the water management framework

FOR THE INDUSTRIAL HEARTLAND AND CAPITAL REGION

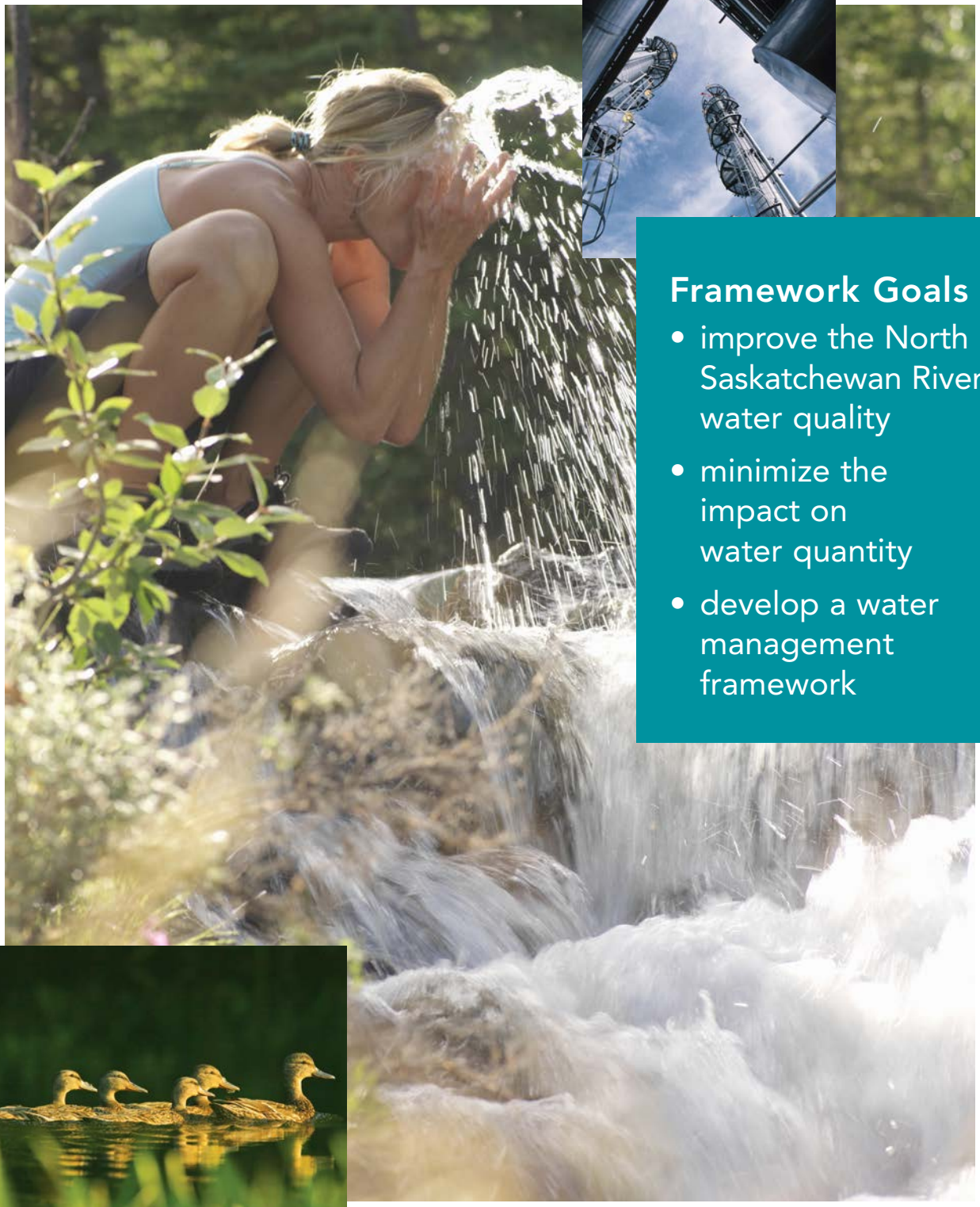
8 years of implementation

Alberta Government

Vision

A world-class integrated water management system within the North Saskatchewan River to sustainably support the environment, and social and economic development.

