FACT SHEET

Surface Water Quality Management Framework for the North Saskatchewan and Battle Rivers: North Saskatchewan Region

The North Saskatchewan and Battle Rivers are important for all those who live, work, and play within these watersheds; they offer ecological, aesthetic, recreational, cultural, and economic value to the region. The Surface Water Quality Management Framework establishes an approach for monitoring and managing the cumulative effects of human activities on the water quality of these rivers.

Cumulative effects management was first introduced in the North Saskatchewan Region with the Water Management Framework for the Industrial Heartland and Capital Region, which was developed in 2008 to address anticipated development in the Industrial Heartland and Capital Region. At that time, government and stakeholders committed to maintaining or improving surface water quality in the stretch of the North Saskatchewan River from Devon to Pakan. Ongoing commitment to cumulative effects management is reflected in the more recent Designated Industrial Zone initiative in the Industrial Heartland.

Indigenous, stakeholder and public engagement on the Framework took place in 2021, and the *Surface Water Quality Management Framework for the North Saskatchewan and Battle Rivers* (the Framework) came in effect in 2022. The Framework applies to the mainstem rivers, as encompassed by the boundary of the North Saskatchewan Region (Figure 1). Visit the Open Government Portal to access the complete Framework document and Engagement Summary report.

Surface Water Quality Pressures

Rivers in the North Saskatchewan Region are relied upon for source water for drinking, livestock watering, recreation, industry, providing healthy aquatic habitat and supporting traditional land use activities. However, pressure from different human activities can impact surface water quality in the region.

Population growth drives urban development, recreational growth, industrial growth and intensification of agricultural operations. All of these activities, individually and in combination, can contribute to increased loadings of point source and non-point source pollutants to these rivers.

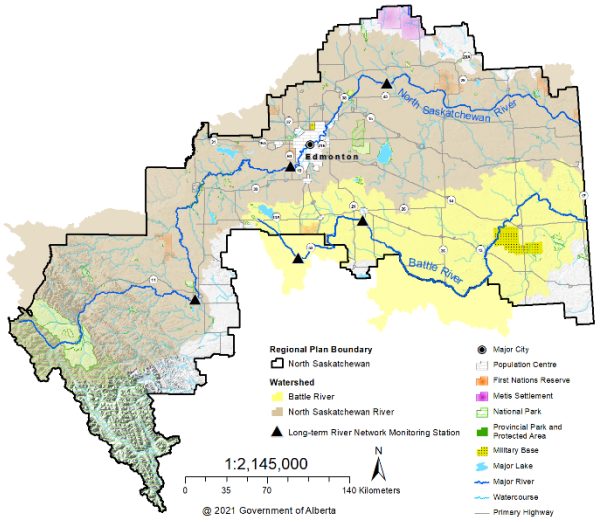

Figure 1: The North Saskatchewan and Battle River Watersheds

Surface Water Quality Status

Many aspects of water quality in the North Saskatchewan Region have improved in recent decades due to improved management practices, especially wastewater treatment. Despite these advances, concerns for water quality in the North Saskatchewan and Battle rivers include low dissolved oxygen in the winter, nutrient enrichment trace metals and high sedimentation. Continuing efforts under the Water Management Framework for the Industrial Heartland and Capital Region are working to address these issues.

Low flow rates, a natural characteristic of the Battle River, may result in low pH, and high bacteria counts and nutrient concentrations. This is a prairie-fed river system that relies on precipitation and groundwater to feed the river, so there is less dilution and flushing of human-made wastes.

Key Components of the Framework

Regional Objective
The regional objective for the North Saskatchewan Region Surface Water Quality Management Framework is:

Surface water quality in the North Saskatchewan and Battle rivers is managed so current and future water quality is maintained or improved.

This objective reflects input from past engagements where participants indicated there was a strong local desire that surface water quality be maintained or improved, and managed to support human and ecosystem needs through shared stewardship.

Once a regional objective is set, indicators are measured and used to understand whether that objective is being met.

