



AGENDA

SPC ON UTILITIES AND CORPORATE SERVICES

September 16, 2020, 9:30 AM
IN THE COUNCIL CHAMBER

Members

Councillor W. Sutherland, Chair
Councillor P. Demong, Vice-Chair
Councillor G. Chahal
Councillor D. Colley-Urquhart
Councillor D. Farrell
Councillor R. Jones
Councillor S. Keating
Mayor N. Nenshi, Ex-Officio

SPECIAL NOTES:

*Public are encouraged to follow Council and Committee meetings using the live stream
<http://video.isilive.ca/calgary/live.html>*

*Public wishing to make a written submission may do so using the public submission form at the following link:
[Public Submission Form](#)*

*Public wishing to speak are invited to contact the City Clerk's Office by email at
publicsubmissions@calgary.ca. to register and to receive further information.*

Members may be participating remotely.

1. CALL TO ORDER
2. OPENING REMARKS
3. CONFIRMATION OF AGENDA
4. CONFIRMATION OF MINUTES
 - 4.1 Minutes of the Regular Meeting of the Standing Policy Committee on Utilities and Corporate Services, 2020 July 22

5. CONSENT AGENDA

5.1 DEFERRALS AND PROCEDURAL REQUESTS

None

5.2 BRIEFINGS

5.2.1 Status of Outstanding Motions and Directions – Q3 2020, UCS2020-1003

5.2.2 Nose Creek Watershed Water Management Plan Implementation Update, UCS2020-1005

6. POSTPONED REPORTS

(including related/supplemental reports)

None

7. ITEMS FROM OFFICERS, ADMINISTRATION AND COMMITTEES

7.1 Source Water Protection Policy, UCS2020-1007

7.2 Calgary's Accelerated Lead Service Pipe Removal and Mitigation Plan, UCS2020-0377

7.3 Alberta Collaborative Extended Producer Responsibility Study Report, UCS2020-0887

8. ITEMS DIRECTLY TO COMMITTEE

8.1 REFERRED REPORTS

None

8.2 NOTICE(S) OF MOTION

None

9. URGENT BUSINESS

10. CONFIDENTIAL ITEMS

10.1 ITEMS FROM OFFICERS, ADMINISTRATION AND COMMITTEES

10.1.1 Proposed Acquisition – (Cougar Ridge) – Ward 06 (470 85 ST SW, UCS2020-1011

Held confidential pursuant to Sections 23 (Local public body confidences), 24 (Advice from officials) and 25 (Disclosure harmful to economic and other interests of a public body) of the *Freedom of Information and Protection of Privacy Act*, until the transaction has been closed.

Review By: 2021 March 30

10.1.2 Proposed Lease and License (Dover) – Ward 09 (19 and 150 Gosling WY SE), UCS2020-1012

Held confidential pursuant to Sections 23 (Local public body confidences), 24 (Advice from officials) and 25 (Disclosure harmful to economic and other interests of a public body) of the *Freedom of Information and Protection of Privacy Act*, until the lease is executed.

Review By: 2021 July 30

- 10.1.3 Proposed Sale (Residual Ward 09 – Sub Area) – Ward 09 (800 84 ST NE), UCS2020-1009
Held confidential pursuant to Sections 23 (Local public body confidences), 24 (Advice from officials) and 25 (Disclosure harmful to economic and other interests of a public body) of the *Freedom of Information and Protection of Privacy Act*, until the sales transaction has closed.

Review By: 2032 April 22, except for Attachments 4 and 5b which shall remain confidential.

- 10.1.4 Proposed Method of Disposition – Manchester and Elboya, UCS2020-1008
Held confidential pursuant to Sections 23 (Local public body confidences), 24 (Advice from officials) and 25 (Disclosure harmful to economic and other interests of a public body) of the *Freedom of Information and Protection of Privacy Act*, until the sales transaction has closed.

Review By: 2030 July 30, except for Attachments 4 and 5 which shall remain confidential.

- 10.1.5 Summary of Green Line Real Property Transactions for the Second Quarter 2020, UCS2020-1013
Held confidential pursuant to Sections 23 (Local public body confidences), 24 (Advice from officials) and 25 (Disclosure harmful to economic and other interests of a public body) of the *Freedom of Information and Protection of Privacy Act*, until the report is published in the Council Agenda, except Attachment 1, unless The City is required to disclose pursuant to the *Expropriation Act (Alberta)*.

Review By: 2029 February 12

10.2 URGENT BUSINESS

11. ADJOURNMENT



MINUTES

SPC ON UTILITIES AND CORPORATE SERVICES

**July 22, 2020, 9:30 AM
IN THE COUNCIL CHAMBER**

PRESENT: Councillor W. Sutherland, Chair
Councillor P. Demong, Vice-Chair (Remote Participation)
Councillor G. Chahal (Remote Participation)
Councillor D. Colley-Urquhart (Remote Participation)
Councillor D. Farrell (Remote Participation)
Councillor G-C. Carra (Remote Participation)

ABSENT Councillor R. Jones (Personal)
Councillor S. Keating (Personal)

ALSO PRESENT: A/General Manager C. Anshurs
Legislative Advisor D. Williams
Legislative Advisor L. Gibb

1. CALL TO ORDER

Councillor Sutherland called the Meeting to order at 9:32 a.m.

ROLL CALL:

Councillor Sutherland, Councillor Demong, Councillor Chahal, Councillor Farrell,
Councillor Colley-Urquhart, Councillor Carra

Absent from Roll Call: Councillor Jones and Councillor Keating

2. OPENING REMARKS

Councillor Sutherland provided opening remarks.

3. CONFIRMATION OF AGENDA

Moved by Councillor Demong

That the Agenda for the 2020 July 22 Regular Meeting of the Standing Policy Committee on Utilities and Corporate Services be confirmed.

MOTION CARRIED

4. CONFIRMATION OF MINUTES

- 4.1 Minutes of the Regular Meeting of the Standing Policy Committee on Utilities and Corporate Services, 2020 June 17

Moved by Councillor Demong

That the Minutes of the 2020 June 17 Regular Meeting of the Standing Policy Committee on Utilities and Corporate Services be confirmed.

MOTION CARRIED

5. CONSENT AGENDA

Moved by Councillor Demong

That the Consent Agenda be approved as follows:

5.1 DEFERRALS AND PROCEDURAL REQUESTS

- 5.1.1 Deferral Request – Corporate Land Strategy – Guiding Document (UCS2019-1579), UCS2020-0832

5.2 BRIEFINGS

None

MOTION CARRIED

6. POSTPONED REPORTS

None

7. ITEMS FROM OFFICERS, ADMINISTRATION AND COMMITTEES

- 7.1 Organizational Health, Safety and Wellness 2019 Annual Report, UCS2020-0446

A presentation entitled "Organizational Health, Safety and Wellness (OHSW) 2019 Annual Report" was electronically displayed and distributed with respect to Report UCS2020-0446.

Moved by Councillor Demong

That with respect to Report UCS2020-0466 the following be approved:

That the Standing Policy Committee on Utilities and Corporate Services recommend that Council:

1. Direct the Organizational Health Safety and Wellness (OHSW) Service Line to report back in Q4 2020 with a summary of the OHSW service line impacts and response to the COVID-19 pandemic.

MOTION CARRIED

- 7.2 Selling Prices for Road Rights of Way in Greenfield Areas (File No. 2020 Sector Rates), UCS2020-0833

A presentation entitled "UCS2020-0833 Selling Prices for Road Rights of Way in Greenfield Areas 2020 Sector Rates" was electronically displayed and distributed with respect to Report UCS2020-0833.

Moved by Councillor Demong

That with respect to Report UCS2020-0833 the following be approved:

That the Standing Policy Committee on Utilities and Corporate Services recommends that Council receive the Report and Attachments for the Corporate Record.

MOTION CARRIED

8. ITEMS DIRECTLY TO COMMITTEE

8.1 REFERRED REPORTS

None

8.2 NOTICE(S) OF MOTION

None

9. URGENT BUSINESS

None

10. CONFIDENTIAL ITEMS

Moved by Councillor Demong

That pursuant to Sections 23 (Local public body confidences), 24 (Advice from officials), and 25 (Disclosure harmful to economic and other interests of a public body) of the *Freedom of Information and Protection of Privacy Act*, Committee move into Closed Meeting at 10:27 a.m. in the Council Boardroom to consider confidential matters with respect to the following items:

- 10.1.1 Proposed Method of Disposition – Ward 9 (1840 9 AV SE and 859 19 ST SE (Adjacent Road ROW), UCS2020-0850; and
- 10.1.2 Proposed Method of Disposition - Ward 9 (Portion of 4920 68 ST SE), UCS2020-0851

And further, that Patrick Mattern from Calgary Economic and Development be invited to join the Closed Meeting for item 10.1.2.

MOTION CARRIED

Committee moved into Public Meeting at 11:35 a.m. with Councillor Sutherland in the Chair.

ROLL CALL

Councillor Sutherland, Councillor Demong, Councillor Chahal, Councillor Farrell, Councillor Colley-Urquhart, Councillor Carra

Absent from Roll Call: Councillor Jones and Councillor Keating

Moved by Councillor Carra

That Committee rise and report.

MOTION CARRIED

10.1 ITEMS FROM OFFICERS, ADMINISTRATION AND COMMITTEES

10.1.1 Proposed Method of Disposition – Ward 9 (1840 9 AV SE and 859 19 ST SE (Adjacent Road ROW), UCS2020-0850

Administration in attendance during the Closed Meeting discussions with respect to Report UCS2020-0850:

Clerks: D. Williams. Advice: C. Berry. Law: B. Graham. Observers: C. Arthurs, S. McClurg, T. Benson and F. Snyders.

Moved by Councillor Carra

That with respect to Report UCS2020-0850, the following be approved:

That the Standing Policy Committee on Utilities and Corporate Services recommends that Council:

1. Authorize the Recommendation as outlined in Attachment 2;
2. Direct that Report UCS2020-0850 be forwarded as an item of Urgent Business to the 2020 July 27 Combined Meeting of Council; and
3. Direct the Recommendations, Report and Attachments 1, 2, and 3 remain confidential pursuant to Sections 23 (Local public body confidences), 24 (Advice from officials) and 25 (Disclosure harmful to economic and other interests of a public body) of the *Freedom of Information and Protection of Privacy Act* until 2030 December 31, except for Attachments 4 and 5 which shall remain confidential.

MOTION CARRIED

10.1.2 Proposed Method of Disposition - Ward 9 (Portion of 4920 68 ST SE), UCS2020-0851

People in attendance during the Closed Meeting discussions with respect to Report UCS2020-0851:

Clerks: D. Williams. Advice: S. McClurg and C. Berry. External Advice: P. Mattern, Calgary Economic Development Law: B. Graham. Observers: C. Arthurs, A. Wihak and F. Snyders.

Moved by Councillor Carra

That with respect to Revised Report UCS2020-0851, the following be approved:

That the Standing Policy Committee on Utilities and Corporate Services recommends that Council:

1. Authorize the Recommendations in Option 1, as outlined in Revised Attachment 2;
2. Direct that Report UCS2020-0851 be forwarded as an item of Urgent Business to the 2020 July 27 Combined Meeting of Council; and
3. Direct the Recommendations, Revised Report and Attachments 1, 2, 3 and 5 remain confidential pursuant to Sections 23 (Local public body confidences), 24 (Advice from officials) and 25 (Disclosure harmful to economic and other interests of a public body) of the *Freedom of Information and Protection of Privacy Act* until 2030 December 31, except for Attachment 4 which shall remain confidential.

Against: Councillor Colley-Urquhart

MOTION CARRIED

10.2 URGENT BUSINESS

None

11. ADJOURNMENT

Moved by Councillor Demong

That this meeting adjourn at 11:44 a.m.

MOTION CARRIED

The following items have been forwarded as Confidential Urgent Business to the 2020 July 27 Combined Meeting of Council:

CONFIDENTIAL URGENT BUSINESS

- Proposed Method of Disposition – Ward 09 (1840 9 AV SE and 859 19 ST SE (Adjacent Road ROW), UCS2020-0850
- Proposed Method of Disposition - Ward 9 (Portion of 4920 68 ST SE), UCS2020-0851

The following items have been forwarded to the 2020 September 14 Combined Meeting of Council:

CONSENT:

- Organizational Health, Safety and Wellness 2019 Annual Report, UCS2020-0446

The next Regular Meeting of the Standing Policy Committee on Utilities and Corporate Services is scheduled to be held on 2020 September 16 at 9:30 a.m.

CONFIRMED BY COMMITTEE ON

CHAIR

ACTING CITY CLERK

UNCONFIRMED

BRIEFING

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Item # 5.2.1

Utilities & Environmental Protection Briefing to

SPC on Utilities and Corporate Services
2020 September 16

ISC: UNRESTRICTED
UCS2020-1003

Status of Outstanding Motions and Directions – Q3 2020

PURPOSE OF BRIEFING

This briefing note summarises the status of the Department of Utilities and Environmental Protection's outstanding motions and directions for Standing Policy Committee (SPC) on Utilities and Corporate Services (UCS) as of 2020 September 16.

SUPPORTING INFORMATION

On 2007 February 06, the Personnel and Accountability Committee approved PAC2007-05 Status of Outstanding Motions and Directions, directing Administration to bring forward as an item of business to each Standing Policy Committee, a list of tabled and referred motions and reports for each committee; such lists to be reviewed by each Standing Policy Committee on a quarterly basis.

There are no current or future capital or operating budget implications associated with this status report.

ATTACHMENT(S)

1. Attachment 1 – Status of Outstanding Motions and Directions – Q3 2020

Status of Outstanding Motions and Directions – Q3 2020



ITEM	DATE OF REQUEST	APPROVAL	SUBJECT	MEETING DATE
Extended Producer Responsibility	2019 Feb 4	C2019-0129	Administration to cooperate with other Alberta municipalities, AUMA, producers and recyclers of packaging and paper products, and the Province of Alberta to develop a baseline that can inform the design of a provincial EPR program by researching: <ul style="list-style-type: none"> The benefits, challenges, and risks of an EPR program in Alberta for these groups and their constituents; The current recycling systems and supply chains across the province, and potential impacts of an EPR program in Alberta; and report back through the SPC on Utilities and Corporate Services no later than 2019 October. <ul style="list-style-type: none"> <i>*Deferred to Q1 2021 (as per C2020-0390).</i> 	2020 Sept 16
Lead Water Pipe Removal Options	2019 Dec 3		Direct Administration to prepare a report on accelerated removal of lead water pipes, from both public and private sector properties, returning to council through SPC on UCS no later than Q1 2020, considering: <ul style="list-style-type: none"> Estimated costs and funding options Opportunities for collaboration and cost sharing with private property owners and the Government of Alberta Timelines <i>*Deferred to Q3 2020 (as per C2020-0390)</i>	2020 Sept 16
Source Water Protection Plan and Policy	2019 Dec 18	UCS-20191539	Administration to report on the Source Water Protection Plan and Policy by end of Q2 2020. <i>*Deferred to Q3 2020 (as per C2020-0390)</i>	2020 Sept 16

Status of Outstanding Motions and Directions – Q3 2020 Continued



ITEM	DATE OF REQUEST	APPROVAL	SUBJECT	MEETING DATE
Progress Update: Nose Creek Watershed Water Management Plan	2019 June 19	UCS-20190808	Administration to report back to SPC on Utilities and Corporate Services with a progress update on Plan implementation no later than 2020 Q3.	2020 Sept 16
Water Customer Assistance Program Pilot	2018 Nov 19	UCS2018-1193	Administration to proceed with a project to conduct customer billing data collection and analysis to determine the need for a Water Customer Assistance Program Study and report back to Council no later than Q1 2020 on results and recommendations for next steps. <i>*Deferred to Q4 2020 (as per C2020-0390)</i>	2020 Dec 16
Scoping Report for Privatization of up to 25% of Residential Black Cart Collection Services	2019 Nov 18	C2019-1467	Direct Administration to: <ul style="list-style-type: none"> Report back to the SPC on UCS no later than April 2020 on the scoping and development of a RFP to contract out up to 25% of residential black cart collection services/ and Report back to the SPC on UCS no later than Q4 2020 on the results of the RFP and a timeline for an implementation goal of Q1 2022 	2020 Dec 16
Cost Analysis for the Potential Reintroduction of Fluoride into the Water System	2019 Oct 29	CPS2019-0965	Direct Administration to undertake a full cost analysis for the potential reintroduction of fluoride into the water system including ongoing projected operational costs, City's authority and jurisdiction with regard to fluoridation, capital cost and possible utility rate impacts; and report back directly through the Priorities and Finance Committee no later Q2 2020 <i>*Deferred to Q4 2020 (as per C2020-0390)</i>	2020 Dec 16

Status of Outstanding Motions and Directions – Q3 2020 Continued



ITEM	DATE OF REQUEST	APPROVAL	SUBJECT	MEETING DATE
Annual Corporate Environmental Management Performance	2019 May 15	UCS2019-0460	Direct Administration to change environmental and safety performance reporting frequency from biannual to annual and provide separate corporate performance reports on the following service lines going forward as part of One Calgary: <ul style="list-style-type: none"> Environmental management. 	2020 Q4
Extra Strength Surcharge Parameters for Wastewater	2018 Jul 30	UCS2018-0884	Administration to report back on rates and limits for wastewater extra strength surcharge parameters no later than 2020 November.	2020 Q4
Bowness Barrier Recommendations	2020 Apr 15	UCS2020-0372	Administration to report back to SPC on UCS no later than Q4 2020 with recommendations regarding the Bowness barrier project.	2020 Q4
Budget Adjustments due to ACRP Rescindment	2020 Apr 15	UCS2020-0372	Return to Council with budget adjustments for ACRP-impacted projects no later than the 2020 November mic-cycle adjustments.	2020 Q4
OHSW Service Line Impacts and Response to COVID-19	2020 Jul 22	UCS2020-0446	Report back in Q4 2020 with a summary of the OHSW service line impacts and response to the COVID-19 pandemic.	2020 Q4

Status of Outstanding Motions and Directions – Q3 2020 Continued



ITEM	DATE OF REQUEST	APPROVAL	SUBJECT	MEETING DATE
Single Use Items Reduction Strategy and Implementation Plan	2019 May 15	UCS2019-0370	Administration to develop a single-use items reduction strategy and implementation plan to return to Committee with a strategy no later than Q3 2020. <i>*Will be proposing a deferral to Q1 2021.</i>	2021 Q1
Detailed Pilot Plan for Variable Set-Out for the Black Cart Program	2018 Dec 18	UCS2019-1142	Administration to report back to the SPC on UCS no later than Q2 2021 with results from the review of customer behaviour and a detailed pilot plan including proposed pilot communities, rates that will be piloted, a detailed cost estimate, and a plan for funding the pilot.	2021 Q2
Annual Water Efficiency Plan update	2005 December 12	UE2005-55	Administration to report back to the SPC on Utilities and Corporate Services annually with updates on progress towards "30 in 30" goal.	2021 Q2
	2019 Dec 18	UCS2019-1539	Report on water security annually as part of the Water Utility update to the Standing Policy Committee on UCS	
Flood Resiliency and Mitigation annual report	2014 December 02	PFC2015-0777	Administration to report back to the SPC on Utilities and Corporate Services annually on progress related to the recommendations from the Expert Management Panel on River Flood Mitigation. (Expert panel recommendation 6f).	2021 Q2

Status of Outstanding Motions and Directions – Q3 2020 Continued



ITEM	DATE OF REQUEST	APPROVAL	SUBJECT	MEETING DATE
Variable Stormwater Rate Structure	2018 July 30	UCS2018-0884	Administration to develop an implementation plan for a variable stormwater rate structure and report back to Council by Q4 2020 for potential implementation for the 2023 to 2026 business cycle. <i>*Will be proposing a deferral to Q4 2021.</i>	2021 Q4
Water, Wastewater and stormwater rates for 2023-2026	2018 July 30	UCS2018-0884	Administration to develop water, wastewater and stormwater rates for 2023-2026 that recover 100% of the cost of service for each customer class.	2022

BRIEFING

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Item # 5.2.2

Utilities & Environmental Protection Briefing to

SPC on Utilities and Corporate Services
2020 September 16

ISC: UNRESTRICTED
UCS2020-1005

Nose Creek Watershed Water Management Plan Implementation Update

PURPOSE OF BRIEFING

The purpose of this briefing is to provide an update to the Standing Policy Committee on Utilities and Corporate Services (SPC on UCS) on the Nose Creek Watershed Water Management Plan (Plan). Council approved the Plan as a guidance document and planning tool on July 22, 2019 and directed Administration to report back no later than 2020 Q3 on implementation progress.

Nose Creek is an important natural feature on the landscape running from north of Crossfield and discharging within the City of Calgary boundary near Deerfoot trail. Nose Creek and adjacent lands provide recreational amenities to area residents including extensive adjacent pathways within Calgary. The main objectives of the Nose Creek Watershed Partnership (Partnership) are to protect riparian areas and manage stormwater with the goal of improving water quality in the watershed. Progress in 2019 / 2020 has been made in the following areas: science based predictive model development, ongoing development industry dialogue on stormwater management, Partnership governance and membership. More information is provided in the *supporting information* section. Project work is anticipated to continue through the end of 2020 and into 2021.

SUPPORTING INFORMATION

The Partnership is an inter-municipal watershed stewardship group that formed in 1998, authorized by the Government of Alberta; providing the group legal standing. Members include: City of Calgary, City of Airdrie, Rocky View County, Calgary Airport Authority, Town of Crossfield and the Bow River Basin Council, which provides technical support.

The Partnership functions on an operating budget provided through annual member contributions and supplemented by project grants from external sources. Plan implementation remains focused on advancing a foundation for science-based decision making and formalizing a governance structure.

Plan Implementation Actions and Partnership Successes

- **Plan Implementation:** Develop a watershed-scale predictive model to understand the consequences of alternative management actions on hydrological / hydraulic, ecological, economic and social systems – to be completed through a multi-year and phased approach. Total project budget, for all phases of work, as estimated in the Phase 1 project report is \$1.6 million for the model development and \$1.3 million for establishing a monitoring program (over 3 years).
 - Phase 1 project work which included a model scoping study, data gap analysis and recommended data collection program was completed in July 2020.
 - The Partnership was successful in securing two grants through the Government of Alberta (unsigned at the date of this report), which will help cover the costs of Phase 2 work.

BRIEFING

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Item # 5.2.2

- Phase 2 project work will include building the predictive model supported by the initiation of a data collection program. Work is anticipated to begin in Q4 2020.
- **Engagement:** The City continues dialogue with the development industry including the Building Industry Land Development (BILD) Calgary Region and the Commercial Real-Estate Development Association (NAOIP) to discuss ongoing challenges around runoff volume control targets. Meeting runoff volume control targets continues to be a challenge for the urban members of the Partnership due to the complexity of stormwater management in the watershed.
 - The City initiated a project in April 2020 to explore low energy control options for alternative operation of stormwater ponds. BILD's engagement on this work to date has been through terms of reference review. The City remains committed to working with partner municipalities and stakeholders on the common goal of improving watershed health. The City continues to work with the development industry on a case-by-case basis to minimize development approval delays in the Nose Creek Watershed due to runoff volume control target requirements.
- **Governance Review:** The City identified a governance gap with The Partnership and has taken steps to initiate a governance review which will be completed by the Partnership in 2021. The review will explore options to formalize the organizational structure and supporting legal framework, membership and sustainable funding options to ensure the operation and collaborative nature of The Partnership continues as the complexity of work increases
- **Membership:** In 2019 the Partnership welcomed The Town of Crossfield as a new member. Crossfield is located near the headwaters of Nose Creek and is an important member as decisions made by Crossfield could influence downstream municipalities.