contents



Framework Goals

- improve the North Saskatchewan River water quality
- minimize the impact on water quantity
- develop a water management framework

introduction

The Water Management Framework for the Industrial Heartland and Capital Region, released in 2007, was the first application of Alberta's cumulative effects management approach. The Framework addresses water quality and quantity in the Devon to Pakan reach of the North Saskatchewan River. This reach includes three wastewater treatment plants, two water treatment plants, numerous storm and combined sewer outfalls, and several industrial intakes and outfalls. Five years after it was released, the Framework was reviewed to consolidate learning and re-confirm priorities. A Five Years of Implementation document was released to provide an overview of the work done and re-affirm stakeholder commitment for future work.

The original outcomes identified in the Framework were re-visited in the Five Years of Implementation document and though priorities and approach have shifted, the overall intent to better manage water quality and quantity is still relevant. The water management goals identified in the Framework and rephrased in the Five Years of Implementation document are to:

- Improve the North Saskatchewan River water quality by:
  - > minimizing load discharge;
  - > investigating the contaminant concentration when the increase over background conditions is 20 percent or greater (threshold level) in the reach from Devon to Pakan; and
  - > assigning values to contaminant concentration thresholds to indicate the need for management responses.
- Minimize the impact on water quantity by:
  - > optimizing the use of existing and new withdrawal infrastructure; and
  - > increasing the use of reclaimed water.
- Develop and implement a water management framework that:
  - > is science-based and world-class;
  - > guides the stewardship of the water resource;
  - > is specific to the Devon to Pakan reach of the North Saskatchewan River; and
  - > provides a model for other regional frameworks.

Since 2012, further work has been done that has made advancements on the goals, priorities and next steps in the Five Years of Implementation document. 2015 is an opportune time to describe those accomplishments and document the strategic direction of implementation.

To provide accessible information to stakeholders and the public on the implementation of the Water Management Framework for the Industrial Heartland and Capital Region

purpose

The purpose of this document is to provide accessible information to stakeholders and the public on the implementation of the Water Management Framework for the Industrial Heartland and Capital Region. This includes:

- identifying key stakeholders collaborating with Environment and Parks on water management for the Devon to Pakan reach of the North Saskatchewan River;
- summarizing past work and work-in-progress;
- identifying changing issues in water quality or quantity;
- identifying priority areas of future work based on water quality and quantity needs and providing details of this work;
- summarizing communication initiatives related to the Framework; and
- highlighting accomplishments.

key points

1. The Water Management Framework for the Industrial Heartland and Capital Region was endorsed in 2007, and will be incorporated into the North Saskatchewan Regional Plan.

2. Water quality in the Devon to Pakan reach of the North Saskatchewan River has been improving. Water management will continue to pursue the goal of maintaining or improving water quality.

3. Continue to optimize the use of existing and new withdrawal infrastructure, along with the increased use of reclaimed water, helps minimize the footprint on the North Saskatchewan River.

4. Modelling and other tools to support cumulative effects management are being further developed and maintained to maximize water quality knowledge and improve decision-making processes in support of Framework goals. Projects such as the Effluent Characterization Program are being undertaken to generate the data needed by these tools.

message from the advisory committee

When completed in 2007, the Water Management Framework for the Industrial Heartland Capital Region brought stakeholders together to understand water management issues, develop solutions, and communicate results. A Steering Committee was established to implement the Framework's vision, strategic objectives and guiding principles to develop an integrated water management system for the region. The Framework's vision is of *a world-class integrated water management system within the North Saskatchewan River to sustainably support the environment, and social and economic development*.