Indicators

The list of indicators for the North Saskatchewan and Battle rivers was developed in consideration of the extensive collection of technical studies and analyses undertaken in the region. Key criteria considered in the selection of indicators include:

- Availability of long term monitoring data from the Long-Term River Network monitoring stations
- Identified as contaminants of concern in previous studies or reports
- Increasing concentrations with time
- Exceedance of Environmental Quality Guidelines for Alberta Surface Waters
- Influenced by human activity or land use pressures
- Ability to be influenced by management actions

Nineteen (19) and twenty-one (21) primary indicators were selected for the Battle and North Saskatchewan rivers, respectively, including metals, ions, nutrients, biological indicators, and herbicides (Tables 1 and 2). Dissolved oxygen is included as a secondary indicator under the Framework for both the North Saskatchewan and Battle rivers, meaning conditions will be monitored and reported.

Each water quality indicator is monitored monthly at Athabasca River monitoring station at five monitoring stations from the provincial Long Term Monitoring Network and assessed in relation to the management thresholds. There are three stations on the North Saskatchewan River and two on the Battle River (see Figure 1):

- North Saskatchewan River Upstream of Clearwater
- North Saskatchewan River at Devon
- North Saskatchewan River at Pakan
- Battle River at Highway 53
- Battle River at Driedmeat Lake

Secondary monitoring stations were identified in the basin, including stations monitoring water quality in tributary rivers. The concentration of these indicators will be reported at these stations, but management thresholds are not applied.

Management Thresholds

Water Quality Triggers

Triggers are values used to assess whether water quality is changing over time. Exceedance of a trigger signals a potential undesirable change in water quality and prompts a management response under the Framework.

Triggers are site specific values, set using historical baseline monitoring data for each of the indicators. At least 10 years of historical data are used to calculate triggers.

Two types of triggers are set: median triggers and peak triggers. Median triggers use the middle value of the historic dataset and represent long term, chronic conditions; and peak triggers use one of the highest values in the dataset (90th percentile) and represent short term, acute conditions.

Because concentrations of many of the indicators vary significantly throughout the year, separate triggers were set for the open water season (April to October (open)) and the ice-covered season (November to March (winter)).

Water Quality Limits

Water quality limits are based on the most stringent water quality guidelines from the Environmental Quality Guidelines for Alberta Surface Waters, which identify the maximum concentrations allowable to support specific use (e.g., protection of aquatic life, recreation and aesthetics, and agriculture). Exceedance of a limit indicates that the risk of adverse effects on water quality is unacceptable.

It is important to note that the limits are not intended to be “pollute-up-to” numbers; the initiation of a management response when a trigger is exceeded is intended to maintain or improve surface water quality conditions (Figure 2).

Trigger and limit values are listed in Tables 1 and 2. Indicators without limits will be managed through the use of triggers. The Framework will incorporate new or amended guidelines as limits, as they are adopted in Alberta.

Figure 2: Management thresholds (triggers and limits)

Alberta

Targets
Targets describe desired future conditions and can guide management direction and inform decisions about existing and future activities. Targets may be set in the future as part of a management response.

Management Response
A management response is a process that will be taken if monitoring data shows that a surface water quality trigger or limit has been exceeded. The steps include investigating potential cause(s) of a trigger or limit exceedence, and identifying management actions that can be taken to maintain or improve conditions.

In the North Saskatchewan Region, the management response will benefit from the numerous technical studies completed in recent years, data from the ongoing monitoring of the tributary monitoring network, as well ongoing work in the Industrial Heartland. Additional monitoring is occurring in tributaries of the North Saskatchewan River through the WaterSHED Program, a collaborative partnership through Alberta Environment and Protected Areas, City of Edmonton, EPCOR, and the North Saskatchewan Watershed Alliance. This monitoring data will be used to support management response.

Evaluation and Reporting
Annual *Status of Surface Water Quality* reporting will provide the public and decision-makers with information on indicator conditions and where they fall in relation to thresholds. A report on the *Status of Management Response* will be released every two years to provide information on any investigations and management actions undertaken by Alberta Environment and Protected Areas.

