	SUS
18XXX	Organo Chlorines	Gas Chromatography	SUS
08101	Oxygen-dissolved	Winkler	SUS
15901	P-particulate	Calculated	SUS
15465	P-total dissolved	Automated Colourimetric	SUS
185XX	Phenoxy Herbicides	Gas Chromatography	SUS
15423	Phosphorus-total	Colourimetric (TRAACS)	SUS
19103	Potassium	Flame Emission	SUS
11250	Percent Sodium	Calculated	SUS
011201	SAR	Calculated	SUS
00210	Saturation Index	Calculated	SUS
34108	Selenium-dissolved	ICAP-hydride	SUS
14108	Silica	Automated Colourimetric	SUS
11103	Sodium	Flame Emission	SUS
00211	Stability Index	Calculated	SUS
16306	Sulphate	Automated Colourimetric	SUS
00201	TDS	Calculated	SUS
02061	Temperature	Digital Thermometer	SUS
02073	Turbidity	Nephelometry	SUS
23002	Vanadium-total	AA-Solvent Extraction	SUS
30005	Zinc-total	AA-Solvent Extraction	SUS
10301	pH	Electrometric	SUS
92111	Uranium	Fluometric	SUS

\* - Computer Storage and Retrieval System -- Environment Canada

AA - Atomic Absorption

NFR - Nonfilterable Residue

UV - Ultraviolet

ICAP - Inductively Coupled Argon Plasma.

SUS - Suspended

## PARAMETERS

Responsible Agency: Water Security Agency								
Data Collected by: SaskPower								
ESQUADAT* Code	Parameter	Analytical method	Sampling Frequency Station No.					
			2	3	4	5	6	
10151	Alkalinity-phenol	Pot-Titration	DIS	Q	DIS	DIS	OF	
10101	Alkalinity-tot	Pot-Titration	DIS	Q	DIS	DIS	OF	
13004	Aluminum-tot	AA-Direct	DIS	A	DIS	DIS		
33004	Arsenic-tot	Flameless AA	DIS	A	DIS	DIS		
06201	Bicarbonates	Calculated	DIS	Q	DIS	DIS	OF	
05451	Boron-tot	ICAP	DIS	Q	DIS	DIS	W	
48002	Cadmium-tot	AA-Solvent Extract (MIBK)	DIS	A	DIS	DIS		
20113	Calcium	AA-Direct	DIS	Q	DIS	DIS	OF	
06052	Carbon-tot Inorganic	Infrared	DIS	Q	DIS	DIS	OF	
06005	Carbon-tot Organic	Infrared	DIS	Q	DIS	DIS	OF	
06301	Carbonates	Calculated	DIS	Q	DIS	DIS	OF	
17203	Chloride	Automated Colourimetric	DIS	Q	DIS	DIS	OF	
06711	Chlorophyll- 'a'	Spectrophotometry	DIS	Q	DIS	DIS		
24004	Chromium-tot	AA-Direct	DIS	A	DIS	DIS		
36012	Coliform-fec	Membrane filtration	DIS	Q	DIS	DIS	OF	
36002	Coliform-tot	Membrane filtration	DIS	Q	DIS	DIS	OF	
02041	Conductivity	Conductivity Meter	DIS	Q	DIS	DIS	W	
29005	Copper-tot	AA-Solvent Extract (MIBK)	DIS	A	DIS	DIS		
09105	Fluoride	Specific Ion Electrode	DIS	A	DIS	DIS		
82002	Lead-tot	AA-Solvent Extract (MIBK)	DIS	A	DIS	DIS		
12102	Magnesium	AA-Direct	DIS	Q	DIS	DIS	OF	
80011	Mercury-tot	Flameless-AA	DIS	A	DIS	DIS		
42102	Molybdenum	AA-Solvent Extract (N-Butyl acetate)	DIS	A	DIS	DIS		
07015	N-TKN	Automated Colourimetric	DIS	Q	DIS	DIS	OF	
10401	NFR	Gravimetric	DIS	Q	DIS	DIS	OF	
10501	NFR( F)	Gravimetric	DIS	Q	DIS	DIS	OF	
28002	Nickel-tot	AA-Solvent Extract (MIBK)	DIS	Q	DIS	DIS	OF	
07110	Nitrate + NO <sub>2</sub>	Automated Colourimetric	DIS	Q	DIS	DIS	OF	
06521	Oil and Grease	Pet. Ether Extraction	DIS	A	DIS	DIS		
08102	Oxygen-diss	Meter	DIS	Q	DIS	DIS	OF	
15406	Phosphorus-tot	Colourimetry	DIS	Q	DIS	DIS	OF	
19103	Potassium	Flame Photometry	DIS	Q	DIS	DIS	OF	
34005	Selenium-Ext	Hydride generation	DIS	A	DIS	DIS		
11103	Sodium	Flame Photometry	DIS	Q	DIS	DIS	OF	
16306	Sulphate	Colourimetry	DIS	Q	DIS	DIS	OF	
10451	TDS	Gravimetric	DIS	Q	DIS	DIS	OF	
02061	Temperature	Thermometer	DIS	Q	DIS	DIS	OF	
23004	Vanadium-tot	AA-Direct	DIS	A	DIS	DIS		
30005	Zinc-tot	AA-Solvent Extract (MIBK)	DIS	A	DIS	DIS		
10301	pH	Electrometric	DIS	Q	DIS	DIS	W	

\* Computer storage and retrieval system - Water Security Agency.