The Steering Committee started its journey, exploring information and methods for water management implementation. Initially, much of the focus was on quantity management and water recycling. It soon became apparent that there were opportunities to improve the use of the water management tools and models. As a result, the committee has supported recent efforts in gathering information, commissioning studies, synthesizing knowledge, and analyzing water quality trends. This provided the shift from the Steering Committee to the Advisory Committee whose main objective now is to advise on the continued implementation of the Framework. For 2015, this focus will continue through the implementation of the *Effluent Characterization Program*, maintenance of water management tools, and improvements in modeling that will incorporate new data.

ADVISORY COMMITTEE MEMBERS

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Mike Darbyshire
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City of Edmonton
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Industry

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Kaitlin Fonteyne (Alternate),

Watershed Planning & Advisory Council

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Les Gammie
Gord Thompson (Alternate)

Provincial Government

Alberta Environment and Parks
Darcy McDonald, Chair

early implementation progress with the steering committee

When the Framework was released in 2007, there were concerns with the impending large-scale industrial expansion of the oil sands upgrading industry located in the Industrial Heartland, and the associated population growth in the Capital Region. Framework principles focused on Framework development and implementation, which include development of a regional approach, meeting water quality management targets, and ensuring an economically viable supply of water for sustainable growth. The implementation goals were to ensure no further deterioration of water quality in the Devon to Pakan reach and to manage water quantity to support both ecosystem needs and proposed industrial development.

In pursuit of these goals, the predominant project undertaken from 2007 to 2012 was the Engineering Study for Evaluation of Industrial Water Supply and Wastewater Treatment Alternatives for the Industrial Heartland and Capital Region. This two-tiered study examined five alternate engineering scenarios that encompassed wastewater management for all municipal and industrial entities in the region, and the supply of non-potable water for existing and future industries located in the Sherwood Park, Strathcona County, and Fort Saskatchewan areas. When viewed through a lens of environmental, social, and economic outcomes (the triple bottom line), and risk attributes, it was found that a modified version of the existing situation was the most favourable scenario.

The initial Steering Committee guided Project 1 and Project 2. Project 1 involved the determination of the baseline for industrial water demand, industrial wastewater discharged to the river, river water quality and quantity, and municipal effluent quality and quantity. Project 2 was the Engineering Study for evaluation of industrial water supply and wastewater treatment alternatives for existing and planned industries in the Industrial Heartland and Capital Region.

Other implementation progress results during early implementation (2007–2012) included:

- continuing to practice the use of shared intakes and comingled effluent treatments;
- determining site specific water quality guidelines for 92 variables of concern and Water Quality Objectives and Maximum Allowable Loads for 21 and 20 pilot parameters respectively;
- developing threshold targets for water quantity based on weekly net in-stream flow, which showed that there was sufficient water quantity for that time period (2007-2012); and
- forming an Advisory Committee to provide strategic advice on framework implementation.

advisory committee

The committee supporting the Framework has evolved since the inception of the Framework. In 2013, the Advisory Committee was formed to be strategic in nature and responsible for advising on the continued implementation of the Framework. Its overarching role is to provide strategic advice, multi-stakeholder input, and regional perspective while ensuring that the guiding principles of the Framework continue to be met. Framework principles include the need for regional planning of the system, certainty of water supply that is economically viable for industrial growth, and a management system that uses the North Saskatchewan River within its ecosystem capacity. The committee works with Environment and Parks to provide advice on:

- communicating management actions consistent with Framework principles;
- implementing cumulative effects management initiatives;
- integrating monitoring and evaluation in support of the Framework;
- improving knowledge of the North Saskatchewan River system; and
- managing emerging issues.

In collaboration with Environment and Parks, the Advisory Committee supports alignment with other related initiatives and enables communication and transparency with the broader stakeholders and the public. The Advisory Committee also enlists support from other stakeholder groups as necessary to inform management decisions, such as expertise on science and technical information.

moving forward with implementation and highlighting accomplishments

Direction provided in the Five Years of Implementation document has guided implementation priorities since 2012. These activities are ongoing and are focused on:

- continuing to define Maximum Allowable Loads and Water Quality Objectives and inform how they will be applied through the regulatory process;
- integrating monitoring to support the Framework and the Maximum Allowable Load approach;
- communicating management actions; and
- filling science gaps and improving knowledge about the North Saskatchewan River.