Decision Making and Authority
Upon implementation of the Framework, long-term planning and decision-making will be made in accordance with the defined objectives for management established under this Framework. The Framework will be issued pursuant to Section 14 of the *Environmental Protection and Enhancement Act* and will be included in the appropriate regional plan under the *Alberta Land Stewardship Act*, when available.

Management of Surface Water Quality

Alberta is committed to the wise management of the province's water quantity and quality for the benefit of Albertans now and in the future. This is achieved through an adaptive management cycle that is responsive to new knowledge, collaboration and innovation. Provincial, municipal and indigenous governments, industry, Watershed Planning and Advisory Councils, and stewardship organizations all contribute to actions that support water quality management.

The Surface Water Quality Management Framework takes an adaptive management approach:

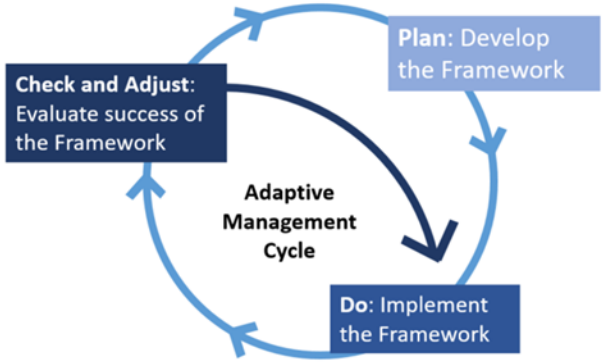

Figure 3: The Surface Water Quality Management Framework Adaptive Management Cycle

Plan: Develop the Framework
Developing a framework incorporates feedback from multiple stakeholders, indigenous communities and the public to stablish a regional objective and identify indicators and thresholds to support the achievement of the objective.

Do: Implement the Framework
Framework implementation is undertaken by Alberta Environment and Protected Areas. Data collected from monitoring is analyzed and compared to the triggers and limits set within the framework. An appropriate management response is taken if any indicators are above the triggers or limits in the framework.

Check and Adjust: Evaluate success of the Framework
Any management actions that are taken are evaluated to ensure that they were effective and the desired state was achieved. Social, economic and environment needs are also evaluated to ensure the Framework is still effective managing the water quality goals for the region.

The Framework is just one piece of the water management approach in the region and across Alberta. Water management in Alberta is a collaborative effort involving many parties: Alberta Environment and Protected Areas, other Government of Alberta departments and agencies, Indigenous communities and organizations, and stakeholders, all have responsibilities related to managing surface water quality in relation to the Framework. Roles and responsibilities are described briefly in the context of the Framework and will be further clarified as they continue to evolve.

Alberta Environment and Protected Areas will review and update the Framework to reflect new information and knowledge within five to ten years.