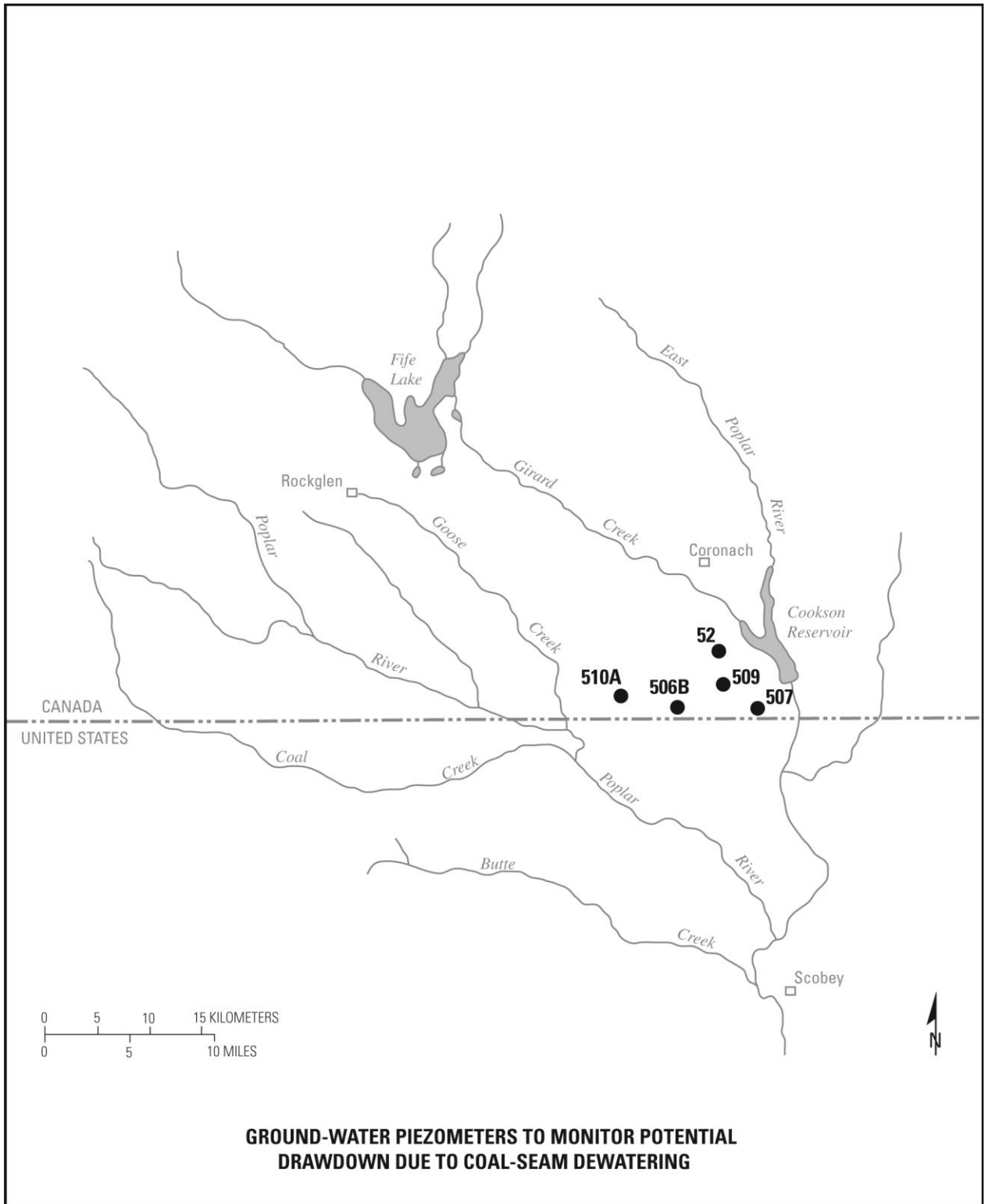
**Symbols:**

W – Weekly during overflow; OF– Once during each period of overflow greater than 2 weeks' duration;  
 Q – Quarterly; A – Annually; AA – Atomic Absorption; Pot – Potentiometric; tot – total; Pet – Petroleum;  
 fec – fecal; diss – dissolved; EXT – extract; NFR – Nonfilterable residue; NFR(F) – Nonfilterable residue, fixed;  
 ICAP – Inductively Coupled Argon Plasma; (MIBK) – sample acidified and extracted with Methyl Isobutyl Ketone;  
 DIS - Discontinued.

**GROUNDWATER PIEZOMETERS TO MONITOR POTENTIAL DRAWDOWN  
DUE TO COAL-SEAM DEWATERING NEAR THE INTERNATIONAL BOUNDARY**

<b>Responsible Agency: Water Security Agency*</b>			
<b>Measurement Frequency: Quarterly</b>			
<b>Piezometer Number</b>	<b>Location</b>	<b>Tip of Screen Elevation (m)</b>	<b>Perforation Zone (depth in metres)</b>
52	NW 14-1-27 W3	738.43	43-49 (in coal)
506B	SW 4-1-27 W3	48.27	81-82 (in coal)
507	SW 6-1-26 W3	725.27	34 - 35 (in coal)
509	NW 11-1-27 W3	725.82	76-77 (in coal)
510A	NW 1-1-28 W3	769.34	28-29 (in coal and clay)

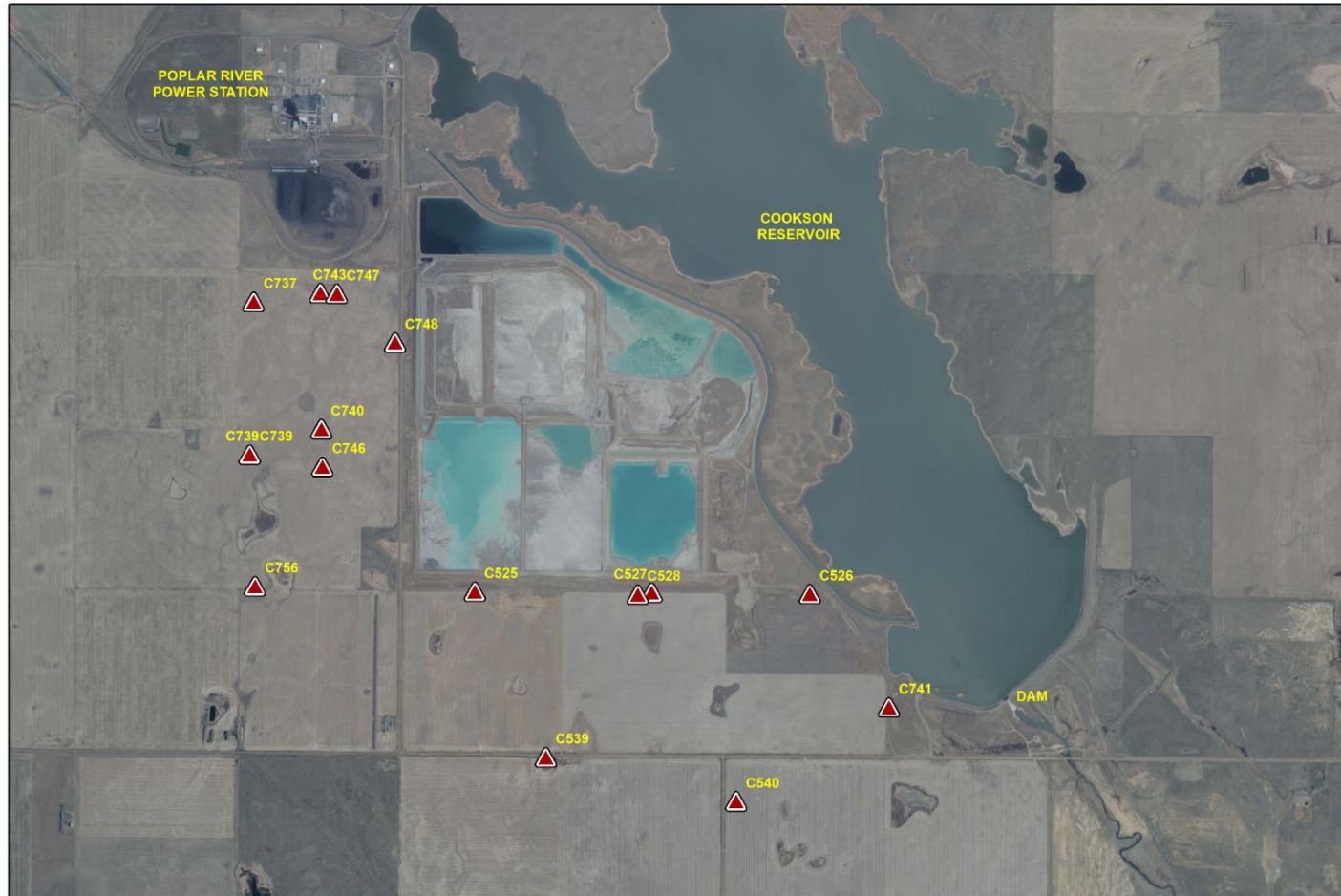
\*Data Collected by: SaskPower



GROUNDWATER PIEZOMETER MONITORING POPLAR RIVER POWER STATION AREA--WATER LEVELS	
<b>SPC Piezometer Number</b>	<b>Completion Formation</b>
C525	Empress
C526	Empress
C527	Empress
C539	Empress
C540	Empress
C737	Empress
C739	Empress
C740	Empress
C741	Empress
C743	Empress
C756	Empress