A pilot suite of 21 parameters (contaminants of concern) were the focus of a study that established Water Quality Objectives and Maximum Allowable Loads as provided in the document, *Pilot Water Quality Objectives and Allowable Contaminant Loads for the North Saskatchewan River*.

Water Quality Objectives (WQOs), through the study noted above, were established to enable the goal of maintaining or improving water quality in the North Saskatchewan River. The WQOs were set for 21 pilot contaminants of concern for the Devon to Pakan reach. These WQOs are the basis for calculating Maximum Allowable Loads and provide a measure against which long-term changes can be assessed.

Site Specific Water Quality Objective

WQOs are a numerical value (usually a concentration) for a contaminant established as a measure of water quality for a specific location in a water body. WQOs have been calculated for several contaminants at the Long Term River Network Stations at Devon and Pakan. In this reach, where maintain or improve is the overall strategic objective for water management, the WQOs are set based on the 50th and the 90th percentile of the historical values for summer and winter. If there is insufficient data for calculating the percentiles or if the value of the parameter exceeds the Alberta Surface Water Quality Guidelines, the Guidelines are used as the limit. WQOs are used to calculate Maximum Allowable Loads.

Maximum Allowable Loads (MAL) were calculated for 20 of these parameters. It was not possible to calculate a MAL for the 21st parameter due to insufficient data. Calculating MALs has highlighted the need for more monitoring of particular parameters.

Maximum Allowable Load

The maximum amount of a pollutant that a water body can receive while still meeting water quality objectives. Expressed as mass/time, it includes any natural, point-source, and non-point sources of the pollutant. These values tell us whether loadings of specific contaminants are seasonally compatible with water quality objectives and water quality management goals.

Seasonal variation in river flow rate complicates the determination of the load capacity of the river for a given contaminant. MALs adjust for the river flow rate by converting the numerical water quality objective (concentration) into a distribution (curve) of allowable loads as a function of daily flow. River samples are multiplied by the flow rate for the day of sampling and plotted on the MAL curve. The behavior of the measured contaminant load as compared with the MAL across the different flow regimes provides information about the source of the contaminant.

Studies into the health of the reach helped to show that overall water quality has improved over the past decade. *Investigations of Trends in Select Water Quality Variables at Long-Term Monitoring Sites on the North Saskatchewan River* shows the water quality trends over time (1987–2011) at Pakan have improved for dissolved oxygen, nutrients, chlorophyll-a and total copper, but an increase in suspended solids, sulphate, fecal coliform, and zinc. When adjusted for flow, a decreasing trend was found for nitrogen while increasing trends were found for total dissolved solids, sulfate, and fecal coliform.

To provide a clear understanding of the state of the river, a water quality report, *North Saskatchewan River: Water Quality and Related Studies (2007–2012)*, was completed, compiling and assessing data and reports spanning from 2007 to 2012 for the North Saskatchewan River within Alberta. The report made several recommendations regarding monitoring and modelling. These recommendations are currently being assessed and implemented to further build decision-making tools, particularly with respect to modelling.

A suite of modelling tools was developed and implemented. The Contaminant Loading Tools is one tool that was used to calculate loads from direct dischargers into the North Saskatchewan River. Other watershed and water quality models were developed for the North Saskatchewan River that will continue to evolve and inform decision-making.

current context

The development of the North Saskatchewan Regional Plan: Surface Water Quality Framework is underway and work is being done to incorporate the Water Management Framework for the Industrial Heartland and Capital Region.