TABLE 1: SURFACE WATER QUALITY TRIGGERS AND LIMITS FOR THE BATTLE RIVER

Primary Indicator	Unit[a]	Season	Limit	Hwy 53		Driedmeat Lake	
				Median Trigger	Peak Trigger	Median Trigger	Peak Trigger
Biological							
Escherichia coli	CFU/ 100ml	open	100 [c]	10	160	10 [e]	60
		winter		10 [e]	30	10 [e]	30
Ions							
Chloride	mg/L	open	100 [c]	7.6	13	32.2	70
		winter		8.7	15	66	180
Sodium	mg/L	open	-	47	75.2	67.4	117
		winter		81.8	140	160	280
Sulphate	mg/L	open	Equation [b]	22	44.8	82.3	160
		winter		29.9	40	190	440
Metals							
Total Arsenic	µg/L	open	5 [b]	2.36	5.7	3.12	6.91
		winter		1.2	7.26	2.56	4.81
Dissolved Iron	µg/L	open	300 [b]	90.8	352	59	275
		winter		39.7	476	22.8	222
Total Lead	µg/L	open	Equation [b]	0.255	0.819	0.499	3.04
		winter		0.237	2.48	0.528	1.63
Total Mercury	ng/L	open	5 [b]	1.91	6.06	2.97	11.3
		winter		0.985	14.5	1.6	4.15
Total Selenium	µg/L	open	2 [bg]	0.282	0.56	0.535	1.27
		winter		0.292	2.42	1.07	2.45
Nutrients							
Total Ammonia	mg/L	open	Equation [b]	0.05 [e]	0.15	0.16	2.1
		winter		0.27	1.21	1.97	11
Nitrate + Nitrite	mg/L	open	100 [c]	0.005 [e]	0.13	0.014	0.71
		winter		0.055	0.37	0.237	0.78
Total Phosphorus (TP)	mg/L	open	[d]	0.18	0.458	0.26	0.627
		winter		0.079	1.1	0.276	0.99
Total Dissolved Phosphorus (TDP)	mg/L	open	[d]	0.11	0.36	0.13	0.408
		winter		0.029	0.11	0.067	0.35
Total Organic Carbon (TOC)	mg/L	open	-	15.5	23.4	19.8	24
		winter		14	28.4	26	32.5
Organic							
MCPA (2-methyl-4-chlorophenoxyacetic acid)	µg/L	open	0.04 [c]	0.01 [e]	0.055	0.015	0.167
		winter	[f]	_[f]	_[f]	_[f]	_[f]
2,4-D (2,4-Dichloro phenoxyacetic acid)	µg/L	open	4 [b]	0.007 [e]	0.027	0.022	0.093
		winter	[f]	_[f]	_[f]	_[f]	_[f]
General							
Total Dissolved Solids (TDS)	mg/L	open	500 [c]	310	370	400	610
		winter	[h]	480	717	878	1460
Total Suspended Solids (TSS)	mg/L	open	[d]	7	27	23	72
		winter		7	22	15	39
Sodium Adsorption Ratio (SAR)		open	5 [c]	1.46	2.6	2.13	3.64
		winter		1.98	3.29	3.78	5.1

[a] Units include: mg/L (milligram per litre), µg/L (microgram per litre), ng/L (nanogram per litre), CFU/100mL (colony forming units per 100 millilitres).

[b] Surface water quality guidelines for the protection of freshwater aquatic life (Table 1, Government of Alberta, 2018, p 25).

[c] Surface water quality guidelines for the protection of agricultural water uses (Table 2, Government of Alberta, 2018, p. 41).

[d] Narrative guideline. The guideline will be considered in the interpretation of water quality monitoring data, but cannot be directly applied as a surface water quality limit.

[e] Indicator is highly censored; trigger value is the maximum detect limit of the dataset from the beginning of the baseline period to 2021.

[f] Herbicides are not generally monitored in winter.

[g] Total Selenium has both an alert concentration (1 ug/L) and a guideline (2 ug/L) for the protection of freshwater aquatic life (Table 1, Government of Alberta, 2018, p 25). Exceedance of the alert concentration in sensitive environments indicates the need for increased monitoring of water and other ecosystem compartments to support early detection of potential selenium bioaccumulation issues and provide earlier opportunities to commence proactive management actions. The annual evaluation of surface water conditions will include consideration of the alert concentration; but the guideline will be applied as the limit.

[h] The limit does not apply in winter.