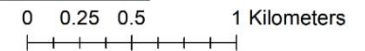
GROUNDWATER PIEZOMETER MONITORING POPLAR RIVER POWER STATION AREA--WATER QUALITY	
<b>SPC Piezometer Number</b>	<b>Completion Formation</b>
C526	Empress
C540	Empress
C741	Empress

# POPLAR RIVER POWER STATION MONITORING LOCATIONS



## LEGEND

 EMPRESS



GROUNDWATER PIEZOMETER MONITORING ASH LAGOON AREA--WATER LEVEL	
SPC Piezometer Number	Completion Formation
C533	Empress
C534	Oxidized Till
C654	Unoxidized Till
C711	Oxidized Till
C712A	Unoxidized Till
C712B	Intra Till Sand
C712C	Mottled Till
C712D	Oxidized Till
C713	Oxidized Till
C714A	Unoxidized Till
C714B	Unoxidized Till
C714C	Oxidized Till
C714D	Oxidized Till
C714E	Empress
C715	Oxidized Till
C717	Oxidized Till
C720	Oxidized Till
C721	Oxidized Till
C722	Oxidized Till
C723	Oxidized Till
C725	Oxidized Till
C726B	Unoxidized Till

GROUNDWATER PIEZOMETER MONITORING ASH LAGOON AREA--WATER LEVEL	
SPC Piezometer Number	Completion Formation
C726C	Oxidized Till
C726E	Empress
C728A	Oxidized Till
C728C	Mottled Till
C728D	Oxidized Till
C728E	Empress
C741	Empress
C742	Empress
C758	Intra Till Sand
C763A	Mottled Till
C763B	Oxidized Till
C763D	Unoxidized Till
C763E	Empress

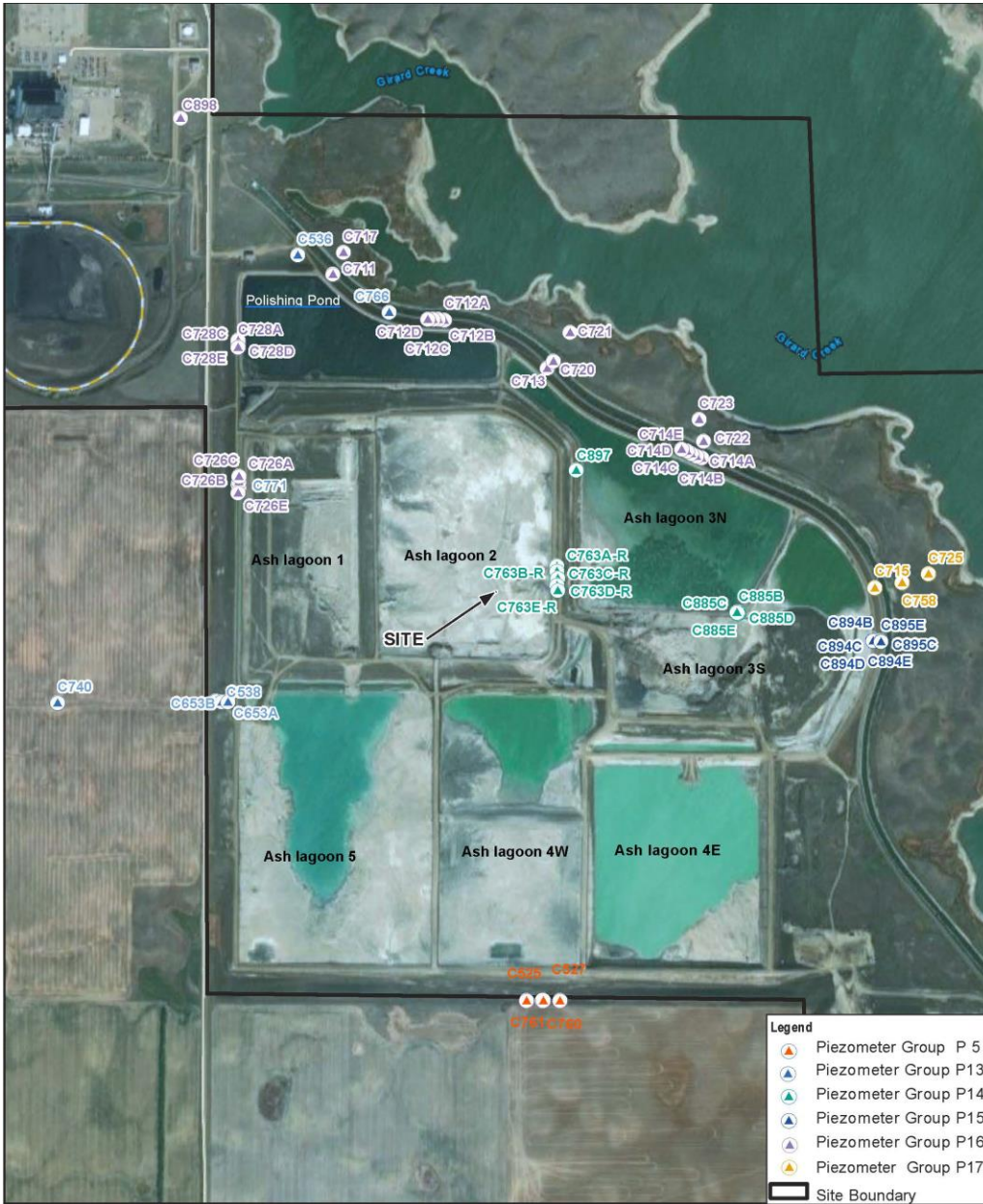
GROUNDWATER PIEZOMETER MONITORING ASH LAGOON AREA -- WATER QUALITY	
SPC Piezometer Number	Completion Formation
C533	Empress
C534	Oxidized Till
C654	Unoxidized Till
C711	Oxidized Till
C712A	Unoxidized Till
C712B	Intra Till Sand
C712C	Mottled Till
C712D	Oxidized Till
C713	Oxidized Till
C714A	Unoxidized Till
C714B	Unoxidized Till
C714C	Oxidized Till
C714D	Oxidized Till
C714E	Empress