The Plan identifies eight implementation goals, three of which are listed as short term: 1) *Watershed Condition Reporting*, 2) *Develop a hydraulic / hydrologic and water quality model*, and 3) *Develop and implement a standardized water monitoring program*. The Partnership is proud to report that two of the short-term goals are under development with the intention of initiating reporting once the monitoring program has been implemented and is generating data. The City will continue to participate in the activities of the Partnership and will provide further updates to SPC on UCS through the annual Integrated Watershed Management Update.

ATTACHMENT(S)

1. None

Source Water Protection Policy

RECOMMENDATION(S):

That the Standing Policy Committee on Utilities and Corporate Services recommend that Council:

- 1) Approve the Source Water Protection Policy; and
- 2) Direct Administration to determine how the Source Water Protection Policy and associated plans can be integrated into city and regional planning and development policy.

HIGHLIGHTS

- The Source Water Protection Policy (the Policy) will provide clear, strategic direction to the Corporation and guidance for the consistent application of source water and riparian area protection in city planning processes and decision making.
- What does this mean to Calgarians? Safe, clean drinking water, healthy rivers and riparian areas are important values to the quality of life of Calgarians. The new Policy ensures that source water and riparian protection are accounted for in decisions at The City of Calgary (The City).
- Why does this matter? Protecting drinking water at its source in the Bow and Elbow River watersheds and maintaining healthy waterways within Calgary is critical for ensuring high quality drinking water for customers in Calgary and the region and downstream communities.
- Every land use decision is also a water management decision. No land use decisions can be made without understanding the risks to source water quality.
- Protecting high quality water at its source can lead to significant cost savings for The City. As the quality of a water source degrades, more expensive treatment processes must be implemented to achieve drinking water quality guidelines. Source water and riparian protection strategies mitigate risks to water quality.
- Council directed Administration to report on the Source Water Protection Plan and Policy by Q2 2020 (UCS2019-1539), deferred to Q3 2020 due to the COVID-19 pandemic.
- Strategic Alignment to Council's Citizen Priorities: One of the five One Calgary Council Directives is focused on achieving future water security, a sustainable water supply, and integrating watershed management into our land use policies, plans and decisions. The proposed policy also aligns with the *Municipal Development Plan*, *Climate Resilience Strategy*, *Resilient Calgary Strategy* and *BiodiverCity Strategy*, and *One Calgary One Water: Calgary's Water Security Framework*.
- Background and Previous Council Direction is included as Attachment 1.

DISCUSSION

The purpose of the Policy (Attachment 2) is to provide clear, strategic direction to Administration and outline Council's position regarding the protection of watershed health and resilience, and safeguarding drinking water quality. The Policy also provides guidance for the consistent

Source Water Protection Policy

application of source water and riparian area protection in city planning processes and decision making. The Source Water Protection Plan (2018) and the Riparian Action Program (2017) are two key implementation plans under the new Policy and are respectively included as Attachment 3 and Attachment 4.

As part of One Calgary, Council adopted a Directive focused on achieving future water security and integrated watershed management. Council approval of this Policy supports that Directive.

Key elements of the Policy include:

- a clear statement of The City's position on source water protection in regional planning matters;
- proactive stewardship and management of regional source watersheds and riparian areas within Calgary;
- integration and alignment of land use and watershed planning within City plans and administrative processes, as well as a clear statement of The City's position on source water protection in regional planning matters;
- restoration and protection of waterways and riparian areas that contribute to clean drinking water, flood and drought resilience, and biodiversity within Calgary; and
- management of current and future risks related to drinking water quality.

Connecting watershed protection and land use planning

When implementing actions in the two plans related to land use planning and development, a shared direction, responsibility and collaborative approach is required across the Corporation. A Council approved policy will provide unifying direction for embedding watershed protection into land use decisions early in the planning process.

Every land use decision is also a water management decision. No land use decisions can be made without understanding the risks to source water. For example, when land is developed or intensification increases, the flow and quality of water that drains from that landscape will change. When watershed outcomes are considered later in the planning and development process, this can result in delays and the perception that water management requirements are a barrier to development. This lack of alignment can lead to confusion on some planning and development applications, eroding public and business trust.

Council adoption of the Policy will support integration of watershed plans and development policies within the Next Generation Planning System (NextGen), resulting in improved alignment of watershed and land use decisions.

Improving regional planning outcomes

Integrating watershed outcomes into regional planning is also critical for maintaining the region's high-quality drinking water. This includes working with the Calgary Metropolitan Region Board and ensuring watershed concerns are included within inter-municipal development circulations. For example, The City has worked extensively with Rocky View County on the development of the Source Water Protection Plan and created the Bearspaw Tri-Lateral Task Force to promote a shared responsibility for source water protection within the watershed. However, challenges and policy gaps remain. The City continues to see development applications throughout the region that do not include source water protection or stormwater management requirements, potentially posing significant risks to Calgary's drinking water supply. Council adoption of the

Source Water Protection Policy

Policy will support a unified voice at The City for the inclusion of watershed outcomes in statutory plans and development applications throughout the region.

STAKEHOLDER ENGAGEMENT AND COMMUNICATION (EXTERNAL)

- ☐ Public Engagement was undertaken
- ☐ Public Communication or Engagement was not required
- ☒ Public/Stakeholders were informed
- ☐ Stakeholder dialogue/relations were undertaken

Communications on the development of the Policy were initiated in March 2020. Key stakeholder groups were informed of the Policy via one-on-one conversations and meetings (March – August 2020), as well as a webinar for external stakeholders (July 2020). Information sessions provided stakeholders with an opportunity to learn about the Policy and discuss on Policy implications. External stakeholders included: Building Industry Land Development (BILD), Alberta Environment and Parks, Alberta Agriculture and Forestry, Calgary Metropolitan Region Board, Bow River Basin Council, other watershed partnership groups and various environmental non-government organizations. Letters of Support for the Policy are included as Attachment 5.

IMPLICATIONS

Social

The Bow and Elbow rivers provide opportunities for recreation, education and natural beauty. Sustainable management of water is critical to long term city-building and the sustainment of healthy watersheds for the region now and in the future. A proactive approach to protecting source water and riparian health helps protect public health and safety and can help reduce risk to property from flooding.

First Nations' engagement was undertaken during the development of the Source Water Protection Plan to better understand indigenous cultural values related to our watershed and to build deeper relationships between The City and First Nations. This is consistent with the spirit and intent of The City's Indigenous Policy. During Source Water Protection Plan implementation, The City will implement actions that provide mutual benefits to both Calgarians and indigenous peoples.

Environmental

The quality of Calgary's water supply depends on the condition of the land upstream that collects and drains water via the Bow and Elbow Rivers to The City's water treatment plants. Maintaining the health of the rivers within Calgary also protects water for downstream users and aquatic ecosystems. Healthy riparian areas filter contaminants and nutrients, trap and store sediment, and store and recharge groundwater.

Proactive protection of water quality at its source will help ensure that the watershed remains resilient to current and future stressors, including climate change. For example, widespread, high intensity wildfires are a key risk for Calgary's source watershed, which are likely to become more frequent due to climate change. To reduce the risk of wildfire impacting water quality, management strategies have been identified to improve emergency management communications, build resiliency of the water treatment infrastructure to wildfires, and work

Source Water Protection Policy

collaboratively with regional partners on proactive landscape wildfire risk management.

Economic

Investing in source water and riparian protection is considered best practice from a municipal finance perspective. In addition to protecting public and environmental health, protecting source water quality allows The City to avoid (or at the very least delay) expensive water treatment upgrades. The costs of upgrading both the Glenmore and Bearspaw water treatment plants with more advanced treatment processes could reach \$350 million, and an additional \$5.5 million/year for annual operating costs. A policy aimed at protecting source water prior to reaching The City's water treatment plants is more cost effective than building and operating more advanced treatment facilities. This will help maintain affordable rates for customers.

Healthy riparian areas also help filter pollutants from urban run-off, and stabilize stream banks, which prevent erosion especially during flood events. Functioning riparian areas provide free ecosystem services that reduce the need for costly restoration and additional infrastructure over time.

Service and Financial Implications

Existing Operating funding – base: No additional operating or capital budget is anticipated during this business cycle.

Existing operating funding - base

No addition operating or capital budget is anticipated during this business cycle.

RISK

Sustainable management of water resources is one of Calgary's most significant resilience challenges. Risks to source water and riparian areas include climate change, upstream wildfires and land use impacts to water quality. Proactive protection of watersheds and riparian areas will help manage and mitigate cumulative risks for a more secure water future.

Watershed requirements provided at later stages of the planning and development process can pose timing and financial risks to applicants and potentially result in inconsistent land use decisions. This can lead to frustration and confusion, as well as the perception that watershed outcomes are a barrier to development. The Policy provides overarching direction to ensure source water and riparian protection are considered in city-building throughout the NextGen planning process.

Watershed management crosses many jurisdictional boundaries within the Calgary region, and consistent consideration of watershed outcomes in inter-municipal and regional planning and development is critical. The Policy provides an opportunity to demonstrate regional leadership and promote watershed outcomes in regional land use and development decisions.

ATTACHMENT(S)

1. Attachment 1 – Previous Council Direction, Background
2. Attachment 2 – Source Water Protection Policy
3. Attachment 3 – Source Water Protection Plan
4. Attachment 4 – Riparian Action Program

**Utilities & Environmental Protection Report to
SPC on Utilities and Corporate Services
2020 September 16**

**ISC: UNRESTRICTED
UCS2020-1007
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Source Water Protection Policy

5. Attachment 5 – Source Water Protection Policy Letters of Support

Department Circulation

General Manager (Name)	Department	Approve/Consult/Inform (Pick-one)
Chris Arthurs	General Manager	Approve
Katie Black	Community Services	Approve
Stuart Dalglish	Planning and Development	Approve
Dan Limacher	Utilities and Environmental Protection	Approve
Doug Morgan	Transportation	Approve
Michael Thompson	Greenline	Approve

Background

Context

Water Resources has developed two watershed management plans that protect our waterways and watershed: the Source Water Protection Plan (2018) and the Riparian Action Program (2017). Both plans were created through extensive stakeholder consultation and robust science and technical input. Since completion, the Water Utility has been implementing key actions outlined in both plans to achieve our integrated watershed management goals.

The Source Water Protection Plan identifies actions to protect source water quality upstream of Calgary's two water treatment plants. The specific goals of the Plan are to:

- Protect the source watershed with **improved land use planning**;
- **Promote innovation in stormwater** management to protect source water quality;
- **Leverage key partnerships** for wildfire management, emergency response and protecting vulnerable source watershed lands; and
- Involve the community through **education and research**.

The Riparian Action Program protects and restores riparian areas within Calgary by identifying specific actions to achieve the following three outcomes.

- Further loss of riparian areas is minimized through **land use planning**.
- City-wide **riparian health** is improved through bioengineering and riparian restoration projects.
- Citizens and riparian landowners value riparian areas through **education and outreach**.

The Source Water Protection Plan (2018) and the Riparian Action Program (2017) are two key implementation plans under the new Policy.

Previous Council Direction

The 2019 May 13 Strategic Meeting of Council (C2019-0648) helped Administration understand what is important to Council on Integrated Watershed Management. Three themes on what we heard are reflected in the development of this Policy: the importance of integrating urban planning and watershed management outcomes, collaborating with stakeholders towards policy solutions around water supply, and being proactive in policy and practices The City has control over.

On 2020 January 13, Council accepted the One Calgary One Water: A framework for Calgary's water secure future (UCS2019-1539) and directed Administration to report on the Source Water Protection Plan and Policy by Q2 2020 (deferred to Q3 2020 due to COVID-19).

Timeline – Source Water Protection Policy



Council Policy

Policy Title: **Source Water Protection Policy**
Policy Number: **Assigned by the City Clerk's Office**
Report Number: **Report(s) going to Committee/Council**
Adopted by/Date: **Council / Date Council policy was adopted**
Effective Date: **Date adopted or later as directed by Council**
Last Amended: **Date of the last amendment, if any**
Policy Owner: **Water Resources**

1. POLICY STATEMENT

- 1.1. The City of Calgary is committed to delivering safe, clean, high quality drinking water to our city and regional customers through proactive stewardship and management of regional source watersheds and riparian areas within Calgary.
- 1.2. The City of Calgary is committed to restoring and protecting Calgary's waterways and riparian areas as part of The City's goals for clean drinking water, flood and drought resilience, and biodiversity.
- 1.3. The City of Calgary's Source Water Protection Plan and the Riparian Action Program, as amended, address current and future risks to drinking water quality, as well as river and riparian health.
- 1.4. Continued growth and development in the Calgary region requires proactive management of cumulative risks to protect the quality of Calgary's water sources prior to withdrawal from reservoirs and rivers for city and regional customers.
- 1.5. Effective implementation of this Council policy shall be achieved by integrating and aligning land use and watershed planning within City and regional plans and administrative processes.

2. PURPOSE

- 2.1 This Council policy addresses the need to:
 - 2.1.1 Integrate land and water management to protect the health of watersheds and drinking water quality now and for the future.
 - 2.1.2 Collaborate with regional stakeholders throughout the source watersheds through partnerships and shared watershed stewardship to manage cumulative risks.
 - 2.1.3. Maintain affordability in the treatment operations of drinking water.
 - 2.1.4. Enhance the resilience of Calgary's watersheds to a changing climate and meet the needs of customers, the environment and a sustainable economy now and in the future.

2.1.5. Provide a more systematic and consistent application to source water and riparian area protection across all City business units.

2.1.6. Provide guidance for land use decisions for source water and riparian protection within Calgary.

2.1.7. Promote the value of watershed management as a collective responsibility through education and outreach initiatives.

2.1.8. Promote watershed management innovation and demonstrate watershed leadership at The City.

3. DEFINITIONS

- 3.1 Riparian area: Transitional lands between upland and aquatic ecosystems. Riparian lands usually have soil, biological and other physical characteristics that reflect the influence of water and hydrological processes.
- 3.2 Source water: Water in its natural or raw state, prior to withdrawal for treatment and distribution as a drinking water source.
- 3.3. Source watershed: The land areas from which water drains downstream and provides raw water supplies for a drinking water utility.

4. APPLICABILITY

- 4.1 This Council policy applies to members of Calgary's City Council and City Administration.
- 4.2. This Council policy applies to the following geographies:
 - 4.2.1 Riparian areas within the city of Calgary's boundaries as it relates to the implementation of the Riparian Action Program.
 - 4.2.2. To the extent that The City has decision making authority or influence, the source watersheds of the Bow and Elbow Rivers upstream of the City of Calgary's drinking water intakes as it relates to the implementation of the Source Water Protection Plan.

5. PROCEDURE

- 5.1. Implementation of this Council policy is outlined in the Source Water Protection Plan and Riparian Area Program.

- 5.2 This Council policy should be applied in conjunction with other Council and Administrative policies and standards related to watershed management and land use.

5.2.1 The City will continue to work with the Government of Alberta, regional municipalities, stakeholders and First Nations to protect the quality of the source water.

5.2.2 For any proposed changes to land uses, The City commits to engagement with stakeholders and will follow the legislative requirements for land use amendments.

- 5.3. The process by which the Council policy will be monitored and reported on will be through the annual Integrated Watershed Update report to Council.

6. **AMENDMENT(S)**

Date of Council Decision	Report/By-Law	Description

7. **REVIEW(S)**

Date of Policy Owner's Review	Description



Source Water Protection Plan

Protecting our source watershed through proactive collaboration



Executive summary

The City of Calgary is committed to delivering high quality, safe drinking water to the communities we serve, which include over 1.3 million citizens. Our exceptional drinking water is due in part to the high quality of our **source water** – the natural waters of the Bow and Elbow rivers prior to treatment and distribution to our customers. In turn, the quality of our source water depends on the condition of the land that collects and drains water downstream to our drinking water treatment facilities. Also known as our **source watershed**, this 9,000 km² area generates and filters water through a vast network of glaciers, mountains, forests, grasslands, rivers, streams, wetlands, aquifers, agricultural landscapes and communities.

Safeguarding our high quality source water requires a proactive approach to comprehensively address current and future risks to source water.

Source water protection is a coordinated risk management approach that provides the first line of defence in a multi-barrier approach to providing safe, clean drinking water.

Our Source Water Protection Plan (Plan) was developed over the course of three years (2015-2018), and is based on the culmination of:

- Provincial direction and guidance
- Water quality monitoring data
- Technical risk assessments
- Internal and external engagement
- Best practice guidelines and standards

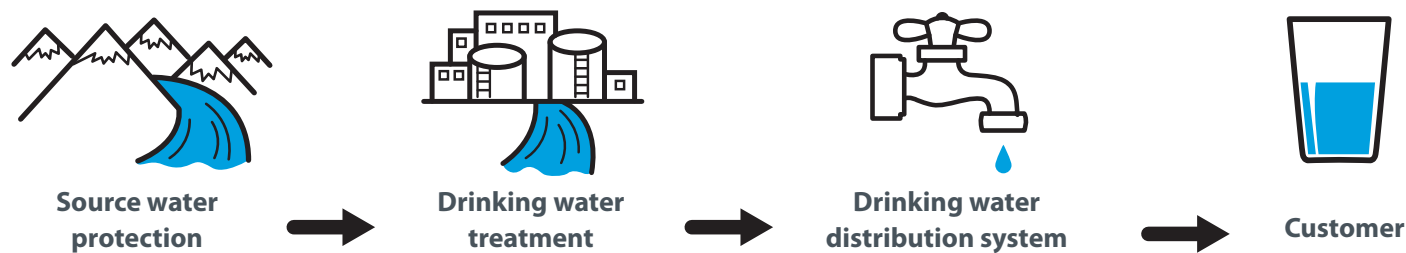


Figure 1: The City of Calgary's multi-barrier approach to safe drinking water

The vision, goals and actions to protect source water quality are the foundation of this Plan (Figure 2). These flow from documented best practices in other jurisdictions, as well as provincial direction and key policy drivers, including public health, environmental stewardship and cost-effective service delivery. The Plan provides a common direction and priorities, while synthesizing and building on existing data and initiatives. Although the Plan is focused on The City's source water, it can also be used as a foundation for more regional source water protection initiatives as well.

Priority actions under each of the four goals are also described in the Plan, including targeted timelines and key stakeholders. Implementation intends to leverage resources across a wide range of jurisdictions and knowledge domains.

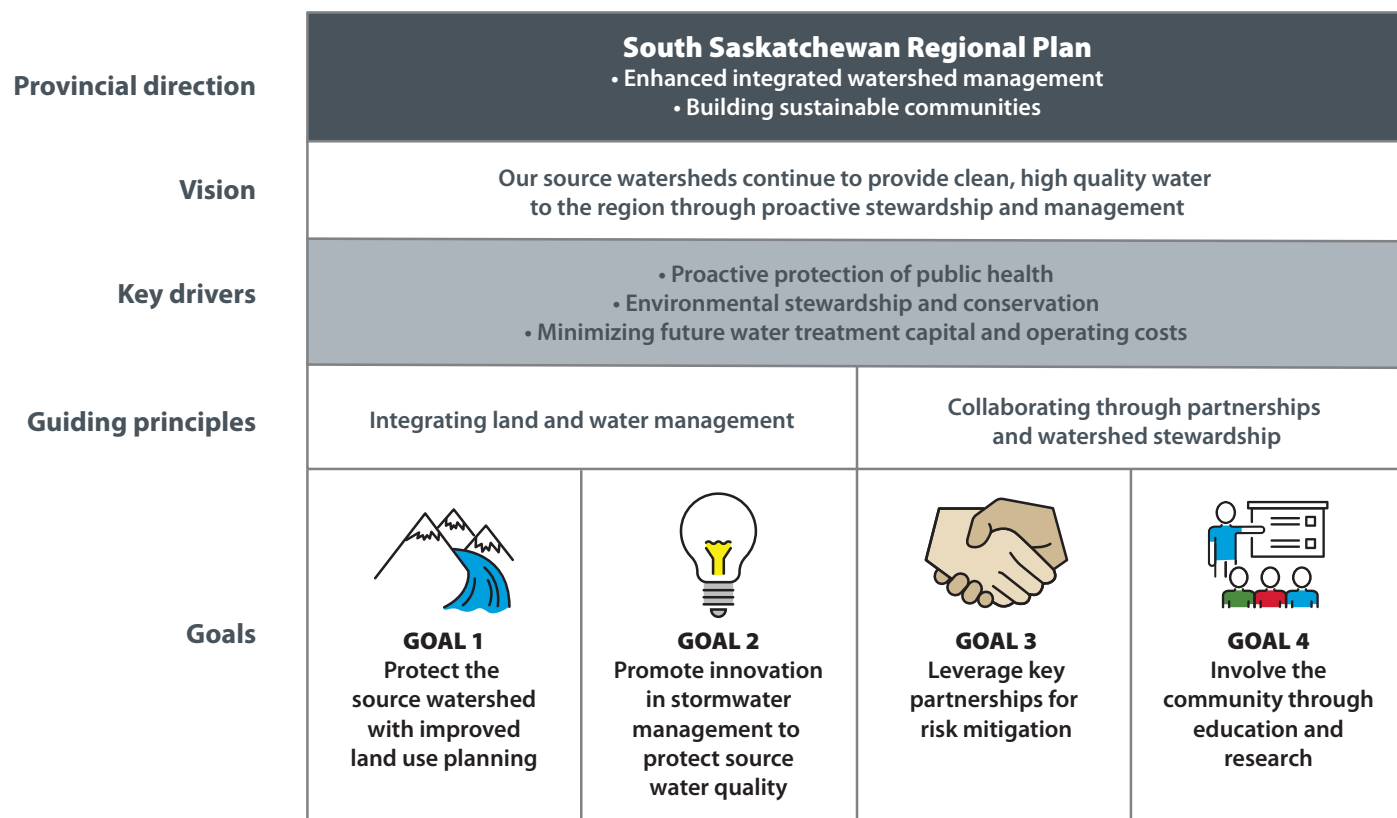


Figure 2: From vision to goals: A strategic framework for source water protection

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What is source water protection?

Source water protection is the first line of defence to minimize the risk of drinking water contamination. Together with drinking water treatment and risk mitigation within the water distribution system, source water protection is part of a multi-barrier approach to providing clean, safe drinking water to our customers (Figure 3). Source water protection reflects the inherent diversity and unique attributes of natural waters, watershed landscapes, local governance and institutions.

Source water

Water in its natural or raw state, prior to being withdrawn for treatment and distribution as a drinking water supply. The City of Calgary's source water is associated with the Bow and Elbow watersheds upstream from the Bearspaw and Glenmore water treatment plants.

Documented best practices show that successful source water protection plans and programs share the following six basic elements [1,2]:

- A program **vision**
- Source water **characterization**
- Source water protection **goals**
- A source water protection **action plan**
- **Implementation** of the action plan
- Periodic **evaluation and revision**

In accordance with these best practices, the contents of this Plan reflect the above elements.



Figure 3: The City of Calgary's multi-barrier approach to safe drinking water

A focus on source water quality

This Plan focuses primarily on source water quality issues, although interactions between water quality and quantity are recognized throughout. Approaches to manage water quantity and scarcity issues are addressed more thoroughly in The City's Water Efficiency Plan, Drought Management Planning and other related work.

Key **drivers** for undertaking the development of a Source Water Protection Plan for Calgary include:

- **Proactive protection of public health** for current and future generations.
- **Greater awareness of the need for environmental stewardship and conservation**, including cumulative effects management addressing multiple stressors, such as land use change and climate change.
- **Potential to minimize costs**, including operational costs for water treatment, or deferred capital costs for future upgrades to treatment infrastructure.
- **Increasing development and land use change** throughout our source watersheds, both within and upstream of Calgary.

Relationships to other regulations and planning processes

Source water protection is related to many other processes at provincial, regional and local scales. This Plan complements existing governance frameworks and does not duplicate existing roles and responsibilities.

