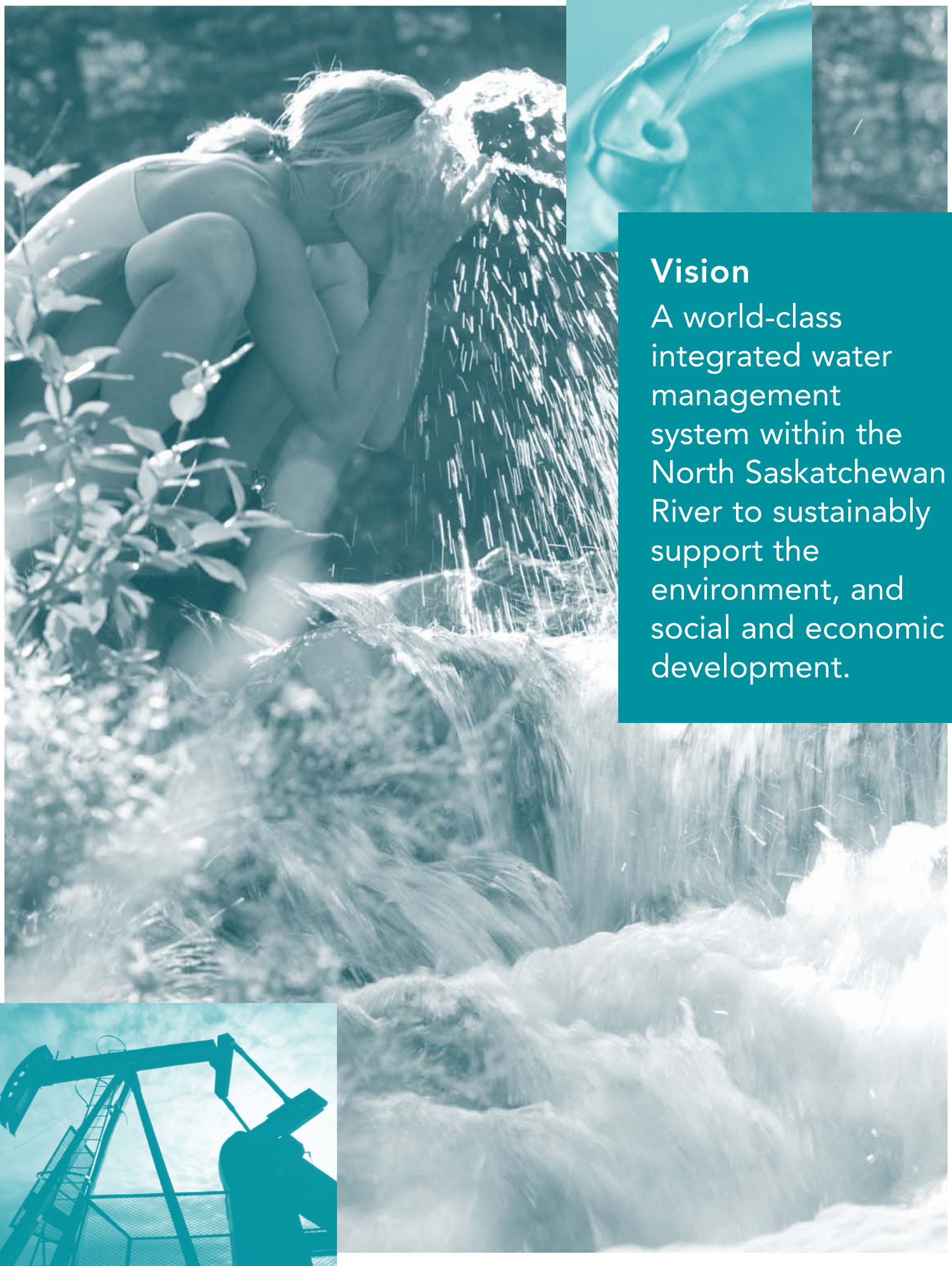
the water management framework

FOR THE INDUSTRIAL HEARTLAND AND CAPITAL REGION

five years of implementation

2007 - 2012

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.

introduction

After five years of implementation during changing economic conditions, the time is right to consolidate learning and plan the next steps. This document describes the implementation work completed to date and reaffirms stakeholder commitment to future work, applying the cumulative effects approach to manage water quality and quantity in the Devon to Pakan reach of the North Saskatchewan River.