GROUNDWATER PIEZOMETER MONITORING  
ASH LAGOON AREA -- WATER QUALITY

SPC Piezometer Number	Completion Formation
C715	Oxidized Till
C717	Oxidized Till
C720	Oxidized Till
C721	Oxidized Till
C722	Oxidized Till
C723	Oxidized Till
C725	Oxidized Till
C726B	Unoxidized Till
C726C	Oxidized Till
C726E	Empress
C728A	Oxidized Till
C728C	Mottled Till
C728D	Oxidized Till
C728E	Empress
C741	Empress
C742	Empress
C758	Intra Till Sand
C763A	Mottled Till
C763B	Oxidized Till
C763D	Unoxidized Till
C763E	Empress



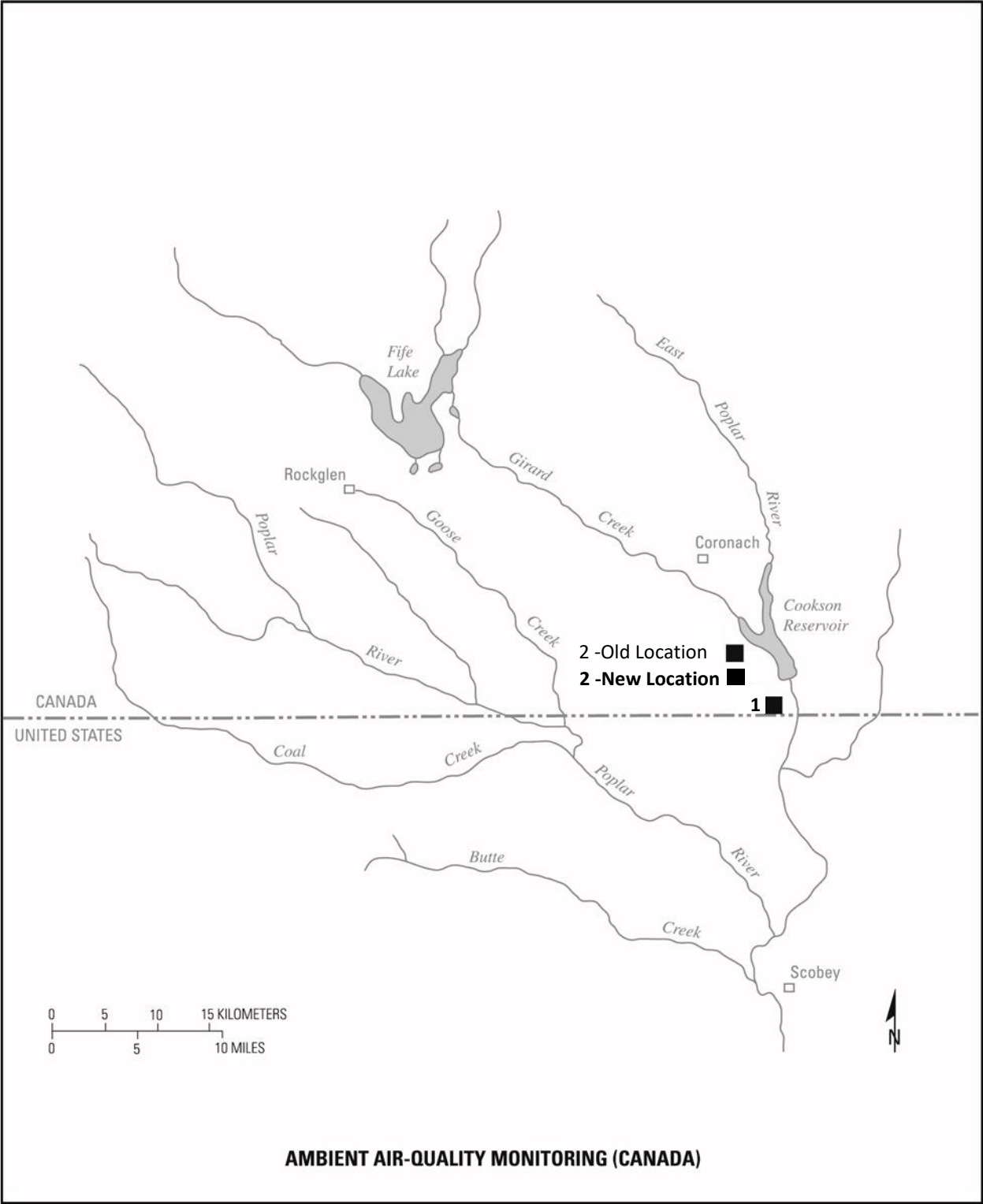
# POPLAR RIVER POWER STATION ASH LAGOON MONITORING LOCATIONS 2024



## Ambient Air-Quality Monitoring

<b>Responsible Agency: Saskatchewan Environment</b>			
<b>Data Collected by: SaskPower</b>			
<b>No. On Map</b>	<b>Location</b>	<b>Parameters</b>	<b>Reporting Frequency</b>
1	International Boundary	Sulphur Dioxide Total Suspended Particulate	Continuous monitoring with hourly averages as summary statistics. 24-hour samples on 6-day cycle, corresponding to the national air pollution surveillance sampling schedule.
2	Poplar River Power Station	Wind Speed and Direction	Continuous monitoring with hourly averages as summary statistics
<b>METHODS</b>			
Sulphur Dioxide		Saskatchewan Environment Pulsed fluorescence	
Total Suspended Particulate		Saskatchewan Environment High Volume Method	

SaskPower re-located its Ambient Air Quality monitoring station to another location directly south of the Power Plant. Total Suspended Particulate and SO<sub>2</sub> will continue to be monitored at the new location. The relocation took place in October 2019. The Ambient Air Quality Map was updated to show the new location.