Integration with other planning and regulatory frameworks

A wide range of regulations, policies, plans and strategies relate either directly or indirectly to watershed protection in Alberta and the Calgary region (Figure 4). Legislation, regulations and standards are in place for many land use planning procedures, and for regulating water-related environmental risks associated with various industries. Water utilities in Alberta are also required to prepare Drinking Water Safety Plans (DWSP), which include qualitative risk evaluations and mitigation actions in a source-to-tap framework. This Source Water Protection Plan builds on the foundation provided by The City's Drinking Water Safety Plan.

The Plan also integrates and coordinates with the South Saskatchewan Regional Plan, the Calgary Municipal Development Plan, the Bow Basin Watershed Management Plan, various subwatershed plans and evolving regional planning requirements. The City of Calgary is also a leader in minimizing the impacts of our wastewater and stormwater on the broader Bow River Basin watershed, in order to help protect the environment and the source water of other users located downstream from Calgary.

The City of Calgary's stewardship of downstream environments

The scope of this Plan focuses on source watersheds upstream from Calgary. However, The City of Calgary is also a leader in minimizing the impacts of wastewater and stormwater on the broader Bow River Basin watershed, to help protect the environment and the source water of other users downstream from Calgary. As a reflection of success to date, the amount of sediment pollution loading to the Bow River from Calgary remains under 2005 levels, despite rapid growth.

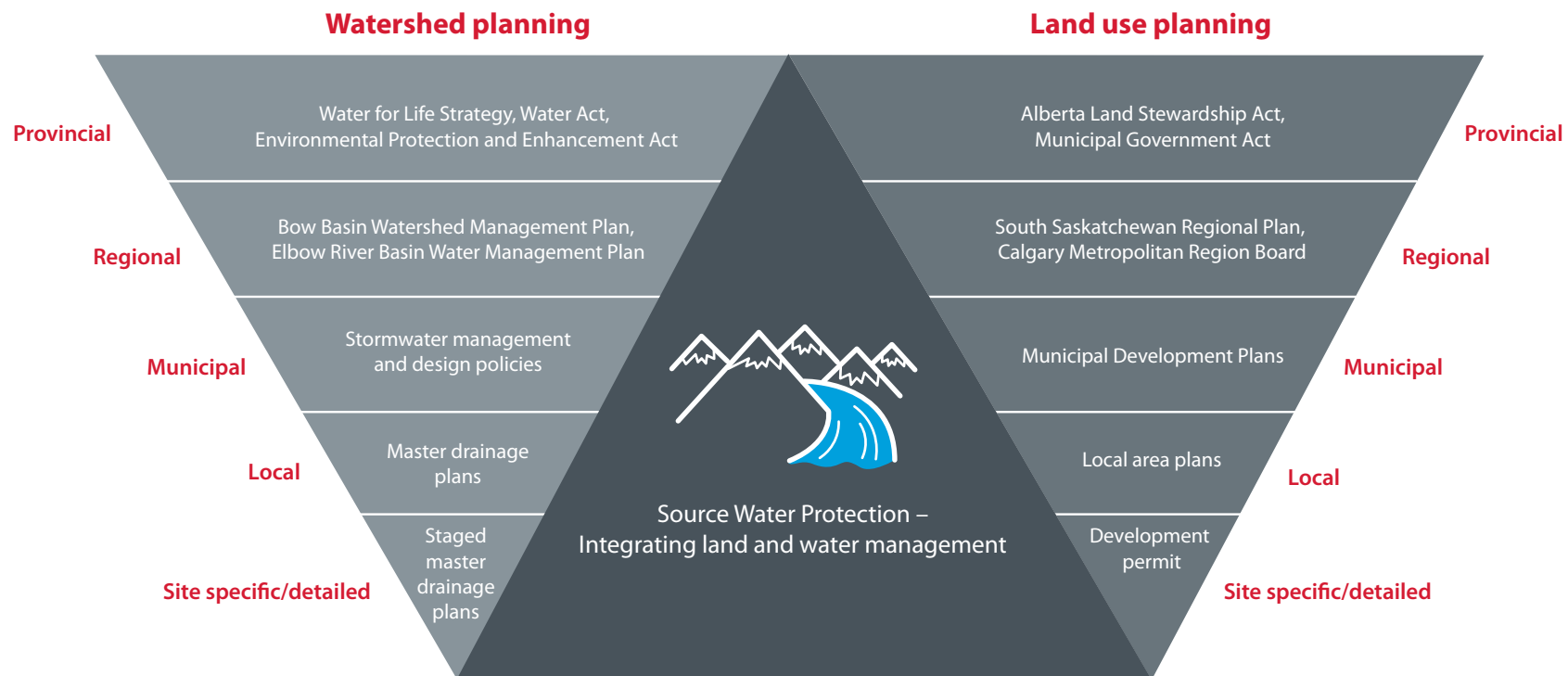


Figure 4: Source water protection and integrated watershed management

"Clean water and a healthy watershed are integral to our ability to protect public health." ~ Internal City stakeholder



Watershed values and program vision

Calgary's source watersheds include a wide range of landscapes, with diverse functions and values that must be balanced. These include First Nations' cultural values, ecological values and ecosystem services, development values, working landscapes and industrial activities.

First Nations' values

Since time immemorial, land and water resources in the Bow and Elbow watersheds have been used for traditional purposes by indigenous peoples. Calgary's source watersheds overlap the traditional territories of the Treaty 7 First Nations, including:

- The Niitsitapi or Blackfoot, which includes the Siksika, Kainai and Piikani nations.
- The Nakota Sioux (Stoney) Nation, comprising the Chiniki, Bearspaw and Wesley bands, who also have substantial reserve lands in the Bow River source watershed.
- The Tsuut'ina or Beaver people, who also have substantial reserve lands in the Elbow River source watershed.

Calgary's Source Water Protection Plan honours and acknowledges indigenous values, and encourages ongoing dialogue and collaboration with First Nations and Metis during implementation. First Nations' engagement has been undertaken to better understand indigenous cultural values related to our watershed, and to build deeper relationships between City staff and First Nations. This is consistent with the spirit and intent of The City's Indigenous Policy. During Plan implementation, The City intends to implement actions that provide mutual benefits to both The City and indigenous peoples.

"Water is the most sacred source of life...it is one of the greatest medicines given to living things and beings...nature cannot survive without water, not even humans." ~ Mike Oka, Kainai Nation

"We believe the Creator put us here for stewardship and to ensure the environment is protected."

"In our community, literacy is about understanding that everything is connected and acknowledging that sacred kinship."

"Wetlands and rivers are part of that sacred connection and (this) needs recognition."

~ Treaty 7 First Nations Traditional Knowledge Keepers,
City of Calgary Indigenous Policy Framework (2017)



Vision

Our source watersheds continue to provide **clean, high quality water** to the region, through proactive stewardship and management.

Ecological values and ecosystem services

Our shared source watersheds contain many ecological values and ecosystem services. Ecosystem services are the benefits people obtain from nature [3]. Generating and filtering clean source water for downstream users is a key service provided by a vast network of ecological infrastructure in our source watershed, including mountains, forests, rivers, streams, riparian areas, wetlands, aquifers and grasslands. This network of ecological infrastructure also supports biodiversity, provides recreation and tourism opportunities and a sense of place, and generates a wide range of other ecosystem services.

Working landscapes

Calgary's source watersheds also play host to working landscapes involving agriculture, forestry, hydroelectricity generation and mining – activities which generate food, forest products, electricity, minerals, revenue and jobs. The watershed also includes diverse communities that people call home. These various resources and values must be respected and integrated with the goal of maintaining high quality source water supplies for downstream users. Municipalities, private landowners and industries within our source watersheds also have various rights that go along with their responsibilities.

Stakeholder engagement highlights

Extensive stakeholder engagement targeting various industries, non-government organizations and other government agencies was undertaken as an input to this Plan. Key points emphasized by many diverse stakeholders included:

- Links between public health and environmental stewardship in source water protection.
- A need for collaborative approaches and coordination among groups and agencies.
- A proactive management approach, rather than a reactive or crisis management approach.

Importance of water quality to Calgarians

In addition to the more in depth stakeholder and First Nations engagement, this Plan was also informed by previous surveys of Calgarians on water and watersheds, to reflect the perspectives of our customers and citizens. Surveys consistently show strong support for the importance of high quality drinking water. A 2017 Ipsos Reid poll showed that over 95 per cent of Calgarians rate the quality of drinking water as “very important” [4].

Our source water vision

A formal vision has been established to provide focus and direction for source water protection activities. The vision statement was developed using stakeholder input and reflects:

- Public values, confirmed through citizen surveys.
- Treaty 7 First Nations' perspectives.
- Stakeholder input gathered from government, industry and non-government organizations.

Land stewardship, holistic thinking and connection to place were important themes heard during First Nations' engagement, and very similar themes were also echoed by stakeholders in industry, government and non-government organizations.

“Source water protection is a process to turn discussions and plans related to water into on the ground actions to protect water.” ~ External stakeholder

Characterizing Calgary's source watersheds

Calgary has two source watersheds, associated with each of its two drinking water plants:

- **Bow River source watershed:** A 7,768 km² area upstream from the Bearspaw water treatment plant.
- **Elbow River source watershed:** A 1,227 km² area upstream from the Glenmore water treatment plant.

Jurisdictions

The majority of Calgary's source watershed is owned by the Crown, and administered by the provincial or federal government. Almost two thirds of the source watershed area is designated as parks, primarily in Banff National Park (39 per cent) and provincial parks and protected areas (24 per cent).

The City of Calgary has jurisdiction over only a very small proportion (0.7 per cent) of the total area. Rocky View County's jurisdiction extends over 12 per cent of the source watershed, with most of these lands in private ownership in close proximity to City limits. First Nations reserves make up about eight per cent of the source watersheds in total.

Source watershed

A source watershed includes all land from which water drains downstream to provide untreated water supplies for a municipal drinking water treatment plant. Boundaries for Calgary's source watersheds were delineated based on topography and water infrastructure.

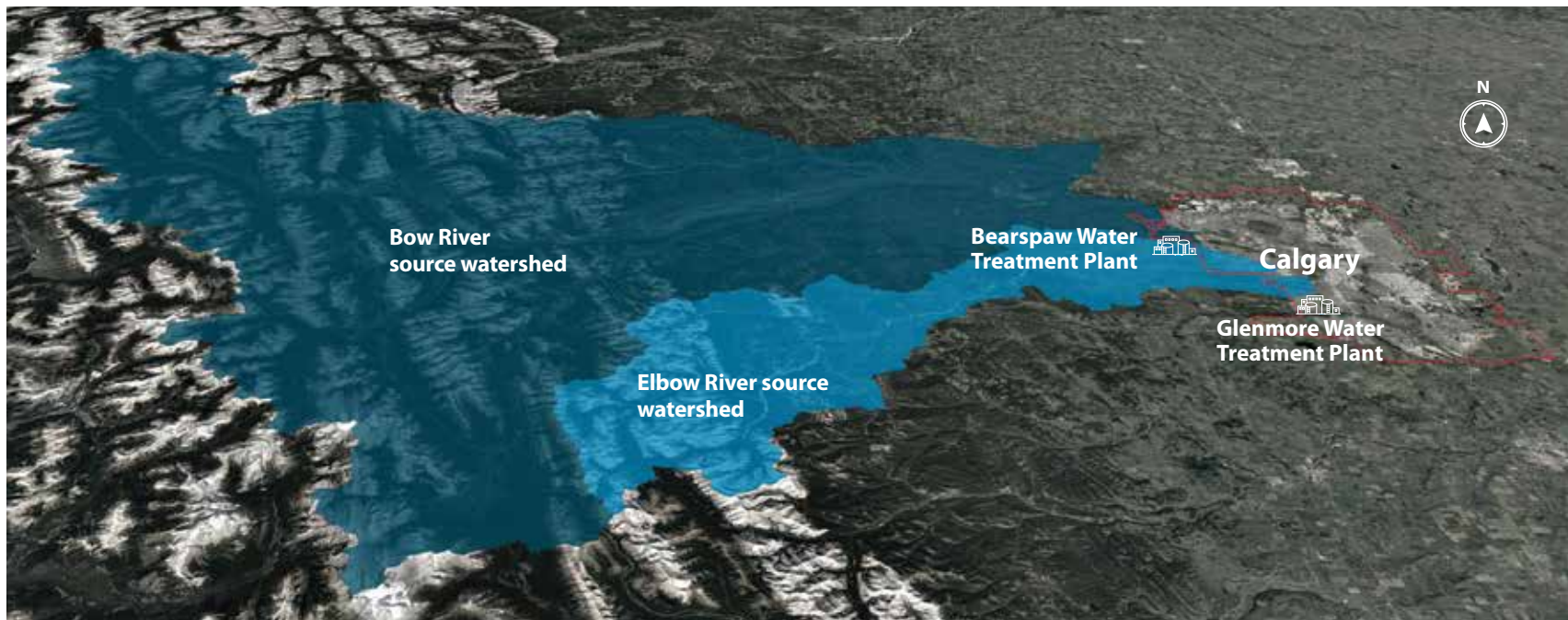


Figure 5: The City of Calgary's source watersheds

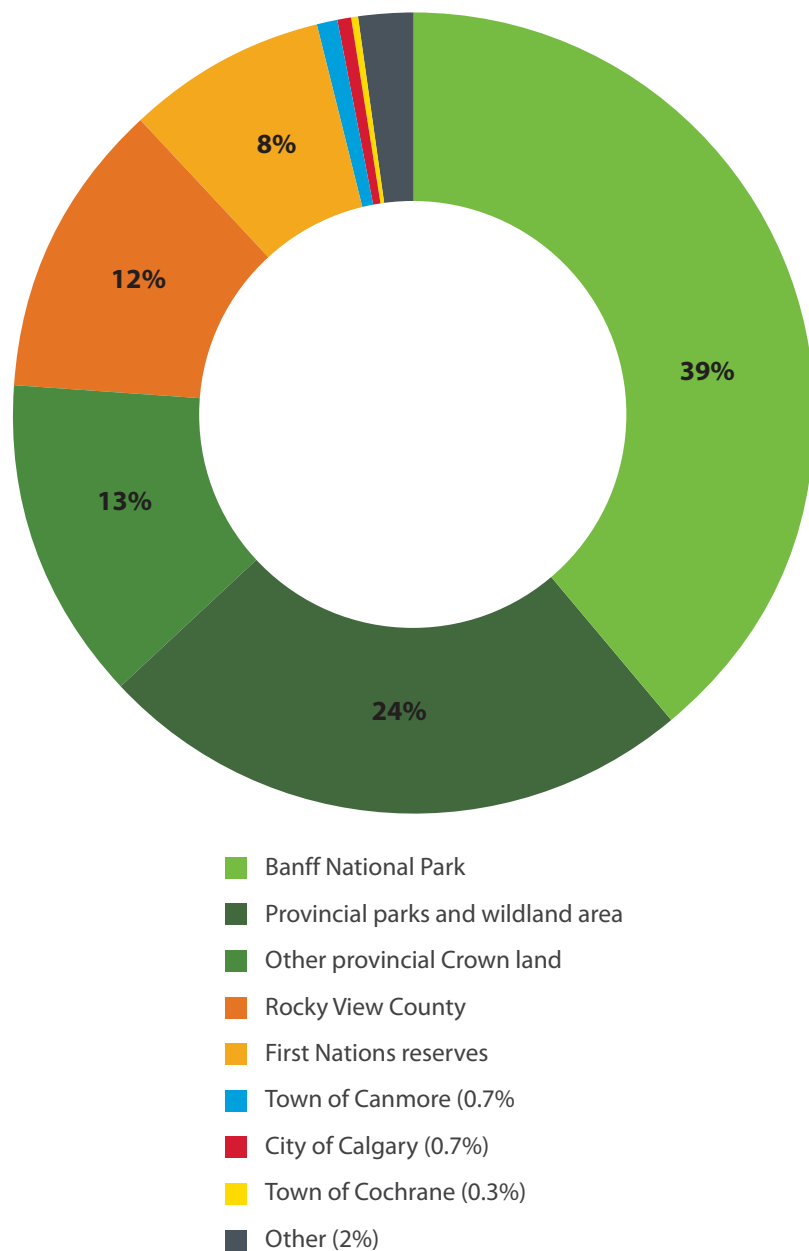


Figure 6: Jurisdictions in Calgary's two source watersheds

Bow River source watershed

The City's Bow River source watershed includes 7,768 km² of the Bow River Basin upstream from the Bearspaw Water Treatment Plant. There are two intake locations for this plant: (i) directly in the Bearspaw Reservoir dam site operated by TransAlta Utilities, and (ii) directly in the Bow River near Stoney Trail.

The Bow River currently supplies about 60 per cent of the water supplied to Calgary and its customers. Many other communities draw their source water from the Bow River, including but not limited to Canmore, Cochrane and several communities in Rocky View County, as well as other communities downstream from Calgary.

Jurisdictions in the Bow River source watershed

The mountainous headwaters upstream from the Bearspaw treatment plant are mostly within Banff National Park, which makes up 46 per cent of this source watershed. Provincial parks and wildland areas are also prominent in our Bow source watershed, particularly in the Kananaskis Country area (Figure 7). Glenbow Ranch Provincial Park located between Cochrane and Calgary along the Bow River is another important provincial park.

Rural municipal districts in the Bow River source watershed include Rocky View County (nine per cent of the Bow source watershed), as well as the Municipal District of Bighorn and the Kananaskis Improvement District. Cochrane is the largest major settlement outside of Calgary, followed by Canmore, Banff and Lake Louise. The Stoney Nakoda Reserve (including the community of Morley) and a small portion of the Tsuut'ina Reserve lands are also located in the Bow source watershed. Approximately 19 km² or just 0.2 per cent of this source watershed lies within Calgary city limits. Lands owned by Calgary Parks in the Bow source watershed include the Haskayne and Bearspaw Legacy parks.

Elbow River source watershed

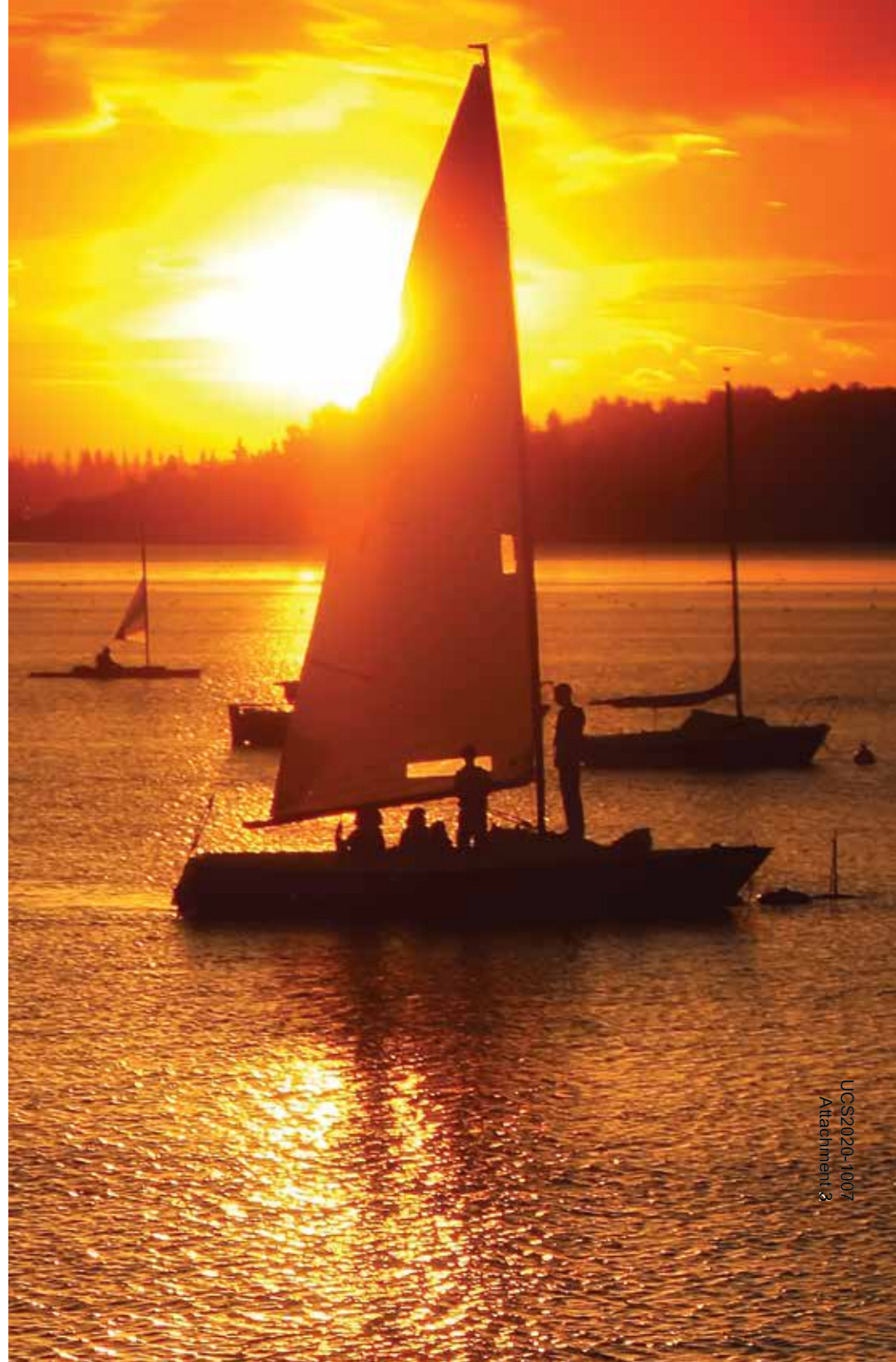
The City's Elbow River source watershed includes 1,227 km² of the Elbow River basin upstream from the Glenmore Water Treatment Plant. The plant's intakes are located in the Glenmore Reservoir at the dam. The Glenmore Reservoir is within City of Calgary limits, and the Glenmore Dam is owned and operated by The City. In addition to water supply, the Glenmore Reservoir also provides flood protection and is a popular site for non-motorized boating and recreation. The Elbow River currently supplies about 40 per cent of the water needs of Calgary and its customers. Maintaining the Elbow River's source water quality is of particular importance since it has been identified as more vulnerable to water quality deterioration.

The Elbow River also supplies water to many other communities, including but not limited to Bragg Creek, Redwood Meadows and several communities in Rocky View County along the Highway 8 corridor. The Elbow is also a tributary to the Bow River, which is used as a water supply by many other communities located further downstream from Calgary.

Jurisdictions in the Elbow River source watershed

The upper headwaters of the Elbow River source watershed include extensive provincial parks and public recreation areas in Kananaskis Country, including the Don Getty and Elbow-Sheep Wildland provincial parks. Rocky View County, including the hamlet of Bragg Creek, has jurisdiction over 20 per cent of the Elbow source watershed, followed by the Tsuut'ina Nation at 14 per cent.

Almost 45 km² of SW Calgary lies upstream from the Glenmore Reservoir, representing 3.6 per cent of the Elbow River source watershed. Almost half of this area has been protected over the years by The City in large municipal parks, including South and North Glenmore Park, Weaselhead Flats and the Clearwater Legacy Park. The other half of this area includes many Calgary communities both north and south of the reservoir that drains stormwater into the Glenmore Reservoir.