TABLE 2: SURFACE WATER QUALITY TRIGGERS AND LIMITS FOR THE NORTH SASKATCHEWAN RIVER

Primary Indicator	Unit[a]	Season	Limit	Clearwater		Devon		Pakan	
				Median Trigger	Peak Trigger	Median Trigger	Peak Trigger	Median Trigger	Peak Trigger
Biological									
Escherichia coli	CFU/ 100ml	open	100 [c]	10 [e]	45	10 [e]	36	30	440
		winter		10 [e]	27	10 [e]	10 [e]	10 [e]	118
Ions									
Chloride	mg/L	open	100 [c]	1 [e]	1 [e]	1 [e]	2.2	3.3	6.2
		winter		1 [e]	1 [e]	1 [e]	1.5	4.3	9.2
Fluoride	mg/L	open	1 [c]	0.12	0.15	0.13	0.16	0.15	0.17
		winter		0.11	0.13	0.13	0.15	0.15	0.18
Sodium	mg/L	open	-	2.1	2.9	4.1	5.8	7.5	11.3
		winter		1.4	2.5	3.7	4.9	8.1	12.3
Sulphate	mg/L	open	Equation [b]	40	50	40	48	45.4	54.6
		winter		42	49	47	53	53	60
Metals									
Dissolved Aluminum	µg/L	open	50 [b]	8.18	31.1	5.9	27	44.6	86
		winter		3.39	13.4	2.2	5.6	19.7	45.4
Total Arsenic	µg/L	open	5 [b]	0.29	1.12	0.46	2.15	0.6	2.02
		winter		0.13	0.36	0.25	0.43	0.31	0.45
Total Cadmium	µg/L	open	Equation [b]	0.02	0.06	0.015	0.126	0.03	0.11
		winter		0.01 [e]	0.04	0.01 [e]	0.016	0.01	0.04
Total Cobalt	µg/L	open	Equation [b]	0.23	0.97	0.2	2.08	0.333	2.21
		winter		0.06	0.45	0.05	0.17	0.09	0.22
Total Copper	µg/L	open	7 [b]	0.92	3.5	1.19	5.85	1.6	6.52
		winter		0.49	1.31	0.67	1.1	0.91	1.78
Total Lead	µg/L	open	Equation [b]	0.34	1.53	0.3	3.24	0.64	3.82
		winter		0.11	1.41	0.13	0.49	0.18	1.19
Total Mercury	ng/L	open	5 [b]	1.8	7.01	2.64	11.4	2.75	16.8
		winter		0.5	3.02	0.65	1.81	0.6	1.5
Total Selenium	µg/L	open	2 [bg]	0.21	0.35	0.3	0.4	0.3	0.6
		winter		0.2	0.59	0.3	0.4	0.4	0.6
Total Zinc	µg/L	open	30 [b]	2.71	10.8	3.8	25.5	6	23.8
		winter		1.04	4.76	1.5	4.5	3.2	17.1
Nutrients									
Total Ammonia	mg/L	open	Equation [b]	0.05 [e]	0.07	0.05 [e]	0.08	0.05 [e]	0.12
		winter		0.05 [e]	0.05 [e]	0.05 [e]	0.05 [e]	0.11	0.2
Nitrate + Nitrite	mg/L	open	100 [c]	0.05	0.07	0.008	0.083	0.17	0.33
		winter		0.06	0.08	0.074	0.093	0.35	0.466
Total Phosphorus (TP)	mg/L	open	[d]	0.018	0.07	0.012	0.14	0.032	0.16
		winter		0.007	0.045	0.006	0.011	0.014	0.029
Total Dissolved Phosphorus (TDP)	mg/L	open	[d]	0.003 [e]	0.011	0.003	0.017	0.008	0.026
		winter		0.003 [e]	0.01	0.003 [e]	0.007	0.008	0.015
Total Organic Carbon (TOC)	mg/L	open	-	1.1	3	2.7	6.9	3.1	7.4
		winter		0.5 [e]	1	1.5	2.1	1.9	2.5
Organic									
2,4-D (2,4-Dichloro phenoxyacetic acid)	µg/L	open	4 [b]	0.007 [e]	0.007 [e]	0.007 [e]	0.007 [e]	0.007 [e]	0.036
		winter	[f]	- [f]	- [f]	- [f]	- [f]	- [f]	- [f]
General									
Total Suspended Solids (TSS)	mg/L	open	[d]	22	130	12	140	21	220
		winter		4	42	3	10	4	23

[a] Units include: mg/L (milligram per litre), µg/L (microgram per litre), ng/L (nanogram per litre), CFU/100mL (colony forming units per 100 millilitres).

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