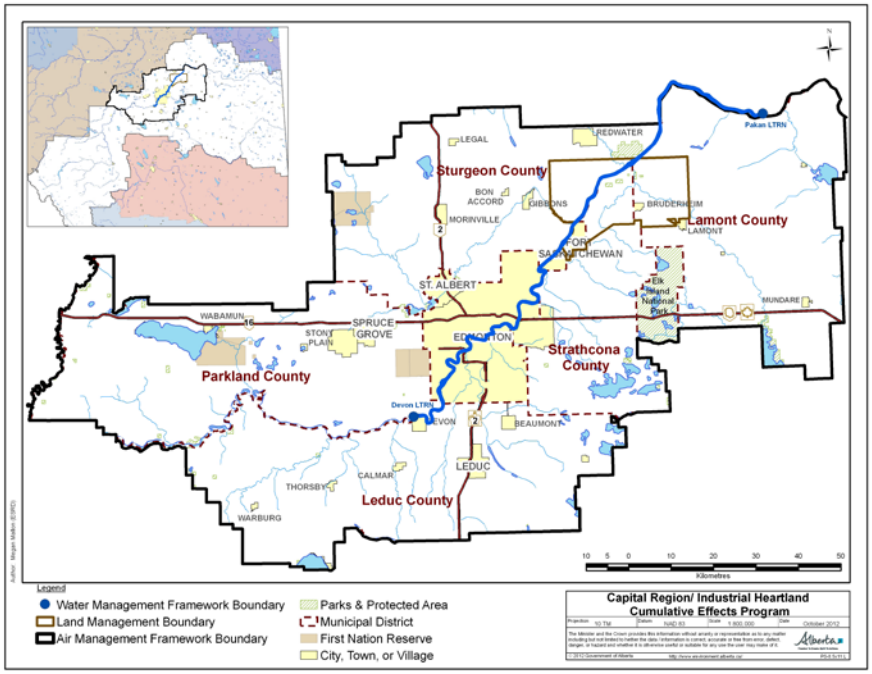
The Government of Alberta is working with citizens, communities and industry to improve our resource management systems, protect the environment, develop Alberta's prosperity and support expanded market access. *The Water Management Framework for the Industrial Heartland and Capital Region* is one of several environmental management frameworks collaboratively developed in recent years. By targeting a specific region of the province, this framework, in 2007, provided a model for other regional environmental management frameworks. This framework aligns with the goals of the Government of Alberta's Integrated Resource Management System that sets and achieves the environmental, economic and social outcomes Albertans expect from resource development and maintains the social licence to develop resources. This system includes the development of regional plans through the *Land-use Framework*, a single regulator for oil and gas, a world-class monitoring system to provide transparent, reliable information on achievement of outcomes and other policies such as *Water for Life*.

The *Water Management Framework for the Industrial Heartland and Capital Region* presents a collaborative, cumulative effects management approach to protect the reach of the North Saskatchewan River, from Devon to Pakan, which is directly impacted by municipal and industrial effluent discharge. The Water Management Framework Implementation Steering Committee (Steering Committee) is implementing the framework's vision, strategic objectives and guiding principles to develop an integrated water management system for the region. The Steering Committee is chaired by Alberta Environment and Sustainable Resource Development. Membership includes representatives from the Government of Alberta, municipal governments, industry and a watershed planning and advisory council. The Steering Committee used additional sub-committees to explore science, engineering, communications, and other topics.

Steering Committee Organizations	Members
Municipal Government	3
Industry	4
Watershed Planning & Advisory Council (WPAC)	1
Government of Alberta	2
TOTAL	**10**

a highly prized river reach

Since the North Saskatchewan River is fundamentally important to the population and economic activity of the Industrial Heartland and Capital Region, prudent use and management of important resource is critical to support both economic activity and population growth.



THE DEVON TO PAKAN REACH OF THE NORTH SASKATCHEWAN RIVER IN THE INDUSTRIAL HEARTLAND AND CAPITAL REGION

The Capital Region is defined by the boundary of the Edmonton Capital Region Board including Elk Island National Park. Within this area there are 25 municipalities including the City of Edmonton, Fort Saskatchewan, Spruce Grove, Leduc and St. Albert. This region is the sixth largest metropolitan area in Canada by population, with 1,176,300 citizens. The Industrial Heartland refers to the total land zoned by the municipalities of Sturgeon, Strathcona, Lamont and Fort Saskatchewan in their Joint Area Structure Plan.

The region is also home to the Alexander First Nation, Paul First Nation and Enoch Cree Nation communities. In addition to the developed area within the region, there are large areas of cropland and a number of large lakes including Wabamun and Cooking lakes.

The North Saskatchewan River traverses the region, and is the primary water source for municipal and industrial use. The region has a strong industrial base including refining, chemical manufacturing and electric power generation, and is a potential area of growth for bitumen upgrading. The Devon to Pakan reach supports the current population and a large segment of Alberta's resource processing industry. Any discharges or withdrawals from the river affect downstream users to the Saskatchewan border and beyond.

where it all started

In 2007, Alberta's economic momentum led to anticipation of significant development along the North Saskatchewan River. Increased population and increased use of resources challenged stakeholders to consider how best to balance economic and social growth with environment.