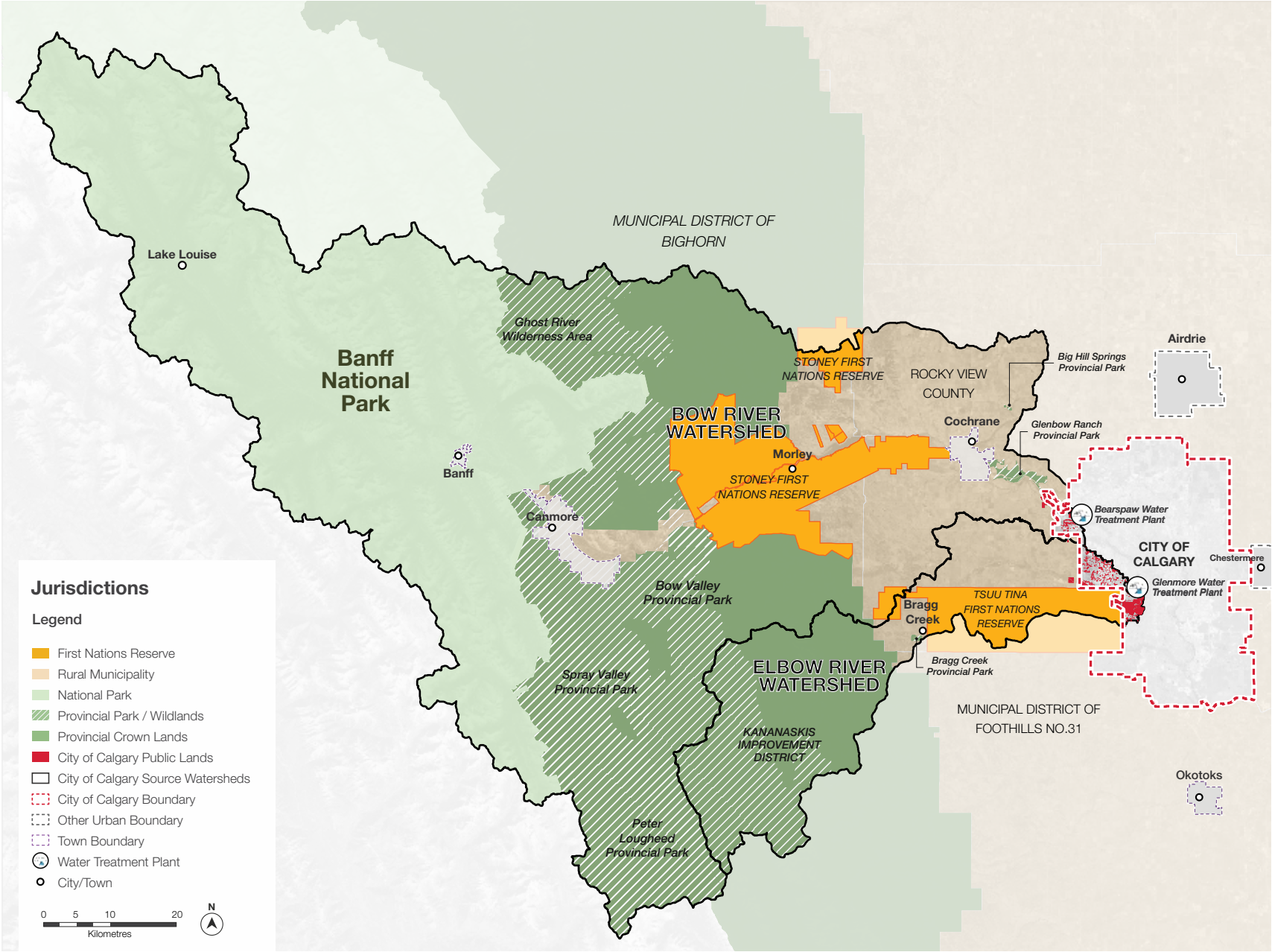


Figure 7: Map of jurisdictions in Calgary's source watersheds

Land cover

Land cover strongly influences water quality in watersheds and treatment costs for water utilities [5, 6]. Calgary is fortunate that almost half of the total source watershed area is in forested land cover (Figure 8). Exposed mountainous areas are also a very common land cover type, occupying over a quarter of the source watershed. Glaciers make up only one per cent of the two source watersheds, with most of these located at high elevations in the headwaters of the Bow River basin. Grasslands and shrublands combined cover about 17 per cent of the area, followed by cultivated agriculture at five per cent. Developed lands currently occupy about four per cent of the source watershed, and are concentrated within Calgary, with significant contributions from Cochrane, Rocky View County and Canmore as well. Open water – including lakes, rivers and streams – occupy three per cent of our source watershed area. Figure 9 shows a map of land cover in the study area.

On average, the cost to treat water in watersheds with 10 per cent forested land cover is double the cost of treatment for higher quality watersheds with 40 per cent forested land cover [6].

The importance of land cover in river valleys

Shallow groundwater aquifers connected to our rivers are also known as “river-connected alluvial aquifers”. These areas of sand and gravel contain water that flows freely between the underground aquifer and the river. These subsurface aquifers can extend up to a few kilometres out from the river. Maintaining natural land cover along these river valley corridors is important for source water protection and preventing sources of contamination from entering rivers.



Figure 8: Major land cover types in Calgary's two source watersheds

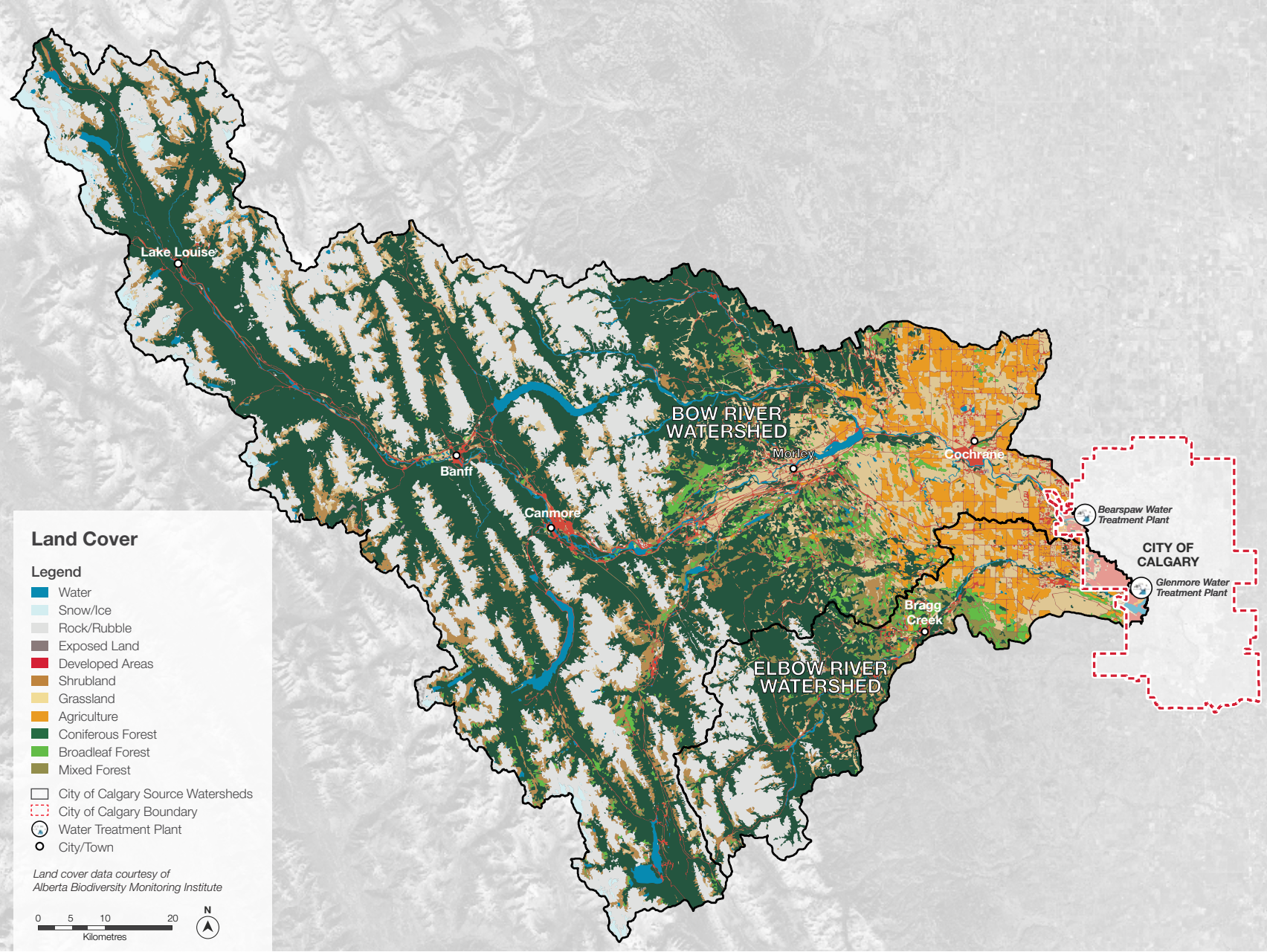


Figure 9: Map of land cover in Calgary's source watersheds

Source water quantity

The majority (greater than 90 per cent) of Calgary's source water originates as rain and snow in the Rocky Mountains and Foothills west of Calgary. Typical flows on the Bow and Elbow rivers are shown in Figure 10. In addition to strong seasonal variation, periodic wet and dry cycles also affect southern Alberta. Major droughts in the past have included droughts in the 1400s, 1700s, 1800s and early 19th century [7]. In addition, climate change is increasing the frequency and magnitude of extreme events such as drought and flash flooding [8, 9].

Water quantity and quality synergies

Although this Plan focuses primarily on water quality issues, there are synergies between water quality and water quantity issues. For example, high flows are usually accompanied by high turbidity. In contrast, low flows result in less dilution of wastewater effluent and stormwater runoff, resulting in higher concentrations of contaminants in our rivers.

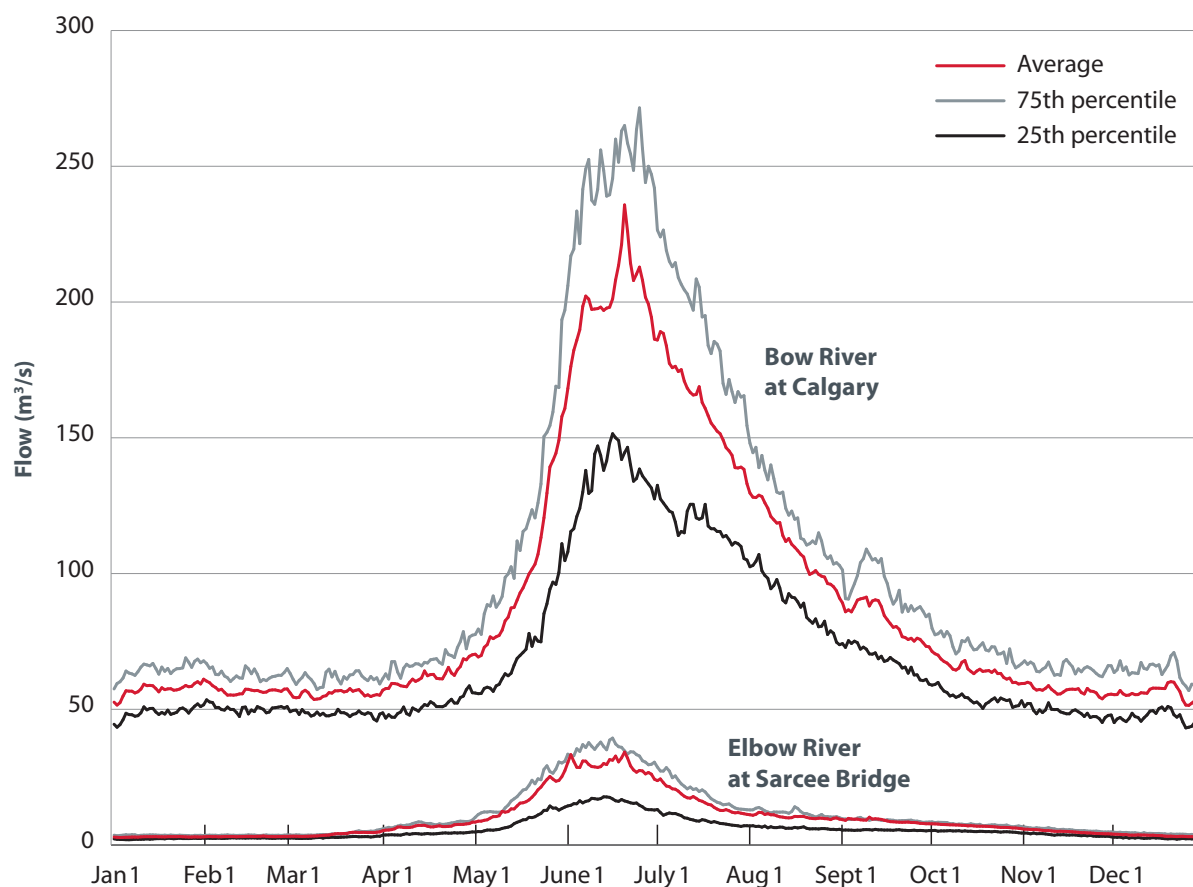


Figure 10: Typical flows of the Bow and Elbow river source water supplies (1955-2015 records)

Source water quality

Understanding source water quality is key to ensuring the protection of public health. The City conducts extensive source water quality sampling at our drinking water treatment facilities and throughout the source watershed. Water quality parameters monitored include:

- Turbidity as a measure of water clarity.
- Microbiological contaminants from human and/or animal faeces, including enteric protozoa (*Cryptosporidium* and *Giardia*).
- Nutrients, including the various different forms of phosphorus and nitrogen.
- Nuisance organic compounds produced by naturally occurring bacteria, algae and fungi, that can create taste and odour issues and in some cases have toxic properties.
- Total organic carbon (TOC), which originates from the decomposition of plant materials.
- Metals, including naturally occurring metals and those associated with human land use or industry.
- Pesticides that may be applied in residential areas or on agricultural lands.
- Organic contaminants commonly associated with industrial processes and waste disposal sites.
- Radiological parameters.
- Other physical-chemical parameters, including pH, temperature, and ions.

Of the 164 water quality parameters monitored, 65 have regulated Maximum Acceptable Concentrations (MAC) for finished drinking water under the Guidelines for Canadian Drinking Water Quality [10].

Public health regulations for drinking water control the quality of treated water entering the distribution system. Source water quality generally determines the level of treatment required to make water safe to drink.

Turbidity, total organic carbon and enteric protozoa are the most important source water quality parameters driving current water treatment operations. These parameters affect the day to day operation and optimization of the water treatment plants, and are the key factors influencing future infrastructure planning. Organic compounds associated with taste and odour issues and a range of other organic chemicals are also key to consider for source water protection, as discussed below.



Turbidity is a term used to describe water clarity. High turbidity is caused by particles of clay, silt and fine organic and inorganic matter suspended in water. Turbidity in our rivers is strongly influenced by high river flows and related processes of erosion, although land use in the watershed is also important. Calgary's source waters demonstrate seasonal changes in turbidity, with peak levels coinciding with the mountain snowpack melt in late spring and early summer. Turbidity also shows strong variation from year to year. Depending on the nature of the suspended matter, implications for water quality and treatment differ. Over the last decade, significant upgrades have been made to both water treatment plants to improve their ability to treat water during high turbidity events. The success of these upgrades was illustrated during the June 2013 flood. During the flood, maximum turbidity values of 4196 NTU and 3754 NTU were recorded at the raw water intakes for the Glenmore and Bearspaw treatment plants, respectively. Despite these extremely high turbidity values, The City continued to produce clean water without any service interruptions.

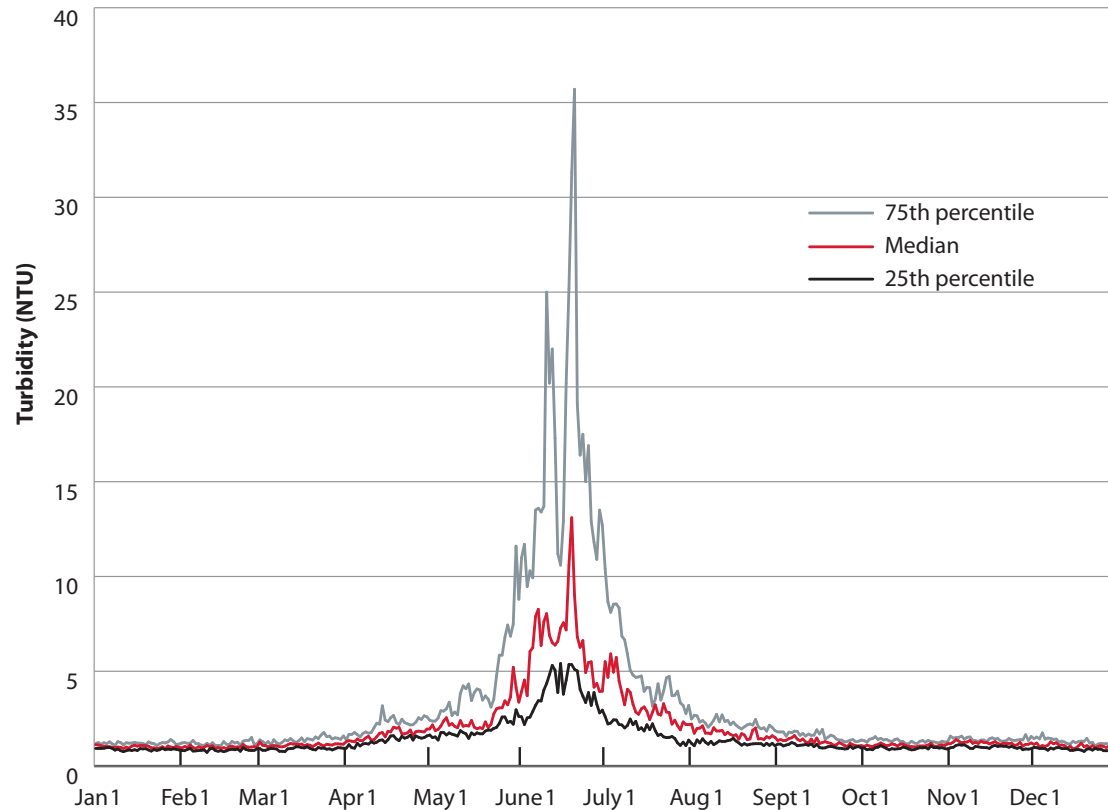


Figure 11: Seasonal turbidity at the Bearspaw Treatment Plant (2000-2016 records)

Water quality changes due to runoff

Spring runoff often causes dramatic, mostly natural changes to water quality. October through March show consistently low values, but there is typically high variability during May, June and July due to high runoff and associated erosion. Microbes, total organic carbon and nutrients also show similar seasonal patterns. Although The City's water treatment system is designed for turbidity spikes, costs for water treatment chemicals can increase by three to five times during runoff events. High flows can also have the benefit of diluting many low concentration contaminants that cannot be treated at The City's plants. Therefore, based on existing treatment capacities, source water quality protection could be even more important during low flow drought conditions.

Microbiological enteric protozoa, such as *Cryptosporidium* and *Giardia*, are the main pathogens of concern for drinking water. Their occurrence in source water is due to contamination by human or animal feces. Calgary is fortunate that their occurrence in our source water is very low by North American standards. Currently, extensive evidence shows that Calgary drinking water treatment processes are sufficient to treat current and historic protozoa levels found in Calgary's source water. However, significant increases of protozoa in source waters could trigger the need for additional disinfection in the future.

Nutrients, taste, odour and algal toxins are not a major problem for Calgary's source water, although taste and odour complaints have occurred in some past years. Tastes and odours can be imparted to water by a number of different chemicals. Some of the most potent are volatile organic compounds (VOCs) produced by naturally occurring algae and bacteria. Although algal blooms can happen under natural conditions, nutrient inputs such as phosphorus and nitrogen from upstream sources tend to increase their frequency and magnitude. Some algae are known to produce toxins; however, monitoring indicates that such algal species are identified infrequently and at low abundances.



Total organic carbon (TOC) is important to water treatment, as increases in TOC can lead to increased treatment costs. Increased TOC that is not accompanied by increased turbidity can increase operational complexities and reduce efficiencies, since dissolved organic carbon is more difficult to remove than solids. TOC is also a precursor to the formation of Disinfection By-Products (DBP) during chlorine disinfection. DBPs can result from chemical reactions between disinfectants and natural organic matter. DBPs are regulated in a precautionary manner to prevent them from causing public health risks and current water treatment practices and monitoring indicates that Calgary's treated water remains within all regulatory limits for DBPs.

Other organic compounds (pesticides, hydrocarbons, volatile organic compounds, PAHs) Calgary's source waters are routinely monitored for synthetic and naturally-occurring organic compounds, including pesticides, polycyclic aromatic hydrocarbons (PAHs), hydrocarbons and volatile organic compounds (VOCs). Since 2007, 103 different compounds have been tested, 53 of which have Canadian Drinking Water Quality Guidelines because of their potential public health risks. Over 1,800 samples from The City's raw water intakes were analyzed for organics between 2007 and 2016, and less than one per cent of these samples had detections. Levels detected in both the raw and finished drinking water were below drinking water guidelines in all cases. Maintaining high quality source water with respect to organics is important, since some of these compounds are not effectively removed by standard drinking water treatment processes.



Emerging substances of concern (ESOCs) are found in products people use on a daily basis, and include pharmaceuticals, hormones, detergents, plasticizers and flame retardants. ESOCs can make their way into surface waters via domestic and industrial waste, and urban and agricultural runoff. As technology continues to advance, it is easier to detect these substances at minute concentrations in water (i.e. parts per trillion or lower); however, our ability to detect these substances at such low concentrations vastly exceeds our capability to accurately determine whether there are any risks of human health effects at these very low concentrations. The World Health Organization conducted a review of pharmaceuticals in drinking water in 2012 and came to the conclusion that *appreciable adverse impacts on human health are very unlikely at current levels of exposure* [11].

Monitoring for ESOCs in Calgary's watersheds has been ongoing since 2007, and an ESOC Strategy was created in 2016. Since then, monthly monitoring has been conducted for 14 indicator compounds at the intakes of both water treatment plants, and semi-annual testing has been conducted for an additional 116 ESOCs. In total, 202 different ESOCs have been tested in Calgary's source water since 2007, and only six of these substances have been detected, all of which are indicators of wastewater impacts from

upstream communities. Of the indicator compounds tested on a monthly basis, the most frequently detected is caffeine, which has been observed in 18 per cent and 5 per cent of samples from the Glenmore and Bearspaw raw intakes, respectively. However, it must be emphasized that the concentrations detected are minute at 32 parts per trillion or lower. This is comparable or lower than concentrations found in other surface waters across North America [12]. The City is also working with government and University partners to gather information and conduct research on ESOCs to proactively advance the state of the science, inform regulatory agencies, and protect public health and the environment both upstream and downstream from Calgary.

Parts per trillion in perspective

The maximum concentration of caffeine detected in our surface water to date was 32 parts per trillion. To equal the amount of caffeine found in a single cup of coffee would require 12.5 million glasses of water at this concentration.



Calgary's watershed monitoring program

Established in the 1980s and expanded over time, The City of Calgary's Watershed Monitoring Program conducts monthly sampling of rivers, tributaries and reservoirs in the region, including 22 sites in Calgary's source watershed. This program complements the detailed daily monitoring of source water at the treatment plants. Historical records of water quality help monitor changing watershed conditions over time and implications for source water protection. Changes in water quality in smaller tributaries or specific reaches can serve as early warnings of deteriorating water quality, and can help pinpoint the locations of contamination sources.

Bow River source watershed

Overall, the Bow River and the Bearspaw Reservoir provide excellent, high quality source water to the Bearspaw Water Treatment Plant (Table 1). The Jumpingpound Creek tributary site shows the greatest departures of water quality from guidelines, although water quality is still considered 'Good' in this creek (Table 1). Jumpingpound Creek generally has higher nutrients, higher TOC, and higher turbidity compared to the Bow River.

In addition, the province maintains a monitoring site at Cochrane where a variety of pesticides are monitored. Between 2009 and 2015, only the herbicides 2,4-D and Mecoprop (MCP) were detected, at frequencies of 18 per cent and 7 per cent of samples, respectively. However, maximum concentrations detected remained much lower than federal and provincial guidelines for aquatic health and drinking water.

Water quality index

The federal water quality index (WQI) represents overall general water quality conditions for rivers and streams. The index translates detailed data on multiple water quality parameters into a score from 0-100 along with a descriptor (e.g., 'Excellent', 'Good', 'Marginal', 'Poor'). The Bow River typically has 'Excellent' water quality, while the Elbow River typically has 'Good' water quality.