Industrial development has continued, albeit at a slower pace than anticipated in 2007, to be the focus for Framework implementation with water quality as a priority rather than water quantity. Population growth in the region has continued to be strong. Population growth for the Census Metropolitan Area was 12.1 per cent from 2006 to 2011 with subsequent years having 3 to 3.5 per cent growth per year. This growth continues to put pressure on water quality and quantity, including more load on the region's three wastewater treatment facilities and on the drainage infrastructure as more land is developed for housing.

priorities and next steps

Implementation of the Framework continues to move forward, with action being taken on priorities and advice from the Advisory Committee. Upcoming priorities include the following:

DEVELOPMENT OF AN EFFLUENT CHARACTERIZATION PROGRAM

The municipal wastewater treatment plants have conducted their own effluent characterization as part of a Canada wide strategy for the management of municipal wastewater effluent. The industrial version of the Effluent Characterization Program will develop a characterization of direct industrial wastewater discharge into the Devon to Pakan reach of the river. A screening study will sample for a broad range of contaminants from the effluent at the industrial outfalls. Other versions of the Effluent Characterization Program will focus on municipal wastewater treatment plants and storm and combined sewer outfalls. Results from these characterizations will inform long-term monitoring requirements for all three components that use these outfalls. The knowledge gained from these studies will help to fill knowledge gaps about the source and manageability of many contaminants.

UPDATING CONTAMINANT LOADING TOOL

Effluent and ambient data from 2011 to 2014 is being incorporated into the Contaminant Loading Tool. Once data from the Effluent Characterization Program is received, it will also be used by these tools. Comparisons with results from previous time spans will help to indicate trends for particular parameters of concern.

ESTABLISHING A MULTI-STAKEHOLDER MODELLING SUB-COMMITTEE

The sub-committee's work of identifying options for collaborative science in modelling and evaluation will be a first step toward a shared modelling approach among stakeholders. The sub-committee will continue to:

- share information;
- prioritize modelling needs and associated work planning;
- create an inventory of all relevant modelling tools; and
- use models to inform cumulative effects management and watershed management.

DEVELOPMENT OF A SEASONAL WATER QUALITY INDEX

The index will support understanding of river water quality in the North Saskatchewan River. Most importantly, it will provide an overview of the impact of seasonal flow, i.e. spring runoff, help distinguish between point source from non-point source influences, and categorize the impact of natural sources.

PROVIDING INPUT INTO THE NORTH SASKATCHEWAN REGIONAL PLAN

The Surface Water Quality Management Framework for the North Saskatchewan Regional Plan will incorporate the *Water Management Framework for the Industrial Heartland and Capital Region*. Advisory committee member organizations will continue to have input into the development of the North Saskatchewan Regional Plan Surface Water Quality Management Framework and the gap analysis between the North Saskatchewan Regional Plan framework and the Industrial Heartland water management framework, once initiated.

communication materials and studies

Below is a list of materials that have been published as part of the work done developing and implementing the Framework. For copies of these documents, please visit the Capital Region Cumulative Effects Management page at aep.alberta.ca.

- The Water Management Framework for the Industrial Heartland and Capital Region (2007)
- The Water Management Framework: North Saskatchewan River Quality for the Industrial Heartland and Capital Region (November 2011)
- The Water Management Framework: Project 2 for the Industrial Heartland and Capital Region (2012)
- The Water Management Framework for the Industrial Heartland and Capital Region: Five Years of Implementation 2007–2012 (2013)
- The Water Management Framework: Five Years of Implementation: 2007–2012—Overview of the Industrial Heartland and Capital Region (2013)

STUDIES

- Synthesis of Recent Knowledge on Water Quality, Sediment Quality, and Non-fish Biota in the North Saskatchewan River (2011)
- Investigations of Trends in Select Water Quality Variables at Long-Term Monitoring Sites on the North Saskatchewan River (November 2012)
- Pilot Water Quality Objectives and Allowable Contaminant Loads for the North Saskatchewan River (2013)
- North Saskatchewn River: Water Quality and Related Studies (2007–2012) (2014)

For more information, or to order additional copies, contact:

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