POPLAR RIVER

COOPERATIVE MONITORING ARRANGEMENT

TECHNICAL MONITORING SCHEDULES

2026

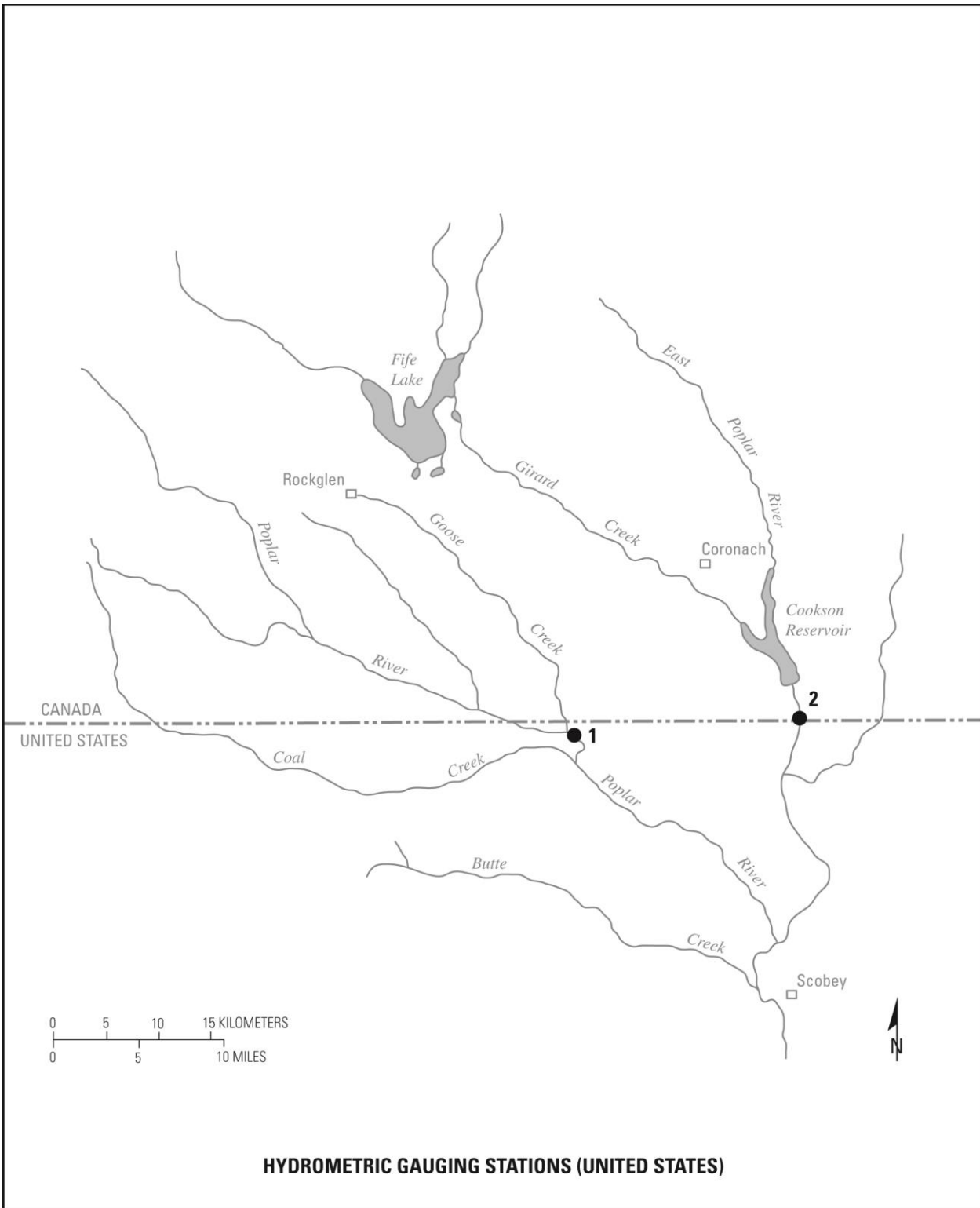
UNITED STATES

## STREAMFLOW MONITORING

Daily mean discharge and monthly statistics as normally published in surface-water-data publications.

Responsible Agency: U.S. Geological Survey		
No. on Map	Station Number	Station Name
1*	06178000 (11AE008)	Poplar River at International Boundary
2*	06178500 (11AE003)	East Poplar River at International Boundary

\* International gauging station.