Elbow River source watershed

There are 14 City monitoring sites in the Elbow River source watershed (Table 2). A gradual deterioration of water quality has been observed from upstream to downstream through the watershed, ranging from the most upstream site (Cobble Flats), which has a perfect Water Quality Index (WQI) score of 100 (Excellent), to an overall rating of 87 (Good) at the Weaselhead footbridge. The changes are primarily due to gradual increases in Total Suspended Solids (TSS) and total phosphorus associated with more developed land uses and associated stormwater inputs. The largest increase in sediment and total phosphorus is observed between the Twin Bridges site and Sarcee Bridge, which reflects the transition from rural to urban land uses and increasing stormwater inputs. Other parameters, such as TOC, metals, *E. coli* and protozoa also demonstrate similar increases as the Elbow River approaches the Glenmore Reservoir. Studies have also shown a gradual deterioration of water quality in the Elbow River over time [13, 14].

Pesticides have been monitored in the Elbow River at the upstream end of the Glenmore Reservoir for over 10 years. Of the 72 pesticides investigated, only six have been detected, with the herbicides 2,4-D and MCPP detected most frequently. Their presence is due to the cumulative impacts from upstream sources, including urban stormwater inputs and diffuse overland drainage from various land uses in the watershed. However, maximum concentrations of pesticides still remain significantly lower than federal and provincial guidelines for aquatic health and drinking water.

Table 1: Summary of Calgary's watershed monitoring program: Bow River source watershed (2014-2016)

Bow River source watershed		
Monitoring site	Sampling frequency	Summary of water quality
Bow River below Ghost Dam	Monthly, year round	Excellent (100)
Bow River at Highway 22		Excellent (97)
Bow River below Bearspaw Dam		Excellent (100)
Tributaries		
Ghost River at Benchlands	Monthly, year round	Excellent (100)
Jumpingpound Creek at the mouth		Good (82)
Bearspaw Reservoir		
Bearspaw Reservoir west	Monthly, May to September	Oligotrophic*
Bearspaw Reservoir centre		
Bearspaw Reservoir east		

* River values based on Water Quality Index (WQI); reservoir value based on trophic status (oligotrophic represents a desirable low nutrient status).

Trophic state index

The Carlson Trophic State Index for chlorophyll a is used to measure algal productivity, as an indicator of the nutrient status for reservoirs. It is typically used to classify water bodies into three categories: oligotrophic, mesotrophic, or eutrophic. For drinking water and recreational uses, oligotrophic conditions are desirable as they have the lowest potential for harmful algal blooms to occur.

Table 2: Summary of Calgary's watershed monitoring program: Elbow River source watershed (2014-2016)

Bow River Source Watershed		
Monitoring Site	Sampling frequency	Summary of water quality
Elbow River above Cobble Flats	Monthly, May to October	Excellent (100)
Elbow River above Bragg Creek	Monthly, year round	Good (90)
Elbow River at Highway 22 bridge		Good (92)
Elbow River at Twin Bridges		Good (87)
Elbow River at Sarcee Bridge		Good (86)
Elbow River at Weaselhead foot bridge		Good (87)
Tributaries		
Prairie Creek near mouth	Monthly, May to October	Excellent (100)
McLean Creek near mouth		Good (88)
Lott Creek near the mouth		Good (88)
Bragg Creek at the mouth	Monthly, year round	Good (88)
Bearspaw Reservoir		
Glenmore Reservoir – head pond	Monthly, May to September	Oligotrophic*
Glenmore Reservoir – mid-lake		
Glenmore Reservoir – Heritage Cove		
Glenmore Reservoir – Weaselhead		

*River values based on WQI; reservoir value based on trophic status, where oligotrophic represents a desirable low nutrient status.

"Our watershed is vital for communities; better source water means treatment is more cost effective."

~ Internal City stakeholder

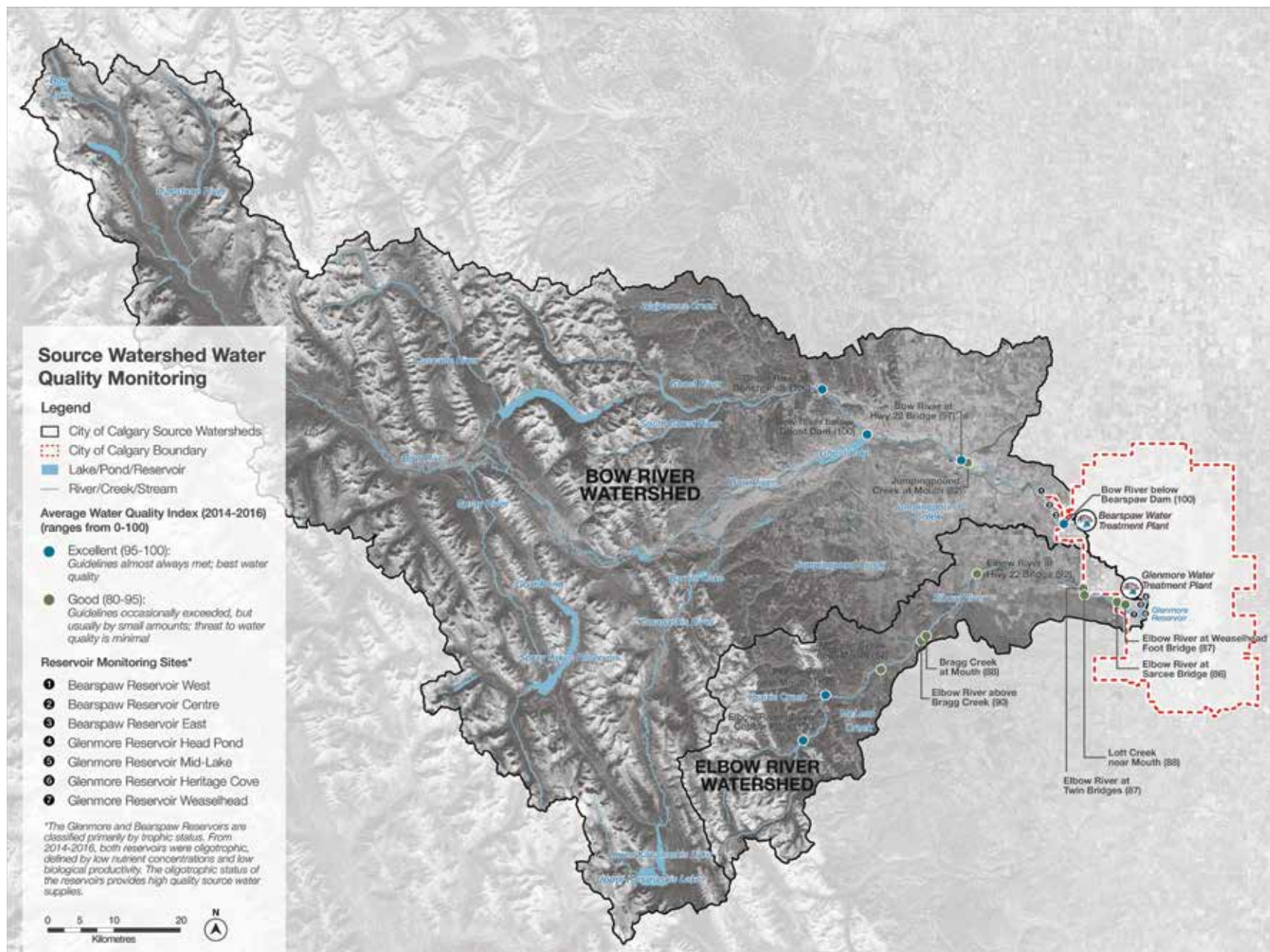


Figure 12: Source watershed water quality monitoring sites

The Glenmore Reservoir

Generally, the Glenmore Reservoir currently provides high quality source water. Water quality in the Glenmore Reservoir also tends to improve as water moves from the Weaselhead Natural Area through the reservoir to The City's source water intake. This occurs because natural processes in the reservoir facilitate the removal of particulate matter, nutrients, metals and protozoa from water as it passes through the reservoir. The reservoir tends to maintain low algal productivity – classified as 'oligotrophic' – which is ideal for source water (Figure 13). However, there is a risk that this delicate balance could be disturbed by land use change in the watershed combined with climate change. If nutrient inputs cause the reservoir to increase in productivity to mesotrophic or eutrophic conditions, source water quality will degrade, leading to a range of management issues.

Sediment, nutrients and flood dynamics in the Glenmore Reservoir

Most of the fine sediments that are deposited in the Glenmore Reservoir are washed or scoured past the dam during high flow events. The trophic index also tends to decrease in the Glenmore Reservoir the first few years following a flood (e.g., 2005, 2013) (Figure 13). This indicates that natural removal of sediment from the reservoir during high flow events may also be contributing to its desirable low-nutrient status.

Summary of source water quality issues

The City's extensive water quality monitoring shows that the Bow River generally provides excellent source water to The City. In contrast, the Elbow River generally provides good source water quality, but with some deterioration observed in recent decades. The cumulative effects of land use change and climate change may result in future issues such as more taste and odour issues due to algal blooms, or an increase in real or perceived public health risks due to ESOCs. These risks are likely higher for the Elbow River source compared to the Bow River source, due to existing and future land uses and lower dilution capacity of the Elbow.

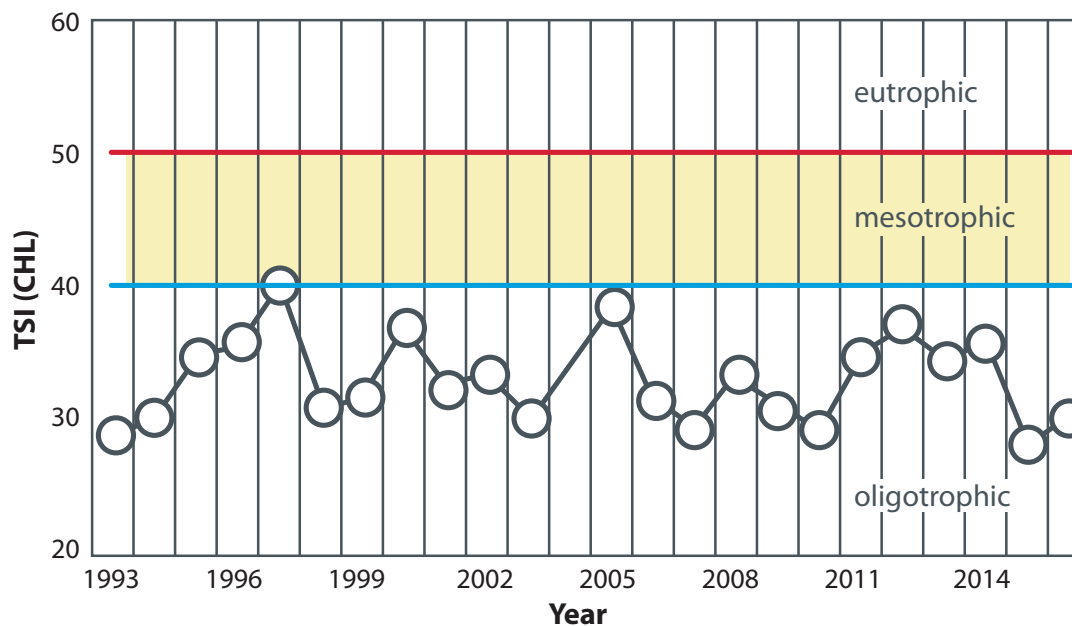


Figure 13: Trophic state index (average of monthly May-Sept values) in the Glenmore Reservoir over time

Source watershed risks

Assessing source water risks is a critical precursor to source water protection planning. To achieve this, The City worked with a multidisciplinary consulting team to complete a Source Watershed Assessment and Risk Characterization (SWARC) study. This study drew from and integrated with provincial direction including the Drinking Water Safety Plan process, as well as the American Water Works Association's Source Water Protection Standard [2] and the federal government's Source-to-Tap guidelines [15]. The methodology included mapping and spatial analyses, and a synthesis of information to assess and prioritize risks. Risks were prioritized in relation to one another based on the likelihood of risks occurring, and the consequence of risks should they occur. Vulnerable areas in the source watershed were also identified and mapped using a Geographic Information System (GIS).

Risk does not imply impact

Identified risks do not imply that actual impacts to source water are occurring. Risks have the potential to contaminate source waters if something goes wrong (e.g., a spill, major wildfires). Small impacts from multiple activities can also have cumulative impacts that gradually degrades water quality over time.

Key risk: Stormwater

One of the highest risks to Calgary's source water was identified as stormwater pollution from current and future land developments in the source watershed. Currently, almost 200,000 people live in Calgary's source watershed in several municipal jurisdictions. The vast majority of these reside within 30 km of Calgary's intakes. This population is projected to more than double to almost 400,000 people over the next 50-70 years. Stormwater quality is highly variable and shows significant spikes in pollutants in an unpredictable manner, and has the potential to degrade Calgary's source water. This could include either chronic impacts from ongoing loadings of low concentrations of pollutants or nutrients, or acute impacts due to spill events or runoff after severe storms. Hydrocarbons, pesticides and a variety of other organic compounds in stormwater cannot be treated effectively in our water treatment plants, and current regulations and best practices do not address these contaminants effectively. Nutrients and pathogens found in stormwater also present significant concerns. Temporary impacts to water quality during construction were also identified as a secondary concern. A secondary but relatively moderate concern associated with land development are increasing volumes of treated wastewater discharges associated with populations upstream from city limits not serviced by Calgary.



Key risk: Wildfire

Widespread, high intensity wildfires are also a key risk for Calgary's source watershed. Fires are known to impact water quality in several ways that could pose significant challenges. After fires, water chemistry changes in burned watersheds include higher concentrations of nutrients, sediment, metals, dissolved organic carbon and other organics, which can pose significant challenges for treatment [16, 17, 18]. Large, widespread wildfires are also likely to become more frequent due to climate change in the future [19].

The dry summer and fall of 2017 resulted in widespread fires in the region, including the Verdant Creek wildfire in Kootenay National Park, the Kenow wildfire in and around Waterton National Park, and the Bob Creek Wildland fire. Fortunately, the dry conditions of summer 2017 did not cause any large wildfires in Calgary's source watershed, in part due to the excellent proactive and reactive measures taken by provincial and federal land management and fire management agencies. However, these large wildfires do serve as a reminder of the potential for severe wildfires throughout Calgary's source watersheds.

Other risks

In addition to the top two source water risks described above, moderate risks identified include: contamination introduced from transportation corridors, wastewater, recreation, industrial discharges, livestock, use of pesticides on crops and country residential areas, oil pipeline spills, a rail line spill near Bearspaw and algal blooms. Many other risks were ranked as lower risks overall, based on biophysical factors, location in the watershed, existing regulations and management practices and current water treatment capabilities. It should also be noted that lower priority risks do not necessarily imply no management concern, as the cumulative effects of multiple stressors can also degrade water quality.

Time of travel

It can be difficult for treatment plant operators to receive notice and react to spills if travel times are short from upstream areas. Consequently, the time of travel for contaminants moving through a watershed is very important to prioritize locations for source water protection initiatives. This issue was carefully considered during source water risk evaluations.



Investing in source water protection makes good business sense

Investments in source water protection not only protect public health and help The City of Calgary maintain the high quality of drinking water citizens have grown accustomed to, but will also help to avoid expensive infrastructure investments required to treat water. Many other municipalities have found that proactive expenditures to protect source water can be more cost effective than building and operating more advanced treatment facilities.

Currently, the most frequent challenge faced by Calgary's water treatment plant operators is the need to remove high levels of suspended solids associated with turbidity events. Treatment processes have been selected and designed to deal with this challenge. In contrast, current infrastructure and operations are not designed to treat hydrocarbons, pesticides, ESOCs or other organics. Although to date these have largely been absent from our source waters, if source water quality degrades, more advanced treatment processes would be required.

The costs of upgrading both the Glenmore and Bearspaw water treatment plants with more advanced treatment processes could reach **\$350 million of capital costs** for construction, and an additional **\$5.5 million/year annual operating costs** for ongoing operations and maintenance. The benefits in avoided costs that we derive from the high quality of our watershed and rivers is known as an ecosystem service – or a benefit that people obtain from nature.

Current drinking water treatment infrastructure

Water treatment processes at Calgary's two plants include:

- Pre-treatment utilizing a ballasted clarification process
- Clarified water basins
- Filtration with gravity flow and multi-media filters
- Chemical disinfection with sodium hypochlorite
- Clearwell for disinfection contact time and storage

Other ecosystem services in our source watersheds

In addition to clean source water for drinking water utilities, our high quality source watershed also provides many other ecosystem services to people. For example, recreational fishing contributes approximately \$25 million/year to Calgary businesses and the regional contribution of fishing-related activities is approximately \$114 million/year annually. Regional recreational paddling activities also contribute over \$50 million per year to the local economy. Source: Calgary River Users Alliance [21]



Source water protection goals

Strategic source water protection goals provide focus for a source water protection program. The City of Calgary's goals for its long-term Source Water Protection Program are based on proactively preventing, reducing, or mitigating key source water quality risks, as part of a multi-barrier approach to providing safe, clean, high quality drinking water. The following goals have been carefully selected based on risk priorities, customer commitments and stakeholder engagement.

GOAL 1: Protect the source watershed with improved land use planning

Why is improved land use planning important?

Our source watersheds face significant future population growth and land use changes, and stormwater impacts associated with land development in our source watershed have been identified as a key risk. Additional guidance and tools for planning decisions will be needed to more proactively balance community growth with source water risk mitigation. Maintaining source water quality over the long-term requires careful attention in land use planning systems – both within and outside of Calgary city limits – to improve integration with source water protection. Highly vulnerable areas –



including water bodies, floodplains, riparian areas, river-connected alluvial aquifers, steep slopes and erodible soils – are areas that ideally should be left as open spaces during land use planning to reduce the risks of source water deterioration due to land development.

GOAL 2: Promote innovation in stormwater management to protect source water quality

Why is stormwater management important?

One of the highest risks to Calgary's source water is stormwater pollution from current and future developments. To mitigate these impacts and prevent source water quality deterioration, careful attention to innovative stormwater management techniques will be required for both new and existing developments.



“Goals for a source water protection plan should focus on prevention vs. cure” ~ External stakeholder



GOAL 3: Leverage key partnerships for risk mitigation



Why is leveraging key partnerships important?

Partnerships are critical to address our source water risks, since most of the source watershed is outside of the jurisdiction of The City of Calgary. Experience and case studies from around the world demonstrate that effective partnerships are a requirement for an effective source water protection program. By leveraging key partnerships, additional funding can be obtained, while source water protection “champions” can be developed in multiple communities of practice. For Calgary, partnerships are particularly important to help protect and manage vulnerable source watershed lands in upstream jurisdictions.

GOAL 4: Involve the community through education and research



Why is stakeholder and citizen involvement important?

Many industries, stakeholders, and citizens work, live, and play throughout Calgary’s source watersheds. Ultimately, The City aims to create trusting, long-term relationships with decision-makers and communities in the watershed to achieve common goals. Best practice case studies show that by effectively involving people through education and research, municipal utilities can better achieve their source water protection goals through:

- Leveraging expertise from multiple knowledge domains
- Promoting learning and understanding by all parties
- Improving community relations



“A source water protection plan should provide long-term vision but concrete steps in the short and medium term, identify key actors and stakeholders, tools and actions, and should be easy to share, understand and communicate.”

~ External stakeholder

Source water protection action plan priorities

This section identifies and describes actions required to mitigate existing and future threats to source water quality, and establishes priorities and a timetable for Plan implementation.

Past source water protection actions

This Plan is just the latest chapter in a long history of source water protection in the Calgary region. Many agencies, industries, individual citizens and other stakeholders have executed actions that have influenced the high quality source water that we enjoy today. These actions go back well over a hundred years and are far too numerous to list here. However, key source water protection actions implemented by The City of Calgary in the past are summarized in Figure 14. In addition, selected examples of key actions that have been taken by other agencies are profiled below.

Today, The City continues to undertake ongoing operational actions for source water protection. Examples include:

- Extensive water quality monitoring programs.
- Integrating water quality enhancements into infrastructure projects.
- Mitigating source water risks throughout the development application review process.

The Bow River Basin Council: A key partner in source water protection

The Bow River Basin Council (BRBC) is a collaborative, multi-stakeholder charitable organization dedicated to conducting activities for the improvement and protection of the waters of the Bow River Basin. The BRBC is a Watershed Planning and Advisory Council (WPAC) under the province's *Water for Life* strategy. They maintain a forum for all members to share perspectives, exchange information, prioritize water management issues and develop reports including State of the Watershed reports and the Bow Basin Watershed Management Plan. The BRBC is a key partner in our efforts to raise awareness, promote source water protection, network with decision-makers and professionals, and help design sound, multi-stakeholder governance strategies, processes and pilot projects for improved watershed management.

Federal and provincial Crown land management agencies: Key partners in source water protection

Federal and provincial agencies in our source watershed play a key role in maintaining the quality of our source watershed. Two key roles are profiled below: the establishment and management of parks and protected areas, and wildfire risk management.

Parks and protected areas: Originally established in 1885, Banff National Park covers the majority of the Bow River watershed's headwaters, and their current mandate of ecological integrity is highly consistent with source water protection. Provincial parks and wildland areas - established through provincial leadership over a period of decades - also cover a large proportion of our source watershed. The South Saskatchewan Regional Plan (SSRP) recently expanded several provincial parks, wildland provincial parks and public recreation areas, with over 364 km² of new protected areas that will be established in Calgary's source watersheds.

Wildfire risk management: Alberta Agriculture and Forestry maintains rapid response capabilities for wildfires on provincial Crown lands and conducts wildfire risk management planning and modelling. Parks Canada also maintains rapid response capabilities for wildfires in the National Parks and also run an extensive prescribed burn program, which help lower fuel loads and reduce the risk of large, uncontrollable wildfires. During the dry summer of 2017, very effective firefighting responses were observed throughout and adjacent to Calgary's source watersheds. Tools such as fire bans and temporary motorized recreation bans on provincial Crown lands were also applied in 2017 to manage wildfire risk.