The framework provided direction on an integrated regional solution to address the water quantity and quality issues associated with the use of the North Saskatchewan River, beginning at the town of Devon and ending at the Pakan bridge water quality station. The Steering Committee looked at options to create that integrated regional solution, including methods of incorporating reclaimed water from the existing municipal water treatment facilities. At that time, there were industrial projects already in the regulatory queue. The framework provided strategies and actions to promote existing and proposed industrial endeavours as well as the sustainability of the Devon to Pakan reach of the river.

WATER QUALITY & WATER QUANTITY

The framework considers two main issues: water quantity and quality. It proposed that water quantity be managed based on flow expectations. The goal was to manage water quantity to ensure that sufficient water remained in the river to maintain aquatic life and support current and proposed industrial development.

The water quality goals, which are more fully explored in the framework, were to:

- improve water quality from fair to good
- minimize load discharge
- "keep water clean" based on that point at which contaminants increase in the river by more than 20 per cent from upstream to downstream in the Devon to Pakan reach of the river
- minimize the impact or "footprint" on the North Saskatchewan River (such as no new intakes in Phase 1 – described below)
- assign values to contaminant concentrations (termed "threshold levels") to reflect problem conditions and the need for associated management responses.

The Steering Committee realized that achieving these outcomes would require flexible and innovative solutions and therefore devised a conceptual model to describe the future vision for water management. The potential solutions described by the conceptual model include minimal loading discharge to the river, conservation measures such as the use of fresh and reclaimed water, and sustainable management of solids and wastes. Multiple infrastructure systems could be built to embody the intent and ideas described in the conceptual model.

A three phased plan was developed (short term, intermediate and long term sustainability) to tackle the development pressures.

- Phase 1 (2007-2009) Enabling Current Development
- Phase 2 (2009-2012) Foundation Building for Long Term Sustainability
- Phase 3 (2009-2041) Sustainability

understanding our river

Maximum Allowable Load (MAL)
MALs are used to manage water quality by measuring concentrations of contaminants of concern. These values tell us whether instream contaminant loads of specific contaminants are seasonally compatible with water quality objectives and water quality management goals.

To further understand the North Saskatchewan River, the Steering Committee formed a sub-committee to establish environmental water quality baseline conditions and to build on regional scientific knowledge. The sub-committee collected effluent and water withdrawal information, increased monitoring in the North Saskatchewan River, conducted river modelling, such as Environmental Fluid Dynamics Code (EFDC) modeling, and developed Maximum Allowable Loads (MALs) for containments of concern. The science and information was summarized into a Synthesis Report.

CONTAMINANTS OF CONCERN

Contaminants of concern encompass a broad range of variables including nutrients, bacteria, suspended solids, ions, some metals and organic constituents.

A pilot suite of variables was selected for development of water quality objectives and resultant allowable loads.

FINDINGS

Decision-making based on science is foundational to the implementation of the framework. Significant advancements have improved the understanding of the current state of the North Saskatchewan River, and helped to build associated decision-making support tools such as modelling and other evaluative methods. This work was a huge undertaking, and was considered an incredibly valuable exercise for all stakeholders involved.

Wastewater treatment has improved over time and resulted in an improvement of water quality. Despite these enhancements, nutrient enrichment remains the most apparent human impact on the North Saskatchewan River within the Devon to Pakan reach. There is a need for ongoing research; tool development and maintenance; and coordinated monitoring of effluents and ambient river conditions, including an integrated monitoring evaluation and reporting system.

investigating design options for managing growth pressures

To investigate options for managing growth, the Steering Committee formed a sub-committee to test five possible long-term development scenarios to achieve framework outcomes by 2041, including the use of reclaimed municipal wastewater for industrial use.

This work included an engineering study to determine if the use of reclaimed municipal wastewater was technically possible, using growth assumptions and various load reduction targets. The engineering study incorporated work on containments of concern and Maximum Allowable Loads as described previously.

FINDINGS

A modified version of the current system is capable of achieving the necessary environmental outcomes without the added cost of a regional water reclamation pipeline or additional water reclamation facilities. The engineering study illustrated the importance of clear measurable and definable end results based on science-based environmental outcomes.

a world-class system

To minimize the footprint on the river, industry is limiting discharges to the river, sharing existing infrastructure locations for current developments and promoting the use of shared intakes. Area municipalities have upgraded wastewater facilities and improved stormwater management. Such collaborative use of infrastructure requires effective governance and administration. To explore shared governance in the region for wastewater treatment, the Steering Committee formed a sub-committee to review collaboration processes used in other regions, policies, laws and institutions, and to consider existing governance models for wastewater treatment used worldwide.