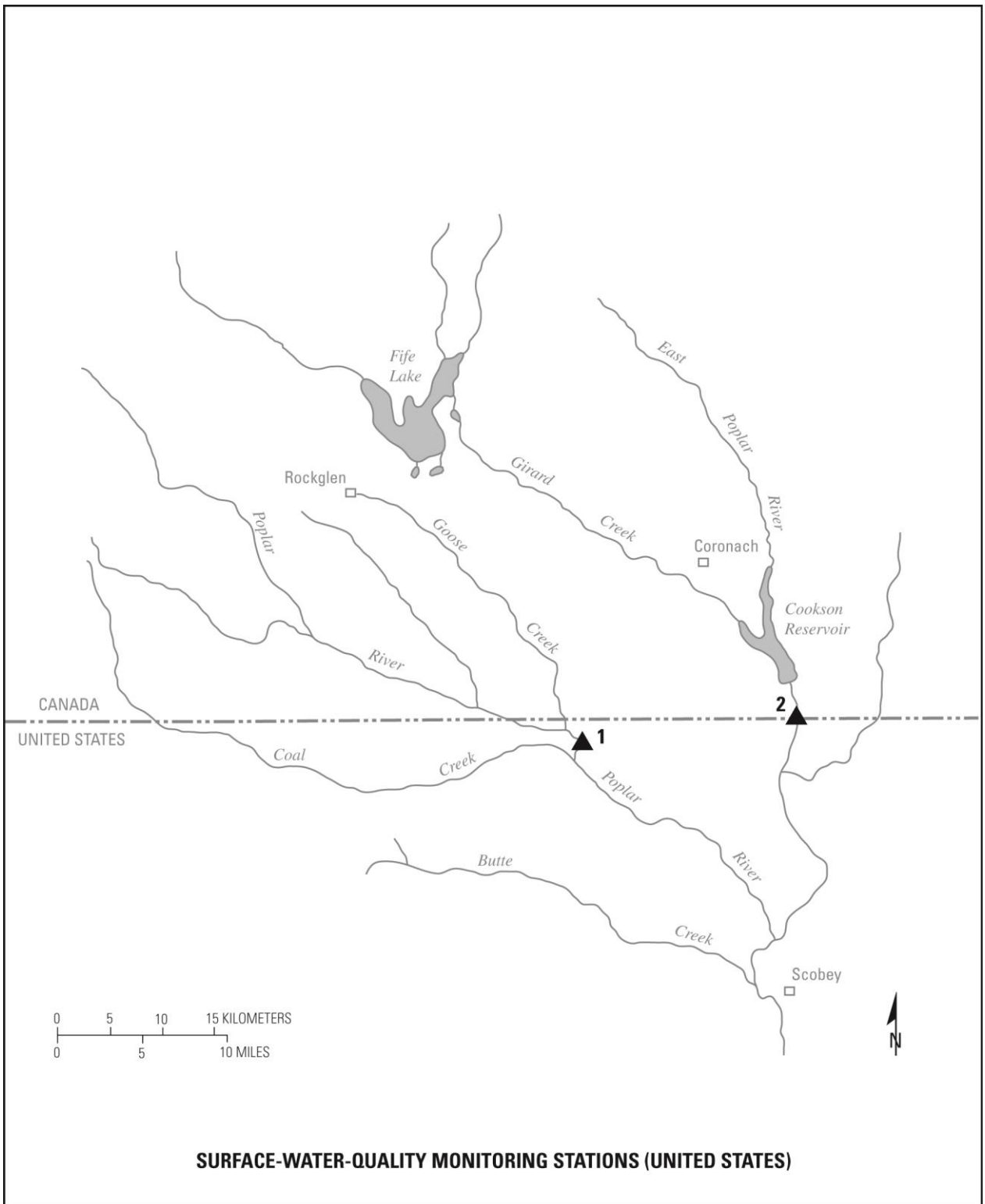


**SURFACE-WATER-QUALITY MONITORING -- Station Locations**

<b>Responsible Agency: U.S. Geological Survey</b>				
<b>No. On Map</b>	<b>USGS Station No.</b>	<b>STATION NAME</b>		
1	06178000	Poplar River at International Boundary		
2	06178500	East Poplar River at International Boundary		
<b>PARAMETERS</b>				
			<b>Annual Sampling Frequency</b>	
<b>Analytical Code</b>	<b>Parameter</b>	<b>Analytical Method</b>	<b>Site 1*</b>	<b>Site 2**</b>
29801	Alkalinity - lab	Fixed endpoint Titration	SUS	SUS
00608	Ammonia - diss	Colorimetric	SUS	SUS
01002	Arsenic - tot	ICP, MS	SUS	SUS
00025	Barometric pressure	Barometer, field	SUS	SUS
01020	Boron - diss	ICP	SUS	SUS
01027	Cadmium - tot/rec	ICP, MS	SUS	SUS
00915	Calcium - diss	ICP, AES	SUS	SUS
00940	Chloride - diss	IC	SUS	SUS
00095	Conductivity	Electrometric, field	SUS	SUS
00061	Discharge - inst	Direct measurement	SUS	SUS
00900	Hardness	Calculated	SUS	SUS
00950	Fluoride - diss	ISE	SUS	SUS
01051	Lead - tot/rec	ICP, MS	SUS	SUS
00925	Magnesium - diss	ICP	SUS	SUS
00613	Nitrate - diss	Colorimetric	SUS	SUS
00631	Nitrate + Nitrite - diss	Colorimetric	SUS	SUS
62855	Nitrogen, total	Colorimetric	SUS	SUS
00300	Oxygen-diss	Oxygen membrane, field	SUS	SUS
00400	pH	Electrometric, field	SUS	SUS
00671	Phos, Ortho-diss	Colorimetric	SUS	SUS
00665	Phosphorous - tot	Colorimetric	SUS	SUS
00935	Potassium - diss	ICP, AES	SUS	SUS
00931	SAR	Calculated	SUS	SUS
80154	Sediment - conc.	Filtration-Gravimetric	SUS	SUS
70331	Sediment - %<.063mm	Sieve	SUS	SUS
80155	Sediment - load	Calculated	SUS	SUS
00955	Silica - diss	ICP, AES	SUS	SUS
00930	Sodium - diss	ICP, AES	SUS	SUS
00945	Sulphate - diss	IC	SUS	SUS
70301	Total Dissolved Solids	Calculated	SUS	SUS
00010	Temp Water	Stem Thermometer	SUS	SUS
00020	Temp Air	Stem Thermometer	SUS	SUS
01092	Zinc - tot/rec	ICP, MS	SUS	SUS

Samples collected obtained during the monthly periods:

**Abbreviations:** AES - atomic emission spectroscopy; **conc.** - concentration; **diss** - dissolved; **IC** - ion exchange chromatography; **ICP** - inductively coupled plasma; **ISE** - ion-selective electrode; **MS** - mass spectroscopy; **Org** - organic; **phos.** - phosphate; **SAR** - sodium adsorption ratio; **QRT** - quarterly, **SUS** - sampling suspended; **tot** - total; **tot/rec** - total recoverable



## GROUND-WATER-QUALITY MONITORING -- Station Locations

Map Number	Well Location	Total Depth (m)	Casing Diameter (cm)	Aquifer	Perforation Zone (m)
7	37N47E12BBBB	44.1	10.2	Hart Coal	39-44
9	37N47EAADD	63.7	10.2	Fort Union	16.2-61.9
24	37N48E5AB	9.6	10.2	Alluvium	9.2-9.6

### Parameters

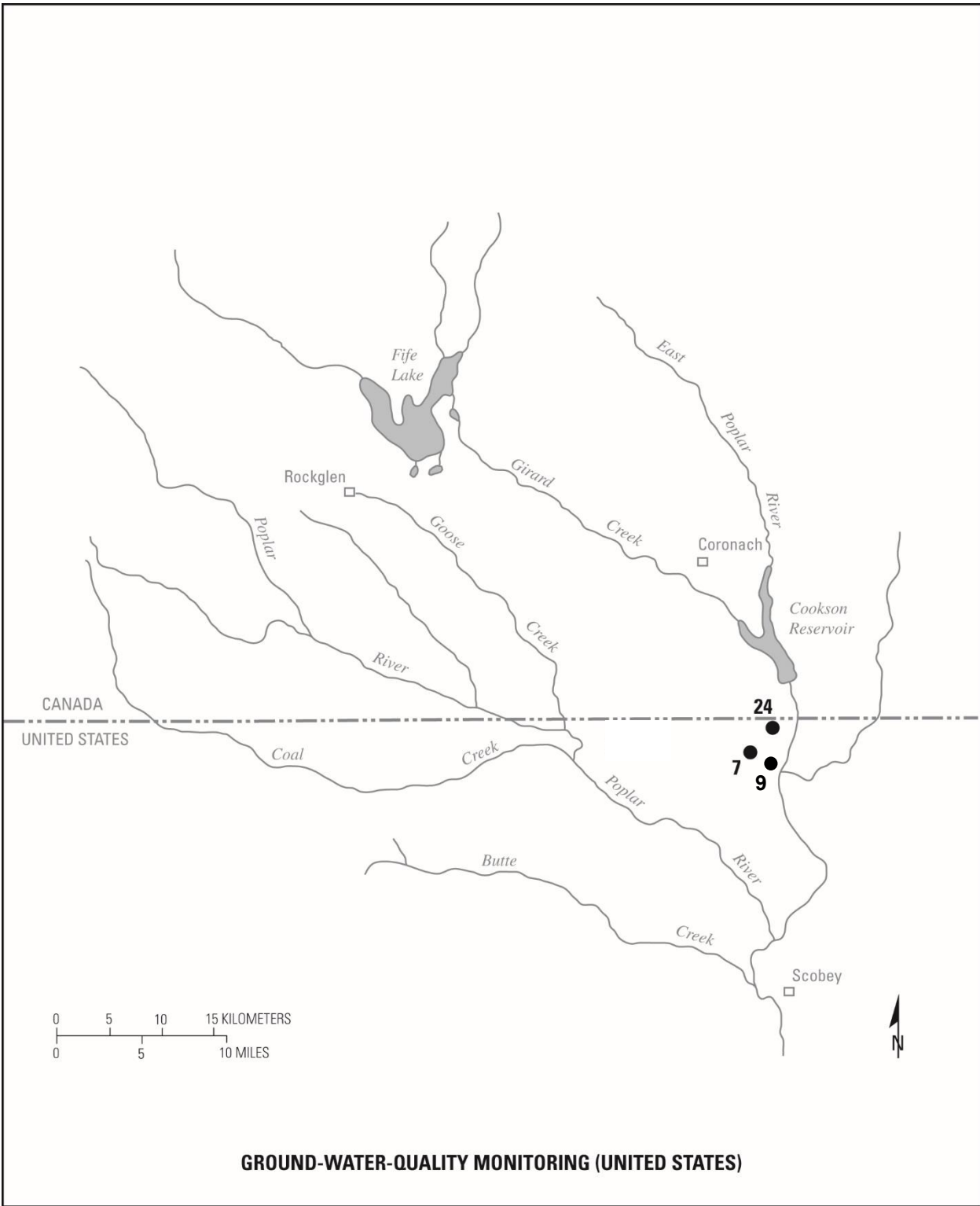
Storet ** Code	Parameter	Analytical Method	Sampling Frequency Station No.
00410	Alkalinity	Calculated	Sample collection is annually for all locations identified above.  The analytical method descriptions are those of the Montana Bureau of Mines and Geology Laboratory where the samples are analyzed.
01106	Aluminum dissolved	ICP or ICP-MS	
01095	Antimony dissolved	ICP or ICP-MS	
50250	Arsenic dissolved	ICP or ICP-MS	
01005	Barium dissolved	ICP or ICP-MS	
01010	Beryllium dissolved	ICP or ICP-MS	
00440	Bicarbonates	Electrometric Titration	
01020	Boron-diss	Emission Plasma, ICP	
82298	Bromide	Ion Chromatography	
01025	Cadmium,dissolved	ICP or ICP-MS	
00915	Calcium	Emission Plasma	
00445	Carbonates	Electrometric Titration	
00940	Chloride	Ion Chromatography	
01030	Chromium, dissolved	ICP or ICP-MS	
01035	Cobalt, dissolved	ICP or ICP-MS	
00095	Conductivity	Wheatstone Bridge	
01040	Copper, dissolved	ICP or ICP-MS	
00950	Fluoride	Ion Chromatography	
09000	Hardness	Calculated	
01046	Iron-diss	Emission Plasma, ICP	
01049	Lead-diss	Emission Plasma, ICP	
01130	Lithium-diss	Emission Plasma, ICP	
00925	Magnesium	Emission Plasma, ICP	
01056	Manganese-diss	Emission Plasma, ICP	
01060	Molybdenum	Emission Plasma, ICP-MS	
01065	Nickel, dissolved	ICP or ICP-MS	
00630	Nitrate	Ion Chromatography	
00671	Orthophosphate	Ion Chromatography	
00400	pH	Electrometric	
00935	Potassium	Emission Plasma, ICP	
00931	SAR	Calculated	
01145	Selenium-diss	ICP-MS	
00955	Silica	Emission Plasma, ICP-MS	
01075	Silver, dissolved	ICP-MS	
00930	Sodium	Emission Plasma, ICP	
01080	Strontium-diss	Emission Plasma, ICP	
00445	Sulphate	Ion Chromatography	
01057	Thallium, dissolved	ICP or ICP-MS	
01150	Titanium, dissolved	ICP or ICP-MS	
28011	Uranium, dissolved	ICP-MS	
01085	Vanadium, dissolved	ICP or ICP-MS	
00190	Zinc-diss	Emission Plasma, ICP	
01160	Zirconium, dissolved	ICP or ICP-MS	
*	Sum of diss. Constituents	Calculated	
70301	TDS	Calculated	