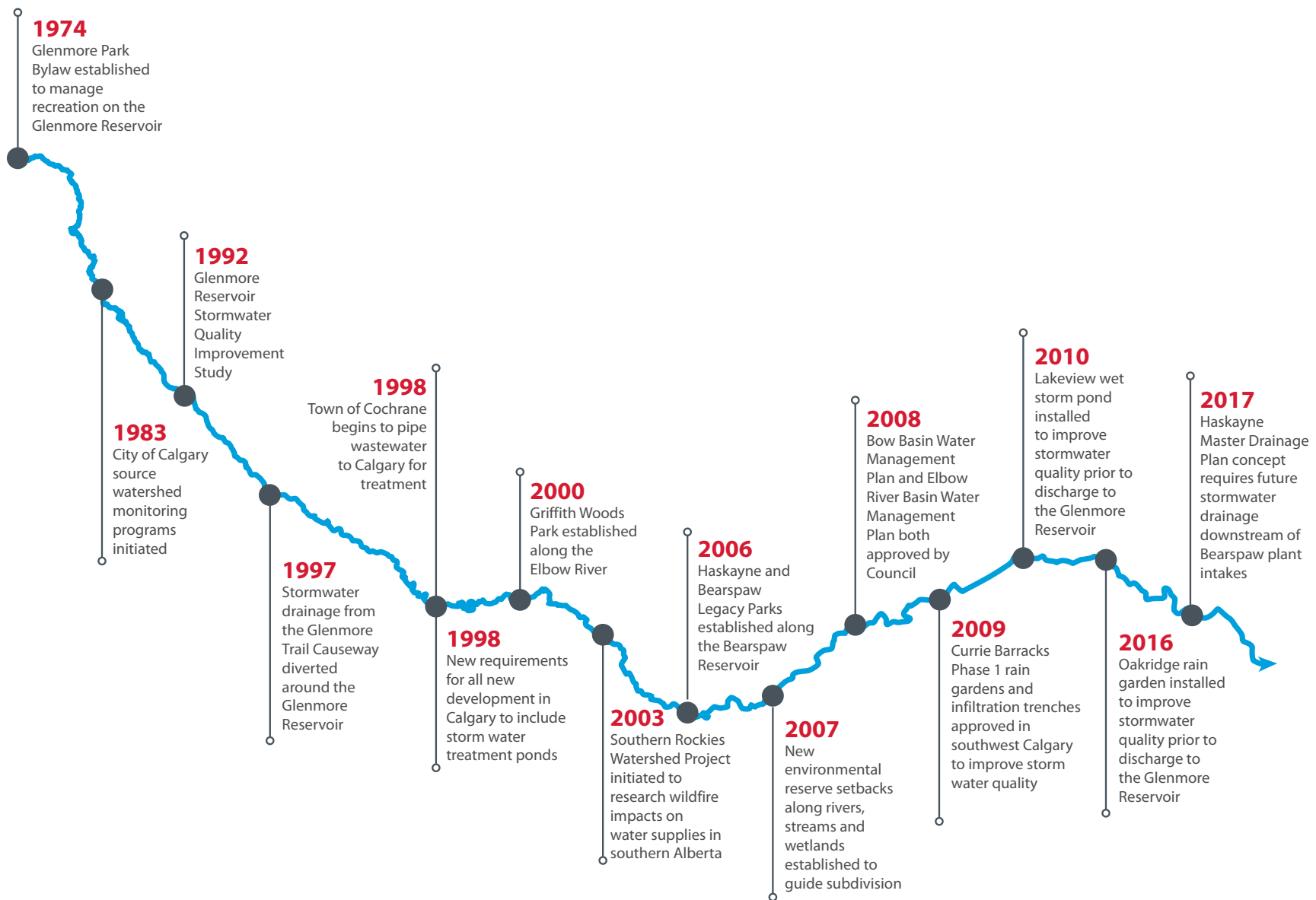


Figure 14: A history of source water protection actions implemented in Calgary

Source water protection action plan

To enable proactive approaches to source water protection, targeted priorities for future actions have been developed and grouped under each of the four goals (Figure 15). Implementation is anticipated to involve many partnerships, to leverage resources across a wide range of jurisdictions, domains, and disciplines. Collaboration and innovation will be promoted throughout Plan implementation. Although additional details will need to be built out further in the future, anticipated implementation strategies for each of the priority actions are outlined below, along with key stakeholders and proposed timelines.





 GOAL 1 Protect the source watershed with improved land use planning	 GOAL 2 Promote innovation in stormwater management to protect source water quality	 GOAL 3 Leverage key partnerships for risk mitigation	 GOAL 4 Involve the community through education and research
1.1 Develop and implement recreation management strategies and actions for the Bearspaw Reservoir	2.1 Prioritize erosion and sediment control inspections and enforcement within The City's source watersheds	3.1 Refine wildfire management strategies with fire management agencies	4.1 Conduct a traditional use study to explore First Nations' traditional knowledge on water and watersheds
1.2 Develop drinking water protection zone overlays and integrate with The City's statutory and regulatory instruments	2.2 Evaluate and implement stormwater management requirements to meet source water quality objectives	3.2 Conduct a watershed investment study to evaluate options to protect vulnerable source watershed lands	4.2 Provide guidance to university research projects in Calgary's source watersheds
1.3 Integrate source water protection priorities in regional land use and servicing plans and provincial regulations	2.3 Prioritize riparian, wetlands and green infrastructure projects within The City's source watersheds	3.3 Update emergency response plans for spills and increase co-ordination with industry	4.3 Develop a source water education plan to promote community and regional actions to reduce risks

Figure 15: From goals to actions: A summary of Calgary's source water protection program priorities



Goal 1: Protect the source watershed with improved land use planning



Action 1-1: Develop and implement recreation management strategies for the Bearspaw Reservoir

Recreational activities have been identified as a moderate risk to Calgary's source water, and planned new developments in the Haskayne area near the Bearspaw Reservoir are likely to significantly increase demand for recreation on the Bearspaw Reservoir, which is currently largely unmanaged. Source water quality risks, emergency response and public safety issues at the Bearspaw Reservoir require more proactive strategies. However, the governance of the Bearspaw Reservoir poses unique challenges. The City of Calgary's boundary ends at the reservoir's eastern shoreline. The reservoir itself, as well as the western and southern shorelines, are under the jurisdiction of Rocky View County. TransAlta Utilities is also a key stakeholder, as it has title to the Bearspaw Dam, reservoir and a right-of-way surrounding the water body.

Key stakeholders: City of Calgary (Water Resources, Fire, Recreation, Parks), Rocky View County, TransAlta Utilities, CP Rail

Timeline: Short-term (2018-2020)

Action 1-2: Develop drinking water protection zone overlays and integrate with The City's statutory and regulatory instruments

Development upstream from Calgary's intakes has been identified as a key risk to Calgary's source water, due primarily to the cumulative impacts of stormwater pollution associated with land development. A key tool to prevent or mitigate these contamination risks is the establishment of Drinking Water Protection Zone Overlays around source water intakes. Policies in these zones typically prohibit or restrict specific activities or land uses, such as industrial land uses, storage facilities for hazardous materials, gas stations and car repair garages, and dry cleaning facilities. Risk management plans can also be developed with business and property owners located in the overlay.

This tool has been established in many jurisdictions, including:

- Ontario (Intake Protection Zones - IPZ)
- Nova Scotia (Watershed Protection Areas)
- New York State (Watershed Protection Overlay Districts)
- North Carolina (Watershed Critical Areas)
- Western Australia (Public Drinking Water Source Areas)



Some municipalities restrict maximum site imperviousness of land uses in the watershed protection overlay to reduce stormwater pollution (e.g., San Antonio, Texas; Austin, Texas). Other municipalities (e.g., Whatcom County, Washington) have watershed overlays that require cluster housing development, very high standards of stormwater management, and mandatory retention of trees and native vegetation.

Key stakeholders: City of Calgary (Water Resources, Planning and Development), development industry, landowners in proposed overlay zones

Timeline: Short-term (2018-2020): Develop overlays and draft regulations and policies. Medium-term (2020-2023): Integrate with The City's statutory and regulatory instruments

Action 1-3: Integrate source water protection priorities in regional land use and servicing plans and provincial regulations

Development upstream from Calgary's intakes is one of the top two highest risks to Calgary's source water, due to the cumulative effects of stormwater pollution, as well as secondary risks related to treated wastewater discharge. This issue is an input to the decisions and deliberations on growth and servicing by the Calgary Metropolitan Region Board (CMRB). The CMRB is a new regional governing body, established in January 2018, with membership from the 10 municipalities in the Calgary region. Its mandate is to develop regional growth and servicing plans that promote the long-term sustainability of the region and ensure environmentally responsible land-use planning, growth management, and efficient use of land. All of these mandates are directly related to regional source water protection issues. This provides unique opportunities for source water protection priorities, risks and vulnerability maps to be used as inputs for the new regional growth and servicing plans.

Key stakeholders: CMRB members)

Timeline: Medium-term (2020-2023)

Provincial regulations and source water protection

In addition to the CMRB regional planning process, The City of Calgary supports provincial implementation of the South Saskatchewan Regional Plan (SSRP), including improved management of Crown lands in our source watershed. The City also strongly supports the application and enforcement of provincial legislation and regulations governing various industries and activities related to water and the environment. Provincial regulations or their interpretation could evolve in the future to further address source water protection priorities.



Goal 2: Promote innovation in stormwater management to protect source water quality



Action 2-1: Prioritize erosion and sediment control inspections and enforcement in The City's source watersheds

Erosion and sediment mobilization during construction is one of the risks associated with land development. In the absence of proper management, large volumes of sediment can be released from construction sites, as well as other pollutants such as nutrients or hydrocarbons. In 2017, The City of Calgary revised their Erosion and Sediment Control (ESC) guidelines, field manual, specifications and review processes. The City's source watershed priorities were integrated into this review. Starting in 2018, construction sites in Calgary's Bearspaw or Glenmore source watersheds will receive higher rates of monitoring and inspection compared to other parts of The City. Although this will be implemented in Calgary first, upstream municipalities have also expressed an interest in this idea for the future.

Key stakeholders: City of Calgary Water Resources (Water Quality Services), development industry, consultants, construction industry

Timeline: Short-term (2018-2020)

Action 2-2: Evaluate and implement stormwater management requirements to meet source water quality objectives

Increasing stormwater pollution was identified as one of the top two risks to Calgary's source water, due primarily to contaminants of concern such

Source water trend analysis update

In part to help inform future stormwater management, The City will also update statistical trend analyses of source water quality data in 2019.

as hydrocarbons, pesticides, organic compounds, nutrients associated with algal blooms and pathogens. Determining optimal stormwater management solutions for the source watershed requires further evaluation.

Additional requirements to meet source water quality objectives might include: diverting stormwater around The City's water intakes where feasible, oil and grit separators, enhanced stormwater pond designs, or low impact development/green stormwater infrastructure facilities. In the interim, The City is taking a precautionary approach, with any new stormwater outfalls in city limits required to discharge downstream of our source water intakes as feasible. Stormwater evaluations and recommendations should also be conducted in a collaborative manner involving upstream jurisdictions, to gain broader regional support for innovative stormwater management.

Key stakeholders: City of Calgary Water Resources, Alberta Environment and Parks, Alberta Transportation, Rocky View County, Town of Cochrane, and potentially Town of Canmore, Town of Banff and the M.D. of Bighorn

Timeline: Short-term (2018-2020): Evaluations and data analysis
Medium-term (2020-2023): Implement new requirements (pending resourcing)

37th St. S.W. stormwater trunk project: Water quality enhancements for source water protection

In 2018, as part of the relocation of the 37th St. S.W. stormwater trunk, The City is improving the quality of stormwater draining to the Glenmore Reservoir by installing an oil-grit separator to capture hydrocarbons and sediment and improve water quality. Water Resources is also investigating the opportunity to install an additional storm pond facility associated with this project to further polish stormwater quality, including nutrient removal.



Action 2-3: Prioritize riparian, wetlands, and green infrastructure projects in The City's source watersheds

The loss and conversion of riparian areas, wetlands, forests and pervious soils on the landscape is associated with watershed degradation and reduced water quality. By conserving and restoring these green infrastructure features and associated watershed functions, impacts of land use change on watershed health and water quality can be reduced or mitigated.

The City of Calgary has developed several strategic watershed-focused plans and policies that are being implemented, including:

- **The City of Calgary's Riparian Action Program** (2017) emphasizes the importance of riparian landscapes as natural infrastructure, and identifies actions to minimize further loss of riparian areas, restore degraded riparian areas, and develop outreach and education that encourages stewardship.
- **The Wetland Conservation Plan** (2004) was developed to help balance wetlands conservation in the context of urban development. The plan highlighted the important roles wetlands often play in maintaining or improving watershed health and water quality.
- **Green Stormwater Infrastructure:** The City continues to promote the integration of Green Stormwater Infrastructure or Low Impact Development as a key component of sustainable urban development throughout Calgary, including within our source watersheds. The Oakridge rain garden, installed in 2016, was selected in part to help improve the quality of stormwater discharging to the Glenmore Reservoir from this community.

There are perhaps even greater opportunities for projects to restore, enhance or build green infrastructure upstream from Calgary than within city limits. For example, land trust organizations and watershed stewardship groups have been working with landowners upstream of the city on a wide range of riparian health restoration and wetlands initiatives. There are strategic plans and policies for watershed management and green infrastructure beyond The City's borders as well, which are strongly encouraged and supported by The City. For example, Rocky View County has implemented a Riparian Land Conservation and Management policy.

Key stakeholders: Within The City of Calgary: City of Calgary Water Resources, City of Calgary Parks, development industry, consultants

Key stakeholders upstream from The City of Calgary: Rocky View County, City of Cochrane, Town of Canmore, Alberta Environment and Parks, Watershed Stewardship Groups, Land Trust organizations (Western Sky Land Trust, The Nature Conservancy of Canada, Southern Alberta Land Trust), Alternative Land Use Services (ALUS), private landowners

Timeline: Short-term and medium-term (ongoing)

"A source water protection plan should empower land users to make good management decisions."

~ External stakeholder



Goal 3: Leverage key partnerships for risk mitigation



Action 3-1: Refine wildfire management strategies with fire management agencies

The risk of large, uncontrollable wildfires was identified as one of the top two risks to Calgary's source water quality. In fact, this is the only risk that could cause a major change in source water quality over a relatively short time period. Although wildfire risk management and emergency planning is very well developed among provincial, federal and municipal fire management agencies, there remains a need to probe the question of wildfire risks further within the context of source water protection and multi-agency dialogue.

Although further scoping with provincial and federal agencies is required, a regional wildfire task force will be pursued to help enhance regional collaboration on wildfire risk management. The task force would discuss and determine options for improved land use management to help mitigate wildfire potential and impacts within high-risk subwatersheds identified as important to Calgary's source water. Potential actions and outcomes to be considered by the task force include:

- Reducing the likelihood of human-caused fires, using various enforcement options under high fire danger conditions.
- Reducing the potential spread and severity of an escape fire in high-risk watersheds, using prescribed burns and other silvicultural and/or forest management practices.
- Conducting mock fire scenario exercises to improve multi-agency communication, understanding, and response strategies.
- Clarifying fire suppression considerations if a fire escapes control in a high-risk watershed.
- Exploring additional synergies and future collaborations on wildfire management within the region.

Key stakeholders: Alberta Agriculture and Forestry – Wildfire Management Branch, Parks Canada, City of Calgary Water Resources, City of Calgary Fire Department, Rocky View County, City of Cochrane, Town of Canmore, Spray Lake Sawmills, Alberta Wilderness Association, Ghost Watershed Alliance Society, University of Alberta, University of Waterloo

Timeline: Short-term (2018-2020)

Action 3-2: Conduct a watershed investment study to evaluate options to protect vulnerable source watershed lands

Most of the headwaters of the Bow and Elbow watersheds are already protected by national and provincial parks. As a result, targeted investments to improve best management practices on vulnerable privately owned lands may provide significant benefits to maintain The City's source water quality over the long-term.

A model for watershed investments is to use market-based payments from downstream beneficiaries to upstream stewards and providers of watershed services. In this manner, The City could incentivize upstream stewardship actions that go above and beyond current legislation and regulations. The main challenges with moving this forward lies in navigating various institutional, administrative, economic, legal, and political issues. Although it is clear that Calgary and the region value water quality and clean drinking water, how much customers might be willing to pay in additional utility fees to help take care of our source watershed over the long term is a question that remains unresolved.

To help move forward in this direction, The City intends to undertake a Watershed Investment Study to examine and evaluate options and administrative processes that would be required to make this a reality. The existing expertise and innovation of land trust organizations and other non-government organizations is intended to be leveraged during execution of the study.

Key stakeholders: The City of Calgary Water Resources, The City of Calgary Parks, Western Sky Land Trust, The Nature Conservancy of Canada, Southern Alberta Land Trust, Alternative Land Use Services (ALUS), private landowners, Rocky View County, Miistakis Institute

Timeline: Short-term (2018-2020)

"We don't have to undertake further planning exercises to protect land, we simply need resources to action existing opportunities." ~ Dustin Pate, Western Sky Land Trust

"I think in the long run, conserving these lands could be a cost-saving measure for Calgary, good for tourism and good for the environment too."

~ Larry Simpson, Nature Conservancy of Canada





Action 3-3: Update emergency response plans for spills and increase coordination with industry

The risk of a rail line spill or oil pipeline spill upstream from our intakes was ranked as moderate overall. However, concerns over potential spills of hydrocarbons or toxic chemicals were expressed during engagement events, and this concern was heightened by recent oil pipeline spills affecting both Saskatchewan and Alberta. The CP rail line adjacent to the Bearspaw Reservoir in particular is a concern, due to extremely short travel times to our intake if a derailment of hazardous materials were to occur. Additional concerns exist further upstream in the Bow River source watershed. For example, under typical conditions, the travel time from the Bow River in Cochrane to The City's intake at the Bearspaw Dam is less than 24 hours, but can be shortened to under 2 hours during high flows. Improving emergency response planning within the Elbow River watershed is also important, despite a longer average residence time in the Glenmore Reservoir.

Key Stakeholders: City of Calgary Water Resources, Calgary Emergency Management Agency, Calgary Fire Department, Alberta Environment and Parks (Compliance and Drinking Water Operations Specialist), ASERT, Alberta Energy Regulator (Environment and Operational Performance Branch), Alberta Transportation, CP Rail, Husky, Shell, Plains Midstream, Western Canada Spill Services, Springbank Airport

Timelines: Short term (2018-2020)

Utilities are increasingly recognizing a strong need to connect the public's desire for high-quality water with an understanding of the costs involved in its delivery and the implications of underinvestment.

Canadian Water Network (2018): Balancing the Books: Financial Sustainability for Canadian Water Systems

Goal 4: Involve the community through education and research



Action 4-1: Conduct a traditional use study to explore First Nations' traditional knowledge on water and watersheds

During consultations with Treaty 7 First Nations, the idea emerged on the need for a traditional use study to better understand First Nations' ways of knowing and ways of seeing with respect to water, watersheds and land management in the Bow and Elbow watersheds. The purpose will be to obtain a deeper understanding and mutual respect of First Nations' viewpoints and values regarding watershed management, while also aiming to create more meaningful relationships between The City and Treaty 7 First Nations.

Key stakeholders: Siksika Nation, Tsuut'ina Nation, Stoney Nakoda Nation, Kainai Nation, Piikani Nation, Metis Region 3, City of Calgary Neighbourhood Services, City of Calgary Water Resources

Timeline: TBD: Short term (2018-2020) or medium-term (2020-2023) pending resourcing

Action 4-2: Provide guidance to university research projects in Calgary's source watersheds

The City of Calgary maintains active research partnerships and provides guidance to many university research projects within Calgary's source watersheds, and plans to continue to do so into the future. Existing partnerships related to source water protection include but are not limited to:

- **The Southern Rockies Watershed Project**, led by the University of Alberta with input from the University of Waterloo, focused on the impacts of wildfire on watersheds and source water quality along the eastern slopes of the Rockies within Alberta.
- **Global Water Futures**, led by the Global Institute for Water Security at the University of Saskatchewan, in partnership with the University of Waterloo, McMaster University and Wilfrid Laurier University.
- **The Advancing Canadian Wastewater Assets** partnership with the University of Calgary, where a controlled research environment has been integrated with The City's Pine Creek wastewater treatment plant to examine novel wastewater treatment technologies

Key stakeholders: Universities, academics, City of Calgary Water Resources

Timeline: Ongoing

Action 4-3: Develop a source water education plan to promote community and regional actions to reduce risks

It is crucial that the connection between raw water from source water areas and people's drinking water is conveyed to the public, landowners and recreationists alike. To achieve this, existing citizen education programs should be leveraged, expanded or shifted to address source water protection priorities, both within and outside of City limits.

Key stakeholders: City of Calgary, Bow River Basin Council, Rocky View County, Alternative Land Use Services (ALUS), TransAlta Utilities

Timeline: Long-term (2023-2026), pending resourcing

Trout Unlimited Yellow Fish Road program

Trout Unlimited's Yellow Fish Road program is a successful example of a public education program to raise awareness and promote watershed stewardship. It emphasizes the importance of people not pouring used oil, paint, fertilizers, pharmaceuticals or other contaminants down storm sewer drains in urban areas.



UNRESTRICTED

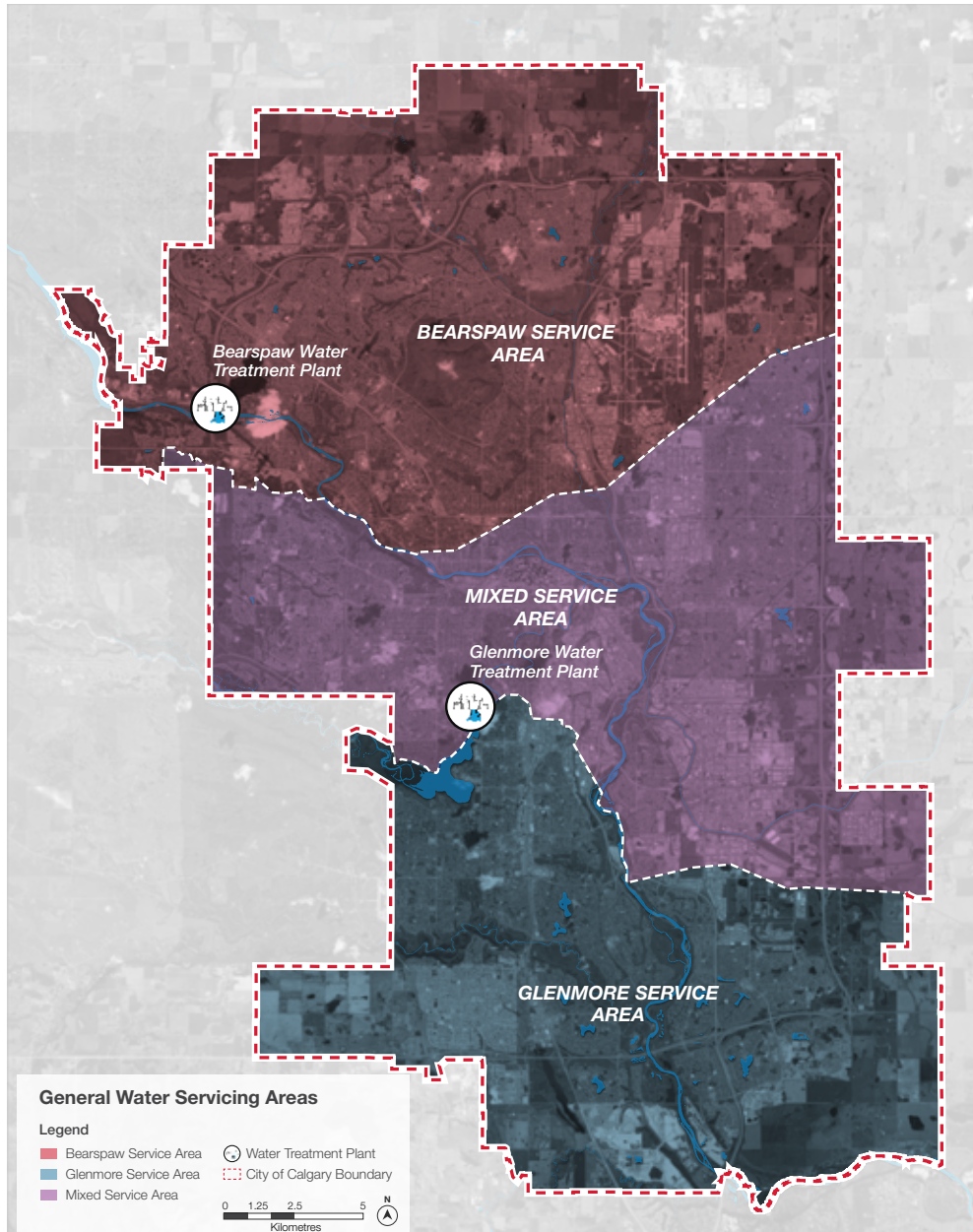


Figure 16: Typical potable water service areas in Calgary

Which river does your water come from?

Typically, the Bearspaw plant supplies treated Bow River water to the northern half of Calgary and the Glenmore Plant provides treated Elbow River water to the southern half of Calgary. There is a wide swath through the middle of Calgary – including downtown and many inner city communities – that is typically a mix of water sources from both the Bow and Elbow rivers.

Typical conditions are shown in Figure 16. However, all of Calgary's water mains are connected to one another. As a result, water sources at different locations in Calgary change regularly in response to production and pumping volumes, operational strategies, or situations in the rivers and reservoirs.