FINDINGS

The Industrial Heartland and Capital Region governance and management of wastewater treatment assets is unique. The existing situation of shared intakes and comingled effluent treatment is a representative model of a world-class system. This current system then, should serve as a model moving forward, as it administers the framework's vision for *a world-class integrated water management system within the North Saskatchewan River to sustainably support the environment, and social and economic development.*

what has evolved since the framework was released?

The Steering Committee provided a forum for meaningful stakeholder engagement, innovative thinking and adaptive management, including strong leadership to sub-committees, confirming study assumptions and taking informed action at decision points as findings became available. Over the past five years, the vision, principles, and strategic objectives of the water management framework were applied. However, some of the context and management strategies have continued to evolve. This evolution is described below.

Alberta's Water Management Framework for the Industrial Heartland and Capital Region will make Alberta a world leader in innovation and technology.

The Framework will minimize the impact or "footprint" on the North Saskatchewan River by improving the quality of the water and ensuring water conservation practices are in effect.

The Framework will be implemented using distinct phasing.

The Framework has a regional perspective and may be used as a model for other regional frameworks in the province.

ECONOMICS

Existing and planned development is significant in this area, but is expected to occur at a reduced rate. The opportunity is now to improve monitoring, consolidate knowledge and build models to better understand conditions in the North Saskatchewan River.

REGIONAL MANAGEMENT SYSTEM

The current management of wastewater treatment works for the region. With its shared intakes and comingled effluent treatment, it is considered a world-class system. There is no immediate need to implement a new governance arrangement. Water reclamation will be evaluated and considered where feasible and remains an important consideration in future development.

WATER QUALITY MANAGEMENT

The objective of managing water quality is to maintain or improve the current water quality in the Devon to Pakan reach of the river, with emphasis on downstream water quality at Pakan. To meet this goal, water quality management will incorporate allowable loading calculations, based on site specific water quality objectives developed for contaminants of concern in the North Saskatchewan River. Water quality objectives and resultant allowable loads were determined for a pilot suite of pollutants. A broader array of pollutants may be assessed going forward, based on continuing monitoring and evaluation studies. The calculation of maximum allowable loads accounts for how temporal flow patterns affect changes in water quality over the course of a year. Once established, the use of maximum allowable loads will be applied through the regulatory process. This process will enable a tiered management system of investigation and potential mitigation management action when exceedances occur.

WATER QUANTITY MANAGEMENT

The water management framework has targets to remain below certain weekly net water use numbers in the Devon to Pakan reach. The numbers vary weekly according to both seasonal and year-to-year variation in flow in the North Saskatchewan River; the available water for net use decreases at lower river flows. The lowest weekly 'available water' number (Appendix D, Table 1) is 4 cubic metres per second, for some of the weeks in December and January. Based on water withdrawal and returns data for *Water Act* licences in the Devon to Pakan reach of the river, this is sufficient for current and future use. Ninety per cent of the time the net use has been below 2.5 cubic metres per second. Some management of the timing of peak withdrawals by the largest licensees may be required into the future. In the meantime, water use relative to the weekly 'available water' numbers will continue to be tracked and considered by decision-makers in new licence applications and amendments.

PHASING

Work to build the long-term foundation and sustainability phases have overlapped. In practice, phasing of framework implementation has occurred concurrently.

The framework enables existing operations and current developments – the policy of no new physical intakes on the North Saskatchewan River continues, unless there are no other options, and proponents are encouraged to use reclaimed wastewater where feasible.

STEWARDSHIP IN ACTION

Industry and municipalities have been employing actions consistent with the framework for many years – the framework has served to make these principles of management more explicit. Examples of actions consistent with the water management framework include:

- Sherritt International Corporation, Agrium Inc., Sulzer Ltd. and Umicore share one intake and send effluent to the Alberta Capital Region Wastewater Commission.
- The Dow Chemical Company shares its intake with other industries and its newer facilities have no discharge to the North Saskatchewan River.
- The Gold Bar Wastewater Treatment Plant supplies the Suncor Energy refinery with reclaimed water.
- New industry like North West Redwater Partnership will use an existing intake and are looking at sending effluent to the Alberta Capital Region Wastewater Commission.
- City of Edmonton is working at improving stormwater quality and reducing Combined Sewer Overflow (CSO) events.
- Improved access to water quality information for the North Saskatchewan River.

priorities and next steps

Going forward, the implementation of the water management framework will continue to define water quality objectives and maximum allowable loads, and their application through the regulatory process.

A key component of managing water quality will be integrated monitoring in support of the framework and maximum allowable load approach.

Communicating management actions and how they are consistent with the principles of the framework continues to be key.

Science gaps will continue to be filled and knowledge of the North Saskatchewan River improved. This includes maintaining the tools developed to understand the river.

Emerging issues will continue to be managed by applying the principles of the water management framework.

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