#### SYMBOLS:

\* - Sum of Dissolved Constituents; calculated the same as TDS but includes all reported bicarbonate

\*\* - Computer storage and retrieval system -- EPA ICP – Inductively Coupled Plasma Unit

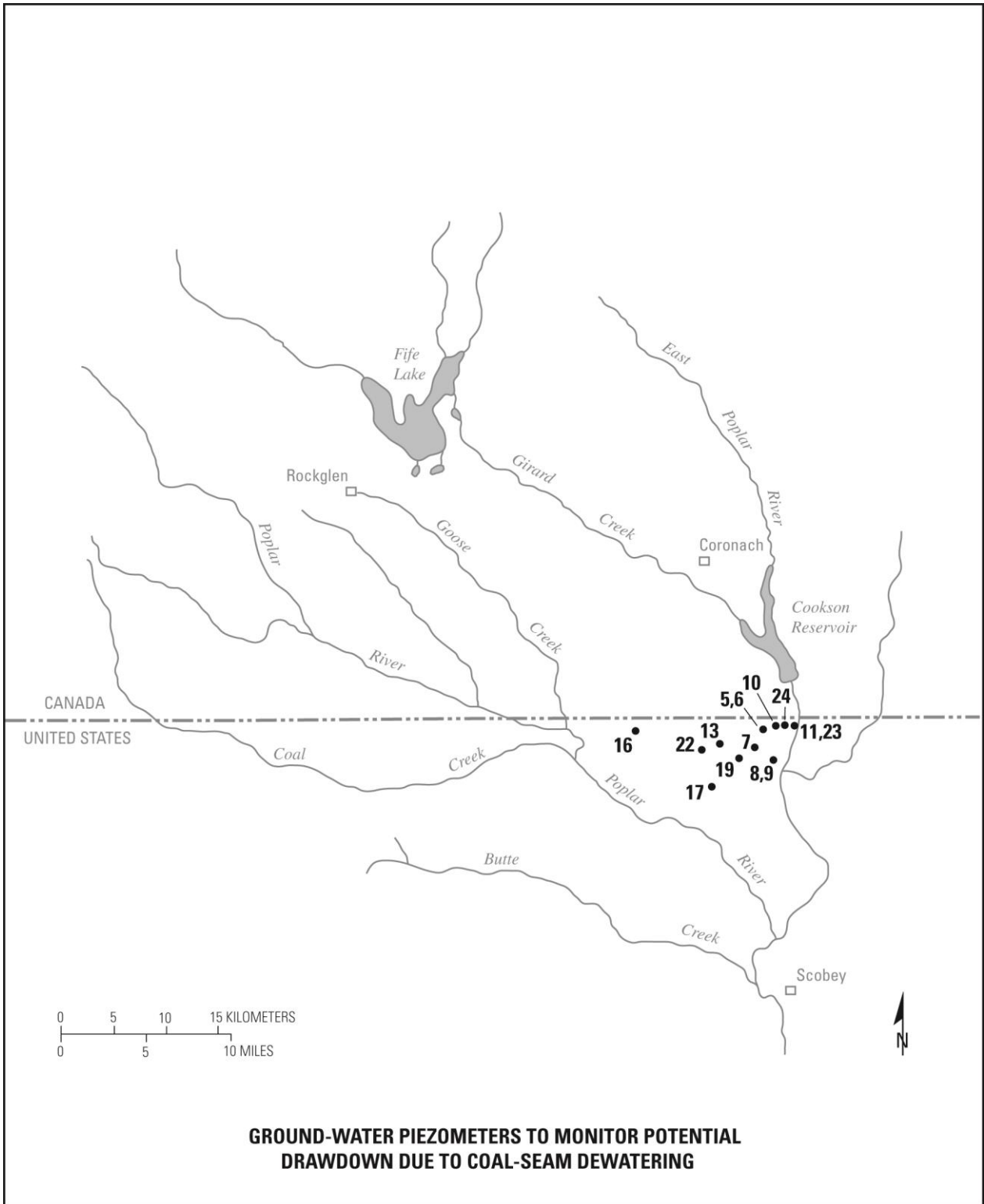
cm – centimetre ICP – MS – Inductively Coupled Plasma – Mass Spectrometry diss – dissolved m – metre