Plan evaluation and revision procedures

This Plan was completed in 2018. The Plan will be reviewed and evaluated every five years to update water quality trends and document progress and issues. The formal review will take a results-based approach and should include an evaluation of:

- Source water quality monitoring data and updated trend analysis.
- Any significant incidents in the source watersheds.
- New scientific or technical research findings.
- New regulatory or planning initiatives.
- Evaluation of successful source water protection actions implemented.
- Challenges and obstacles encountered during implementation of the Plan, and lessons learned.

A wholesale revision of the Plan should occur every 10 years to ensure it is relevant and up-to-date with respect to goals, actions, outcomes, documented progress and potential need for more quantitative indicators. Additional formal stakeholder and public engagement is anticipated to occur prior to 10-year plan revisions. The review will feed into an adaptive management approach, addressing results in the context of our dynamic source watersheds. In a spirit of continual improvement, Plan revisions may require modifications or additions to the vision and goals, risks, action priorities, timelines, key stakeholders or program resourcing.

“A source water protection plan should empower land users to make good management decisions.”

~ External stakeholder



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List of acronyms

AEP – Alberta Environment and Parks
BRBC – Bow River Basin Council
CMRB – Calgary Metropolitan Region Board
DBP – Disinfection By-Products
DWSP – Drinking Water Safety Plan
ERWP – Elbow River Watershed Partnership
ESC – Erosion and Sediment Control
ESOC – Emerging Substance of Concern
GIS – Geographic Information System
IPZ – Intake Protection Zone
MAC – Maximum Acceptable Concentration
SSRP – South Saskatchewan Regional Plan
SWARC – Source Watershed Assessment and Risk Characterization
SWPP – Source Water Protection Plan
TOC – Total Organic Carbon
VOC – Volatile Organic Compound
WQI – Water Quality Index

Glossary

Bioretention area: A landscaped plant bed that captures and filters stormwater. They can differ in design and size from small residential rain gardens to large engineered bioretention areas.

Disinfection byproducts: Chemicals produced during the water treatment process, caused by reactions between disinfection agents and organic materials or ions naturally occurring in water.

Drinking water protection zone: The land and water areas surrounding municipal source water intake pipes, which are managed to prevent or mitigate contamination risks.

Drinking Water Safety Plan: A proactive method of assessing risk to drinking water quality, which better protects public health [20].

Ecosystem services: The benefits people obtain from nature. These include provisioning services such as clean water supplies, regulating services such as flood and disease control, and cultural services such as spiritual, recreational and cultural benefits [3].

Green Stormwater Infrastructure: An approach to use urban stormwater as a resource and manage it at (or as close to) the source of its creation, using vegetation, soils and other elements [22].

Low impact development: An approach to land development that uses various land planning and design practices and technologies to simultaneously conserve and protect natural resource systems and reduce infrastructure costs [23].

Multi-barrier approach: An integrated system of procedures, processes and tools that collectively prevent or reduce contamination of drinking water from source to tap to reduce risks to public health [15].

Riparian area: Transitional lands between upland and aquatic ecosystems. Riparian lands usually have soil, biological and other physical characteristics that reflect the influence of water and hydrological processes.

River-connected alluvial aquifer: Sand and gravel deposits containing water located beside and below rivers, where groundwater flows freely between the shallow aquifer and the river. It can extend for a few kilometres out from the river and typically ends at a relatively steep escarpment.

Source water: Water in its natural or raw state, prior to withdrawal for treatment and distribution as a drinking water supply.

Source water protection: (i) Taking action to prevent contaminants from reaching water sources; (ii) A site-specific process designed to maintain or improve the condition of water sources through a proactive, multi-barrier approach for managing risks.

Source water protection plan: A plan identifying required actions (management practices, statutory or regulatory changes, etc.) needed to mitigate existing and future threats to source water quality, which establishes priorities and a timetable for the plan's implementation [2].

Source water risk: The chance or possibility of a threat causing harm to the functioning of the drinking water system or to human health [15].

Source watershed: The land areas from which water drains downstream and provides raw water supplies for a drinking water utility.

Source watershed assessment: A study that defines the land area contributing to a public water system, identifies the major potential sources of contamination that could affect the drinking water supply and determines how susceptible the public water supply is to this potential contamination [2].

Watershed vulnerability: Reflects the ease with which contaminants, if present, could be mobilized downstream based on the intrinsic properties of the land and subsurface in different areas.



Engagement summary

Stakeholder engagement was undertaken to obtain input for developing this Plan. The purpose of engagement was to obtain input on source water protection goals and priorities, in keeping with documented best practice and The City of Calgary's engagement policy. Stakeholder engagement results are summarized in "What We Heard"¹ reports summarizing internal City staff engagement events held in February 2017, and external stakeholder engagement events held in April 2017. Further engagement occurred during circulation of the draft document. Input was received from over 60 staff within City administration, and over 75 people representing more than 50 stakeholder groups in industry, other orders of government and non-profit organizations (Table 3). The Plan was also reviewed by four leading experts in source water protection and public health issues, including two within Alberta and two in the United States. Additional targeted engagement will also occur during future implementation efforts.

Table 3: List of industries, organizations or agencies consulted during external engagement

Industry groups	Non-government organizations	Watershed management groups	Government	Other
BILD Calgary Region	Action for Agriculture	Elbow River Watershed Partnership	Parks Canada	University of Calgary
Lafarge Canada Inc.	Canadian Parks and Wilderness Society	Ghost Watershed Alliance Society	Alberta Environment and Parks	University of Alberta
Husky Energy	Alberta Wilderness Association	Bow River Basin Council	Alberta Agriculture and Forestry	Calgary Regional Partnership
Volker Stevin Canada	Alternative Land Use Services (ALUS) Canada	Calgary River Valleys	Alberta Energy Regulator	Technical Services Advisory Group (TSAG)
Canadian Pacific Railway	Western Sky Land Trust	Oldman Watershed Council	Alberta Health Services	EPCOR (peer review)
TransAlta Corporation	Southern Alberta Land Trust	Bighill Creek Preservation Society	Rocky View County	Dr. Steve Hrudey (peer review)
Spray Lake Sawmills	Nature Conservancy of Canada	Jumpingpound Creek Watershed Partnership	Town of Cochrane	Dr. Chi Ho Sham (international peer review)
Play Golf Calgary Facilities	Alberta Low Impact Development Partnership Society		Town of Banff (Wastewater Treatment Plant)	Julie Ventaloro, North Carolina Water Supply Watershed Protection Coordinator (international peer review)
River Spirit Golf Course	Alberta Riparian Habitat Mgmt. Society (Cows and Fish)		Town of Canmore	
Earl Grey Golf Club	Yellowstone to Yukon Conservation Initiative		M.D. of Bighorn	
			Town of Airdrie	

¹ What We Heard reports are available at calgary.ca or upon request

First Nations Engagement

Communications and engagement with First Nations was conducted throughout 2016 and 2017, for the following purposes:

- Informing First Nations on the scope of The City's source water protection studies and plans.
- Listening and learning through conversations to understand First Nations' perspectives on water and watersheds.
- Building relationships to help enable ongoing dialogue during future implementation activities.

This type of engagement is consistent with the spirit and intent of The City's Indigenous Policy, and is separate from regulatory Duty to Consult obligations related to provincial legislation and legal requirements. A list of key engagement and communications with Treaty 7 First Nations undertaken during Plan development is summarized in Table 4 below.

Table 4 First Nations' communications and engagement activities on City of Calgary source water protection to date

Date	Activity
January 2016	Letters to all Treaty 7 First Nations delivered
February 2016	Presentation at the Treaty 7 Water Sub-Table* Calgary, AB
May 2016	Follow-up meeting with Stoney Nation
September 2016	Presentation at Full Circle Gathering as part of City Indigenous Policy development, Jon Dutton Theatre, Calgary, AB
April 2017	Presentation at the Treaty 7 Water Sub-Table*, Calgary, AB
September 2017	Meeting with Tsuut'ina Nation representatives, Public Works Building, Tsuut'ina Reserve

* The Treaty 7 Water Sub-Table is organized by the Government of Alberta and includes participation from the Siksika, Kainai, Piikani and Stoney Nations.

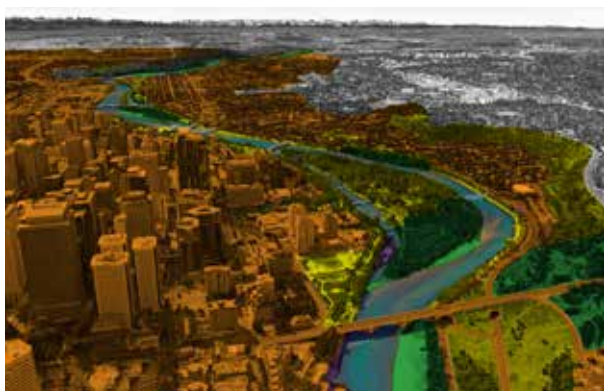




The Riparian Action Program: A blueprint for resilience

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The areas that border our creeks and rivers are highly valued landscapes and critical pieces of 'green infrastructure' that provide multiple, free, and self-sustaining services. The front cover illustration highlights the multiple uses of riparian lands located within the downtown core.

- Developed
- Conservation
- Flood and erosion control
- Restoration
- Recreation

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Foreword

Statement of purpose

Water utilities around the world are seeking new solutions to urban infrastructure issues and have recognized the importance of “green infrastructure” to protect, restore and mimic nature’s water cycle. Green water infrastructure harnesses the power of natural design to provide multiple services, often free and self-sustaining, rather than building costly drainage and flood mitigation infrastructure.

The areas that border our creeks and rivers—riparian areas—are the foundation of The City of Calgary’s integrated approach to watershed protection and management. The Riparian Action Program also takes a systems approach to program design based on the unifying vision and strategies established in the 2013 Riparian Strategy. It sets out a 10-year program focused on three areas and outcomes:

Program area	Outcome
Land use planning	Further loss of riparian areas is minimized
Health restoration	City-wide riparian health is improved
Education and outreach	Stakeholders and citizens value riparian areas

The following document characterizes riparian landscapes, organizes areas of work across The Corporation and brings emphasis to the importance of riparian landscapes as green infrastructure critical to integrated watershed management.

It is also a complementary companion piece to flood resiliency and mitigation. Many of the priority actions found here are equally critical to realizing the recommendations outlined within The City’s **Report from the Expert Management Panel on River Flood Mitigation**, as well as other regional watershed management planning initiatives.

How to use this document

The Riparian Action Program is intended to be a working document and unfolds over three chapters. Chapter One discusses Calgary’s riparian areas, including riparian ecosystem services, the health of Calgary’s riparian areas, recent work to map and categorize these landscapes and citizen research. Chapter Two covers the main content of the program and outlines three areas of action and recommended outcomes and indicators. Chapter Three includes a series of watershed maps that provide an overview of riparian land uses in Calgary and identifies priority restoration projects.

Specific information and implementation tools designed for planners, engineers and practitioners are included in Supplements 1 to 4. Supplements include detailed information on land-use planning, restoration, monitoring protocols and engagement planning. Finally, detailed work plans for each program area are included in an Appendix.

Who should use this plan and how to make best use of it

The document should be used by planners, engineers, practitioners and watershed stewards within The Corporation and the community for direction and ideas on how to protect and restore riparian landscapes within Calgary. It is intended to help practitioners and citizens actively engage and align their work across Calgary’s watersheds. It is hoped that this document will also help watershed stewards identify potential project partners.

This document may also assist with resourcing riparian protection and restoration projects, as proposals linked to this plan will be contributing to watershed goals. A number of resources, contacts and existing projects are detailed throughout.

83 per cent
of Calgarians
say that river
areas are
important
to them
personally.

Ipsos Public Affairs
(2016b)



The legacy of Calgary's river parks and stewardship

Bowness Park: In 1912, developer John Hextall, donated Bowness Park area to The City in return for an extension of a streetcar line to his adjacent subdivision.

Lawrey Gardens: In the 1930s and 1940s, ice jam floods regularly impacted Calgary's riverside communities, including the working class neighbourhood of Lawrey Gardens, three miles west of downtown. To reduce flood risk, private residential lots in Lawrey Gardens were purchased by The City of Calgary with provincial assistance in the 1950s.

Bow Riverfront Park system near downtown:

In the 1960s, the south bank of the Bow River alongside downtown Calgary was almost converted into a highway freeway and railway corridor. The public riverfront park system today that provides such an amenity next to downtown's skyscrapers was only made possible by a coalition between the organized women's movement, urban elites, philanthropists, and the planning department.

Pearce Estate Park: William Pearce, an early settler and the federal government's land commissioner, willed his property on the west bank of the Bow River in Inglewood to The City.

Sources: Armstrong, Evenden, and Nelles (2014); Nelles (2005)



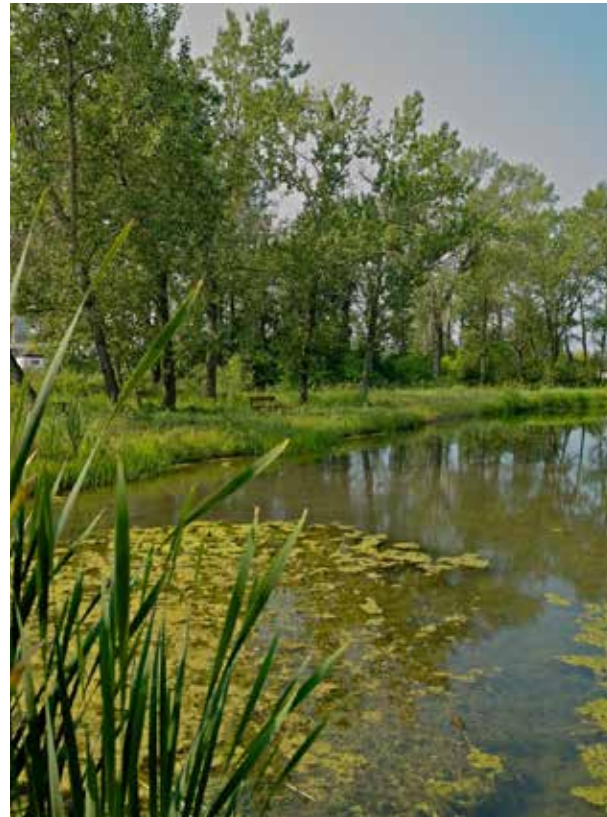


"We have a
clean river
flowing
through our
city, this is
so precious"

Riparian Landowner
Ipsos Public Affairs
(2016a)



Green water infrastructure harnesses the power of natural design to provide multiple services, often free and self-sustaining, rather than building costly drainage and flood mitigation infrastructure.

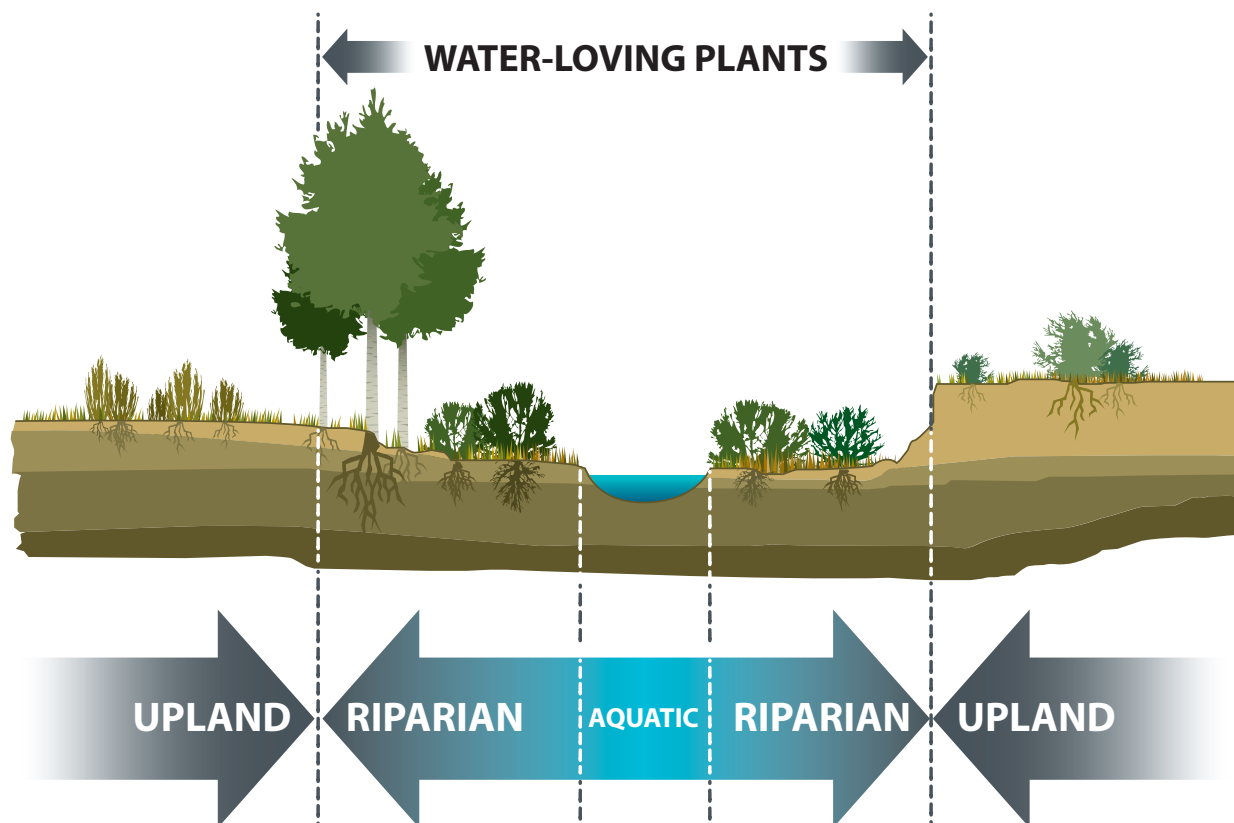


Introduction: Building a blueprint for resilience

Riparian areas are central to watershed and community resilience

Riparian areas unfold like ribbons across our watershed, encompassing landscapes where land and water interact. They border rivers, creeks and wetlands and extend across the floodplain, down into the groundwater and upwards to include plants and trees (see Figure 1). These areas are unique ecosystems largely defined by the complex interactions that happen when land meets water. Along the water's edge, higher-than-average levels of nutrient exchange give rise to rich soils that store water and support a diversity of plant and animal life. This natural diversity sustains many ecological, social and economic benefits that we depend on, including clean drinking water, resilience to flood and drought, plant and animal life, recreational opportunities and experiences of nature within our urban environment.

Figure 1. Riparian areas border rivers, creeks, stream and wetlands (adapted from Fitch et al., 2001)



Resilience is the capacity to endure and recover from disruptive events. Resilience requires appropriate action before, during and after an event to minimize negative effects. A more resilient city suffers less impact when disasters occur and recovers more quickly.

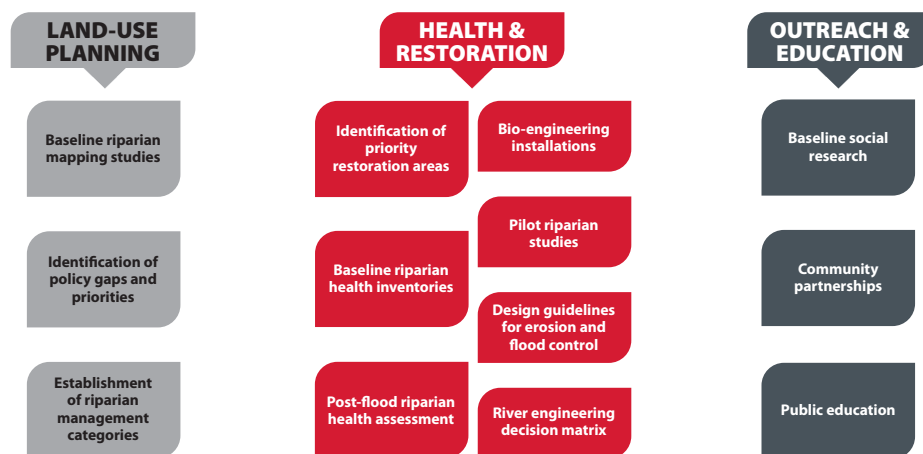
The Latin root of the word riparian is “ripa,” meaning bank.

Within the past 10 years, The City of Calgary has focused on understanding the function of riparian areas within our watershed and on better understanding their connection to the resilience of our community after a flood. In particular, since the 2013 flood, our focus on better riparian management has become an urgent priority. Protecting these landscapes now will directly improve public safety in the near term and increase our watershed and community resilience in the long term. Healthy, intact riparian areas also improve overall drainage and minimize demands on our stormwater infrastructure.

Our commitment to riparian protection and management

The Riparian Action Program addresses multiple business priorities—including stormwater management, flood mitigation, biodiversity and climate change adaptation—while directly improving the quality of life for citizens and improving the resilience of our infrastructure and communities. While Water Resources has already undertaken many actions over the past decade to protect and restore riparian areas (see Figure 2). The Riparian Action Program aims to better co-ordinate and focus municipal and community efforts.

Figure 2. Actions undertaken to improve riparian areas



Program management and governance

Water is a public resource, and there is considerable legislation, policy and planning that already provides direction for riparian-area governance. In fact, the complexity of the Riparian Action Program is due to the broad number of interests that play a role in how we plan for and manage these areas. Currently, the management of riparian areas extends across federal and provincial governments, as well as across multiple municipal business units. Responsibility also extends outwards to partnering organizations, consultants, developers, private landowners and citizens.

It takes a community

Riparian protection is already an important part of how The City manages water and natural resources. The creation and implementation of the Riparian Action Program is made possible by the contributions of numerous City business units and departments, as well as community partners who have shared their expertise, guidance and support, including:

- City of Calgary: Water Utilities, Calgary Parks, Planning and Development
- Cows and Fish: The Alberta Riparian Habitat Management Society
- Calgary River Valleys
- Bow River Basin Council
- Government of Alberta

Due to the critical influence riparian landscapes play in the business of delivering and managing municipal water management priorities, Water Resources will oversee and lead riparian programming within The Corporation and Calgary's municipal boundaries. In the very near future, it is recommended that dedicated resources be established within Water Resources to oversee and deliver on programming identified within this document. It is also recommended that Water Resources provide annual Riparian Action Program progress updates to City Council.

Alignment with flood program and other corporate plans, policies and projects

The Riparian Action Program aligns with numerous provincial and municipal plans, policies and projects. Most notably, it is key to realizing the **Municipal Development Plan's** (MDP) goal of "Greening the City" and specific MDP objectives related to green infrastructure, watershed protection and ecological networks. It also provides a visible line of sight to MDP policies related to riparian protection that have long been approved, though not always consistently applied.

Many of the priority actions found here are equally critical to realizing the recommendations outlined in The City's **Report from the Expert Management Panel on River Flood Mitigation**. While the program focuses specifically on the natural riparian areas that border river, streams and creeks, it complements work related to wetlands and other watershed management programs. Other key areas of corporate alignment include the **Biodiversity Strategic Plan** (2015), the **Action Plan 2015-2018** and a range of regional watershed management planning initiatives, including the provincial **Water for Life** strategy, regional and sub-regional plans like the **South Saskatchewan Regional Plan** and the **Bow River Basin Watershed Management Plan**.¹ See Figure 3.