**GROUNDWATER LEVELS TO MONITOR POTENTIAL  
DRAWDOWN DUE TO COAL-SEAM DEWATERING**

<b>Responsible Agency: Montana Bureau of Mines and Geology</b>		
<b>No. on Map</b>	<b>Montana Ground Water Information Center ID No.</b>	<b>Sampling</b>
5	GWIC ID 4231	Determine water levels quarterly
6	GWIC ID 4227	Determine water levels quarterly
7	GWIC ID 4267	Determine water levels quarterly
8	GWIC ID 4287	Determine water levels quarterly
9	GWIC ID 4274	Determine water levels quarterly
10	GWIC ID 4340	Determine water levels quarterly
11	GWIC ID 4329	Determine water levels quarterly
13	GWIC ID 4248	Determine water levels quarterly
16	GWIC ID 4211	Determine water levels quarterly
17	GWIC ID 4297	Determine water levels quarterly
19	GWIC ID 4290	Determine water levels quarterly
22	GWIC ID 4261	Determine water levels quarterly
23	GWIC ID 124105	Determine water levels quarterly
24	GWIC ID 144835	Determine water levels quarterly



**ANNEX 3**

**RECOMMENDED FLOW APPORTIONMENT  
IN THE POPLAR RIVER BASIN  
BY THE INTERNATIONAL SOURIS-RED RIVERS ENGINEERING BOARD,  
POPLAR RIVER TASK FORCE (1976)**



**\*RECOMMENDED FLOW APPORTIONMENT  
IN THE POPLAR RIVER BASIN**

The aggregate natural flow of all streams and tributaries in the Poplar River Basin crossing the International Boundary shall be divided equally between Canada and the United States subject to the following conditions:

1. The total natural flow of the West Fork Poplar River and all its tributaries crossing the International Boundary shall be divided equally between Canada and the United States but the flow at the International Boundary in each tributary shall not be depleted by more than 60 percent of its natural flow.
2. The total natural flow of all remaining streams and tributaries in the Poplar River Basin crossing the International Boundary shall be divided equally between Canada and the United States. Specific conditions of this division are as follows:
  - (a) Canada shall deliver to the United States a minimum of 60 percent of the natural flow of the Middle Fork Poplar River at the International Boundary, as determined below the confluence of Goose Creek and Middle Fork.
  - (b) The delivery of water from Canada to the United States on the East Poplar River shall be determined on or about the first day of June of each year as follows:
    - (i) When the total natural flow of the Middle Fork Poplar River, as determined below the confluence of Goose Creek, during the immediately preceding March 1st to May 31st period does not exceed 4,690 cubic decametres (3,800 acre-feet), then a continuous minimum flow of 0.028 cubic metres per second (1.0 cubic foot per second) shall be delivered to the United States on the East Poplar River at the International Boundary throughout the succeeding 12 month period commencing June 1st. In addition, a volume of 370 cubic decametres (300 acre-feet) shall be delivered to the United States upon demand at any time during the 12 month period commencing June 1st.

\* Canada-United States, 1976, Joint studies for flow apportionment, Poplar River Basin, Montana-Saskatchewan: Main Report, International Souris-Red Rivers Board, Poplar River Task Force, 43 pp.

- (ii) When the total natural flow of the Middle Fork Poplar River, as determined below the confluence of Goose Creek, during the immediately preceding March 1st to May 31st period is greater than 4,690 cubic decametres (3,800 acre-feet), but does not exceed 9,250 cubic decametres (7,500 acre-feet), then a continuous minimum flow of 0.057 cubic metres per second (2.0 cubic feet per second) shall be delivered to the United States on the East Poplar River at the International Boundary during the succeeding period June 1st through August 31st. A minimum delivery of 0.028 cubic metres per second (1.0 cubic feet per second) shall then be maintained from September 1st through to May 31st of the following year. In addition, a volume of 617 cubic decametres (500 acre-feet) shall be delivered to the United States upon demand at any time during the 12-month period commencing June 1st.
  - (iii) When the total natural flow of the Middle Fork Poplar River, as determined below the confluence of Goose Creek, during the immediately preceding March 1st to May 31st period is greater than 9,250 cubic decametres (7,500 acre-feet), but does not exceed 14,800 cubic decametres (12,000 acre-feet), then a continuous minimum flow of 0.085 cubic metres per second (3.0 cubic feet per second) shall be delivered to the United States on the East Poplar River at the International Boundary during the succeeding period June 1st through August 31st. A minimum delivery of 0.057 cubic metres per second (2.0 cubic feet per second) shall then be maintained from September 1st through to May 31st of the following year. In addition, a volume of 617 cubic decametres (500 acre-feet) shall be delivered to the United States upon demand at any time during the 12 month period commencing June 1st.
  - (iv) When the total natural flow of the Middle Fork Poplar, as determined below the confluence of Goose Creek, during the immediately preceding March 1st to May 31st period exceeds 14,800 cubic decametres (12,000 acre-feet) then a continuous minimum flow of 0.085 cubic metres per second (3.0 cubic feet per second) shall be delivered to the United States on the East Poplar River at the International Boundary during the succeeding period June 1st through August 31st. A minimum delivery of 0.057 cubic metres per second (2.0 cubic feet per second) shall then be maintained from September 1st through to May 31st of the following year. In addition, a volume of 1,230 cubic decametres (1,000 acre-feet) shall be delivered to the United States upon demand at any time during the 12-month period commencing June 1st.
  - (c) The natural flow at the International Boundary in each of the remaining individual tributaries shall not be depleted by more than 60 percent of its natural flow.
3. The natural flow and division periods for apportionment purposes shall be determined, unless otherwise specified, for periods of time commensurate with the uses and requirements of both countries.

## ANNEX 4

### CONVERSION FACTORS

#### CONVERSION FACTORS

ac	=	4,047 m <sup>3</sup> = 0.04047 ha
ac-ft	=	1,233.5 m <sup>3</sup> = 1.2335 dam <sup>3</sup>
°C	=	5/9(°F-32)
cm	=	0.3937 in.
cm <sup>2</sup>	=	0.155 in <sup>2</sup>
dam <sup>3</sup>	=	1,000 m <sup>3</sup> = 0.8107 ac-ft
ft <sup>3</sup>	=	28.3171 x 10 <sup>-3</sup> m <sup>3</sup>
ha	=	10,000 m <sup>2</sup> = 2.471 ac
hm	=	100 m = 328.08 ft
hm <sup>3</sup>	=	1 x 10 <sup>6</sup> m <sup>3</sup>
I. gpm	=	0.0758 L/s
in	=	2.54 cm
kg	=	2.20462 lb = 1.1 x 10 <sup>-3</sup> tons
km	=	0.62137 miles
km <sup>2</sup>	=	0.3861 mi <sup>2</sup>
L	=	0.3532 ft <sup>3</sup> = 0.21997 I. gal = 0.26420 U.S. gal
L/s	=	0.035 cfs = 13.193 I. gpm = 15.848 U.S. gpm
m	=	3.2808 ft
m <sup>2</sup>	=	10.765 ft <sup>2</sup>
m <sup>3</sup>	=	1,000 L = 35.3144 ft <sup>3</sup> = 219.97 I. gal= 264.2 U.S. gal
m <sup>3</sup> /s	=	35.314 cfs
mm	=	0.00328 ft
tonne	=	1,000 kg = 1.1023 ton (short)
U.S. gpm	=	0.0631 L/s

#### For Air Samples

$$\text{ppm} = 100 \text{ pphm} = 1000 \times (\text{Molecular Weight of substance}/24.45) \text{ mg/m}^3$$