Figure 3. Alignment of the Riparian Action Program with other corporate initiatives

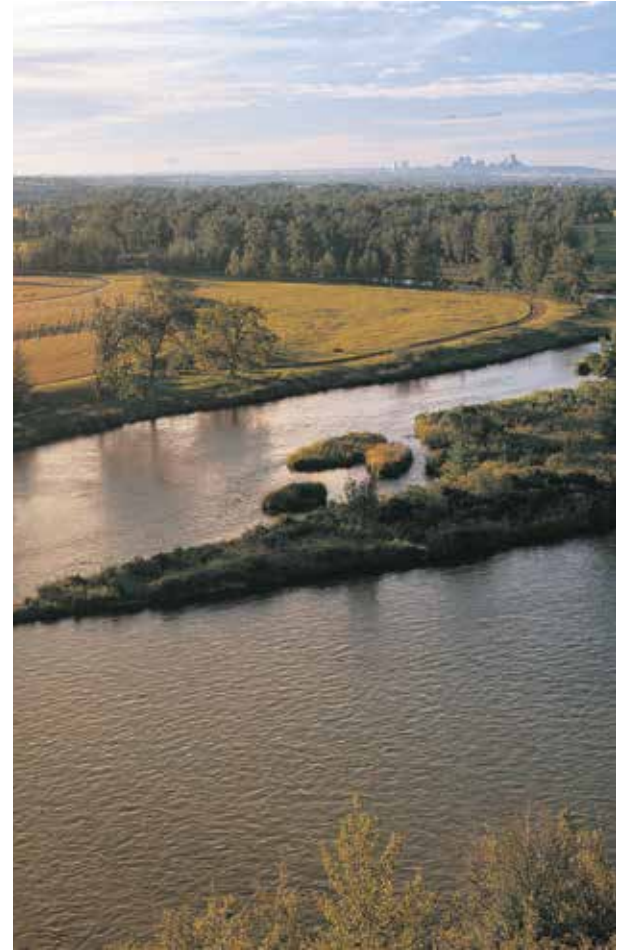


¹ See Supplement Two of the Riparian Strategy (City of Calgary, 2013) for a complete overview of legislation, policy and plans pertaining to Calgary's riparian areas.

Responsible planning and management of riparian areas will benefit Calgarians by providing cleaner water and improved drainage that supports recovery after climatic events, including flood and drought. As well, riparian areas improve public safety, minimize long-term costs to citizens, enhance the spatial quality of our river valleys and creek systems and protect critical environmental assets.



Riparian areas are the foundation of a new approach to integrated watershed management.



Riparian areas sustain our creeks and rivers.

Chapter 1. Riparian Areas in Calgary

Calgary's historical roots are at the confluence of the Bow and the Elbow rivers, a naturally occurring ford that has been the centre of life and activity in this region for millennia. Like many places around the world, as our city has expanded, our natural riparian landscapes have disappeared. Today, Calgary's riparian areas are marked by human intervention, and remaining natural open spaces that border our creeks and rivers often face pressures from recreation and development.

The City has undertaken significant work in partnership with riparian experts to better understand and characterize Calgary's riparian areas, including:

- Recognizing riparian ecosystem services.
- Assessing the health of riparian areas.
- Mapping riparian areas within the city.
- Creating riparian management categories.
- Conducting citizen and stakeholder research.

The work discussed within this section represents nearly 10 years of accumulated research and data focused on Calgary's riparian areas. This document provides a scientific foundation and direction for program implementation.

Recognizing the value of Calgary's riparian ecosystems

The benefits provided to humans by natural areas are often referred to as ecosystem goods and services. Networks of healthy, well-connected riparian areas are vital ecological infrastructure for cities and provide distinct goods and services with high environmental, social and economic values. By integrating natural and built infrastructure, water managers reduce their reliance on the latter, while at the same time realizing a host of riparian benefits, including:

Flood risk management Natural riparian floodplains act as a watershed safety valve by storing water during floods. Wide riparian buffers respect flood hazards and natural channel migration processes. Deep-rooted native plants in riparian areas reduce erosion, instability and bank failure. By retaining natural riparian areas and restoring degraded riparian areas, we will reduce infrastructure damage and risks to safety during future extreme floods.

Clean, safe water Healthy riparian areas are part of source water protection strategies that provide Calgary and downstream communities with fresh, clean water. Well-managed riparian areas can also provide natural filtration systems to help capture, store and filter a wide range of pollutants.

Biodiversity Riparian areas are among the most biologically diverse and productive places in Alberta. Networks of riparian open spaces provide critical habitat and corridors for plant, animal and fish populations.

Economic benefits Well-vegetated riparian areas provide free natural services that reduce the need for costly restoration and additional infrastructure over time. Functioning riparian ecosystems reduce the need for intervention and investment in water quality improvement, stormwater management and erosion protection. If riparian functions degrade, regulatory water quality and quantity targets may be more costly to meet, and reactive repairs or responses—like restoring stream banks and damaged property—may be required.

Quality of life Natural areas and open spaces provide a sense of place, opportunities for activities and play, tourism and education, as well as moments of quiet solitude in areas of natural beauty. High-quality recreation opportunities and scenic amenities contribute to our quality of life, improve our health and improve property values in surrounding communities.



Calgary's creeks and rivers provide precious opportunities to experience nature in our city.

Ecosystem service valuation method

While practitioners have yet to develop a simple, widely accepted method to calculate ecosystem service values, valuation techniques include:

- replacement costs
- avoided damage costs
- contingent valuation + willingness to pay
- choice experiment
- benefits transfer

An example of the avoided damage cost method would be the 2013 Inglewood critical erosion site. It required almost \$5 million to repair and harden the bank. An intact, healthy riparian area, with deep-rooted trees and shrubs, would have slowed erosion at this site and may have eliminated the need for a major engineering intervention.

Therefore, the avoided cost of damage for a healthy riparian area at this site in Calgary is \$2.5 million per hectare or \$4,800 per linear metre of bank.*

*This cost value may be an underestimate, as it does not capture all types of ecosystem services (e.g., fish habitat, aesthetics, etc.)



Riparian areas are places where land meets water

Education and stewardship Riparian areas are premium outdoor classrooms. Spending time in natural riparian landscapes provides critical opportunities for Calgarians to connect with nature and helps them to develop an understanding of how Calgary's watershed functions. Increasing public awareness and understanding of how we are all connected to the river is essential to long-term environmental stewardship.

Assessing riparian conditions in Calgary: the legacy of urban planning

The condition of riparian areas in Calgary is measured using a riparian health inventory, which estimates the ability of a riparian area to provide a range of ecosystem goods and services, including the maintenance of watershed health. In Calgary's urban environment, riparian health has been reduced by a range of factors, including upstream dams, fragmentation by development, recreational activities, bank hardening, channelization and increased stormwater runoff and erosion.

The City of Calgary began conducting baseline riparian health inventories in 2007. The baseline assessments showed that more than 49 per cent of riparian areas city wide were unhealthy, and 40 per cent were healthy with problems. More recently, 2015 assessments showed considerable improvements over baseline levels, including an overall increase of four per cent in average city-wide riparian health (see Figure 7 on page 24). This trend was most pronounced in recently restored riparian areas and those areas beneficially influenced by the 2013 flood.

Mapping riparian areas

Though floodplains and riparian areas occupy the same physical space within our watersheds (see Figure 4), traditionally they have been modelled and mapped separately using different modelling methods. While flood mapping tends to focus on identifying hazards and risks to infrastructure, property and people, riparian mapping tends to focus on defining the boundaries of riparian ecosystems. Over the past years, The City has invested considerable resources in mapping riparian areas, including the application of a variable-width riparian areas model along Calgary's major rivers and, more recently, the mapping of ephemeral and intermittent streams. At the same time, The City and the Government of Alberta have continued to work closely to update flood hazard mapping.

This mapping work has highlighted that many riparian areas are either considerably larger than the current designated floodway, or are larger than the Environmental Reserve policy setback. As such, riparian and stream valley corridors are not fully protected in current land-use planning processes. Smaller headwater-drainage features that generate the majority of a river's flow and play a critical role in maintaining water quality² may be vulnerable to development.

Similarly, river morphology mapping has helped to delineate channel migration zones and better account for how water channels change and migrate over time in our city. If we make room for rivers and creeks at the outset of planning, we can help prevent expensive damage to infrastructure and eliminate the need for expensive bank-hardening projects.

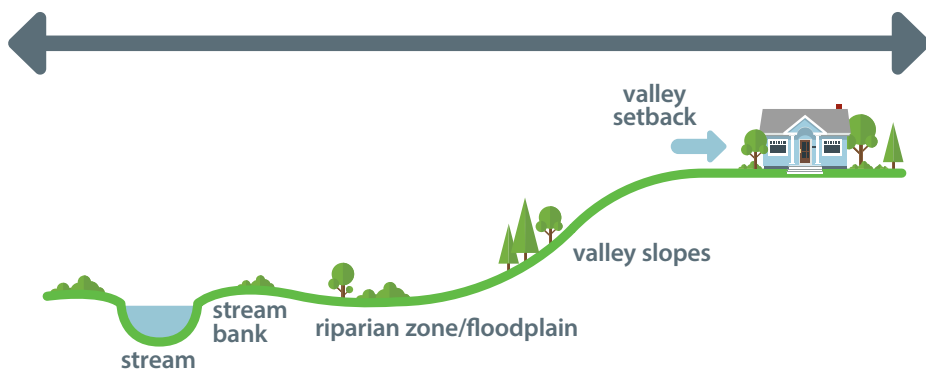
Overall, an important piece of work that lies ahead for The City and stakeholders is to better understand how mapping related to flood hazards and riparian areas (variable-width, morphology and ephemeral and intermittent streams) can be integrated with land-use planning systems. In doing so, we may base decision-making on best available science and adopt a more holistic approach to living with the river.

² See (Bentrup, 2008; TRCA, 2014; USEPA, 2015).



Riparian areas in our source watershed protect and support water quality and quantity.

Figure 4. River valley corridor and setback








Classifying riparian management categories

Given their natural beauty and biodiversity, riparian areas are highly valued landscapes. To better manage these natural assets, The City developed a framework of riparian management categories that can guide river engineering approaches to restoration and bank stabilization, as well as potentially inform decisions about appropriate land uses within riparian areas.

Calgary's riparian management categories include: 1) **conservation**, 2) **restoration**, 3) **recreation**, 4) **flood/erosion control**, and 5) **developed**.

Table 1. Definition of riparian category and an example found within Calgary.

Management Category	Examples	Definition
Conservation		Riparian areas retained for natural open space.
Restoration		Riparian areas with poor health that are intended to be reclaimed or restored.
Recreation		An area of high recreational value and use.
Flood and erosion control		Riparian areas subject to flood and erosion risk. The priority is to mitigate potential flood or erosion damage using the best options available.
Developed		Riparian areas affected by development. If suitable opportunities arise (e.g., redevelopment), these areas will be assessed for restoration.

Making room for the shifting river

Provincial floodplain boundaries represent only a snapshot in time. Rivers, streams and floodplains are not fixed in place, but rather continuously shift in response to natural processes. During floods, these shifts occur particularly rapidly as swelling channels cut new banks, move out onto the floodplain and deposit gravel and debris picked up and carried from upstream areas.

Accounting for channel migration is increasingly important to sustainable land-use planning. Delineating channel migration zones and making room for the river can help prevent expensive damage to infrastructure and eliminate the need for expensive bank hardening projects to prevent flooding and erosion. Avoiding major new developments in river valley corridors makes sense.

It is predicted that the effects of climate change will alter the frequency and magnitude of floods and droughts. Scientists have recently observed changes to the jet stream that are slowing the progression of weather systems and increasing the likelihood of extreme weather. It is prudent to consider climate change risks in relation to the amount and type of new development allowed in these vulnerable areas.



Riparian zones clearly correspond with flood extents

Riparian areas are dynamic, variable systems that respond to cycles of drought and deluge on time scales that range from hours to decades. It is very clear that riparian areas and flooded areas correspond highly with one another. The photos below contrast a sample riparian-zone map along the Bow River in South East Calgary with an air photo from the 2013 flood. Note: inner riparian zones typically correspond with the 1:5 year floodplain boundary; middle riparian zones tend to occupy the 1:20 year floodplain boundary; outer riparian zones tend to occupy between the 1:50 and 1:100 year floodplain boundaries; and the potential outermost riparian zone typically extends beyond the 1:100 year floodplain.



Mapped variable width riparian area (top) versus 2013 flood extent (bottom)

- Inner Riparian Zone
- Middle Riparian Zone
- Outer Riparian Zone
- Potential Outermost Riparian Zone

Implications for management practices and land uses in riparian areas

Key policy gaps related to land-use planning include a need for consistency in riparian river engineering approaches and permitted land uses. Ultimately, riparian management categories address these gaps by providing a city-wide framework and geospatial vision for the use, protection and management of riparian lands. For example, all project engineers and consultants involved with bank stabilization and erosion control are directed to use these management categories when designing bank stabilization and river engineering projects (see Riparian Decision Matrix on page 58).

It is our recommendation that, where possible, these management categories direct City of Calgary guidelines, processes, policies and bylaws related to riparian areas. Key work moving forward will be to consult with internal and external stakeholders to reconcile other land-use planning processes and policies with the proposed management categories.

Understanding citizen and stakeholder values

At the heart of the Riparian Action Program are two discreet, yet related, areas of activity: riparian protection and riparian restoration. Essential to achieving success in both areas will be the engagement of citizens and riparian landowners to understand, value and take action. To this end, The City developed a robust research plan to gain a better understanding of the audiences and potential programs that could be designed to advance riparian protection in Calgary.

Research took place over a six-month period and used a mixed-methods approach that included semi-structured and in-depth interviews, focus groups, surveys and literature review. In addition to informing program development, this research also established a baseline and indicators and has revealed the foundational citizen values and expectations that will inform subsequent stages of community engagement related to land-use planning and policy, and restoration.



The floodplain provides vital space to hold water during spring melts.

Chapter 2. Riparian Action Program: A blueprint for resilience

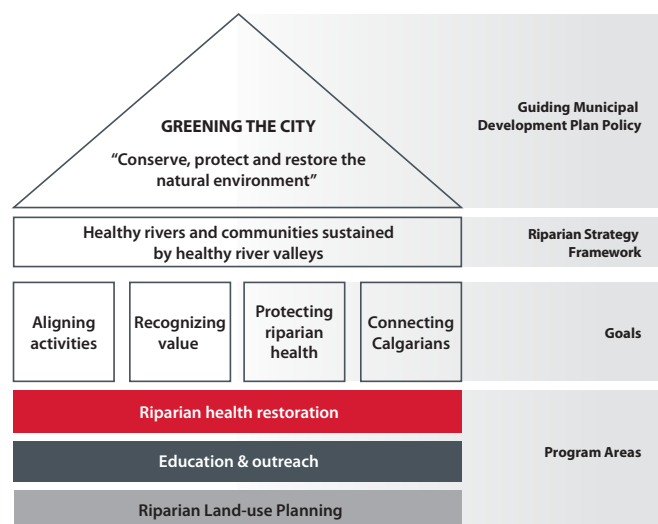
Building resilience through a systems approach to programming

The challenges facing our watershed and water management approaches cannot be understood in isolation. They are often systemic problems, interrelated and interdependent. Just as the challenges facing riparian areas are interconnected, so too are the intervention points for change. The ability of our riparian areas to provide Calgarians with ecosystem services is intimately tied to their health and to our land use planning choices. Similarly, it is also tied to the citizen and community values that influence and shape our choices. As such, the program contains three areas of focus:

1. land use planning
2. health restoration
3. education and outreach

This program has been designed purposely to deliver on the goals outlined within the **Riparian Strategy** framework (see Figure 5). It is also based on best-available science and a robust planning process. The following chapter discusses these program areas in more detail, including desired outcomes, current trends, key actions to improve our performance and how we will measure our results.

Figure 5. Alignment of Riparian Action Program with Riparian Strategy



83 per cent of Calgarians care about The City having a plan to preserve and protect river areas

Ipsos Public Affairs (2016b)



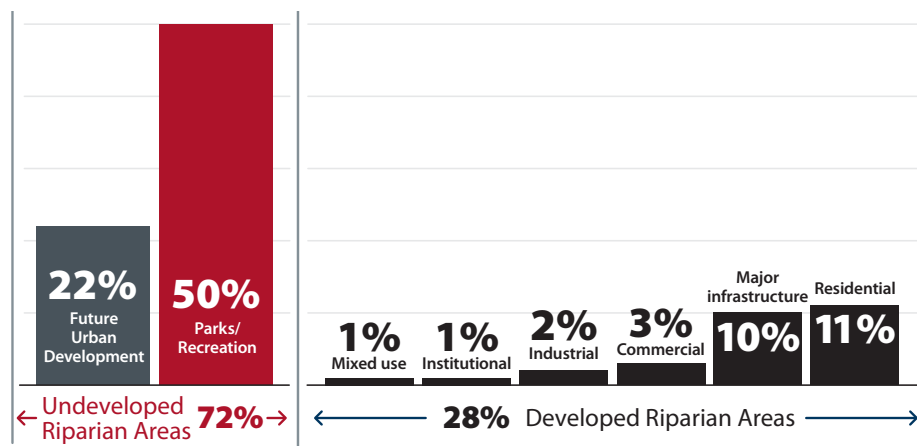
Outcome: Further loss of riparian areas is minimized.

Program area one: riparian land-use planning

Indicator #1: Retain open spaces along major perennial creeks and rivers.

Less than one third (28 per cent) of riparian areas are developed in Calgary. The vast majority (72 per cent) of these areas have been effectively conserved due to a combination of regulation, philanthropy and buyouts in the 1950s, a remarkable legacy that continues to define the lives of Calgarians today. The remaining 22 per cent awaiting planning and development is largely agricultural land in various stages of the planning process.

Figure 6. Major land uses in Calgary's riparian area (2012)



Indicator #2: Limit the conversion of riparian areas to new development along ephemeral and intermittent watercourses.

Work to inventory and map ephemeral and intermittent watercourses is ongoing. Once complete, limits of acceptable change related to the loss of ephemeral and intermittent watercourses will be defined.

Three key actions to improve performance

- 1. Identify riparian areas.** While many riparian areas have been identified and protected, significant work remains. First, most river maps represent only a snapshot in time, because rivers, streams and floodplains are not fixed in place, but continuously shift in response to natural processes. As such, it is important to assess river geomorphology to better understand the changing landscape of riparian areas. Second, The City must identify ephemeral and intermittent streams. The health of our rivers and streams depends on the ephemeral and intermittent watercourses and wetlands where they begin. Yet, due to their small size, intermittent nature and lower aesthetic value, small drainage features are often lost or highly vulnerable to the impacts of urban development. Identifying these areas is an important step towards enhancing green infrastructure and working with nature.
- 2. Protect riparian areas.** Riparian floodplains are just one component of river or stream corridors, which contain a mosaic of landscape types. Protection of slopes associated with valleys, ravines, gullies and coulees is also critical for watershed protection, as these slopes are often prone to erosion and sediment mobilization.

Support tools for practitioners: land- use decision trees

In response to stakeholder demand and identified gaps in process, The City has developed a series of decision-making trees to support land use planners and developers. These flow charts integrate riparian area direction policies from a wide number of documents. See Supplement Two.

Currently, Environmental Reserve (ER) is the most effective planning tool to protect riparian areas. The City's ER setback policy and guidelines³ are based on the Municipal Government Act (MGA) and are variable widths based on a number of factors, including waterbody type, slope, vegetation cover and local groundwater influence. However, they do not go far enough to protect all riparian areas, such as ephemeral and intermittent streams, nor provide a large enough setback to ensure healthy and functioning riparian areas. Generally, best-practice provides more space to rivers and streams, so that natural processes can occur. To achieve this, the current ER setback policy and guidelines must be reviewed, and processes must be developed to ensure new guidelines are consistently interpreted and applied throughout The Corporation. It is recommended that Administration also investigate other ways to protect riparian areas. For example, once the Municipal Government Act is updated, other planning tools may become available.

3. Manage development along riparian areas. Allowing appropriate land uses and managing the interface between development and riparian areas in greenfield areas will help ensure that riparian areas remain healthy and continue to provide ecosystem benefits. It is recommended that Administration investigate other planning tools or approaches to manage and inform appropriate land uses along riparian areas.

Who will benefit

Current and future Calgarians will benefit from improved community safety, as these drainage features can be designed as emergency valves for extreme rainfall events. Other benefits include access to nature and increased ability to recover from climatic events, including flood and drought. As more riparian areas are protected from development, The City could lower its maintenance costs by having less engineered drainage infrastructure.

Partners who can help us

City of Calgary. Parks, Planning and Development, Water Resources.

Other. Cows and Fish, Calgary River Valleys, Federation of Calgary Communities, community associations, citizens, Urban Development Institute, Canadian Home Builders Association, consultants, planners and developers.

Performance measurement Measuring and reporting on program progress will rely on a results-based framework including indicators and targets. These provide guidance over the long term and assist with assessing our performance during the implementation period. See Table 1 below for an overview of indicators and targets.

Table 2. Riparian land-use indicators and targets

Outcome	Indicator	Area	Baseline	2026 Target
Further loss of riparian areas is minimized.	riparian open spaces along major perennial creeks and rivers*	City wide	73%	No net loss
		Bow River	75%	
		Elbow River	62%	
		Nose Creek + West Nose Creek	67%	
	riparian open spaces along ephemeral and intermittent watercourses	City wide	Limits of acceptable change/thresholds for ephemeral and intermittent streams are to be determined.	

See Supplement Three for detailed methodology and land-use monitoring protocols.

3 See http://www.calgary.ca/CSPParks/Documents/Planning-and-Operations/Natural-Areas-and-Wetlands/environmental_reserve_setback_policy.pdf



The health of our rivers and streams depends on the ephemeral and intermittent watercourses and wetlands where they begin.

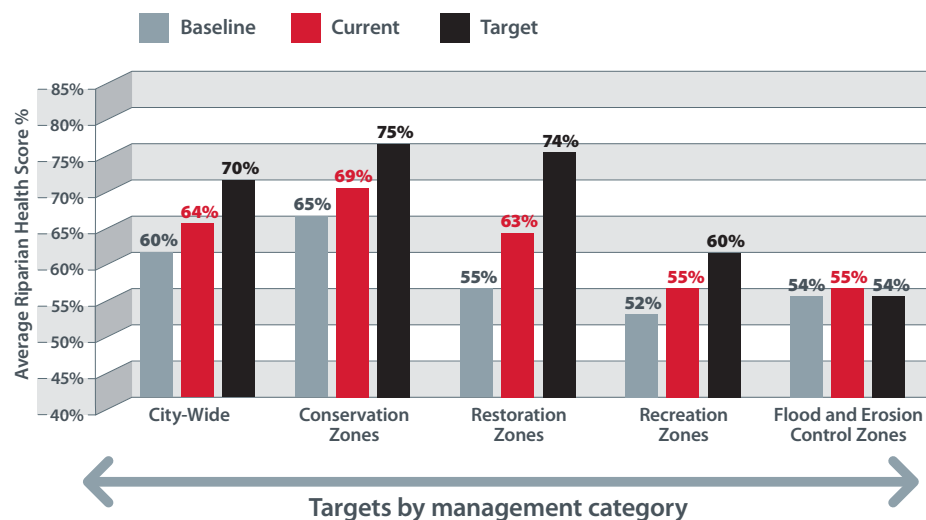
Outcome: City-wide riparian health is improved.

Program area two: riparian health restoration and monitoring

Indicator #3: City-wide riparian health index scores improve over time.

Baseline surveys of riparian health were conducted from 2007 to 2010 across 57 sites in Calgary, representing over 368 hectares of riparian habitat. All of these sites were revisited in 2014-2015. Assessments show that, overall, riparian health scores in Calgary have improved over this time period, with 25 per cent of sites showing an improving health trend and very few sites showing a declining health trend. Overall, the City-wide average riparian health score increased by approximately four per cent (from 60 per cent to 64 per cent). Key factors contributing to this trend include restoration and management improvements, natural vegetation recovery and the beneficial impacts of the 2013 flood on riparian ecology.

Figure 7. Trends and targets of riparian health



Unhealthy riparian area.



Healthy with problems riparian area.



Healthy riparian area.

Three key actions to improve performance

- 1) **Integrate bioengineering techniques into bank restoration.** Bioengineering⁴ is more ecologically beneficial than hard riprap designs—the practice of armouring and stabilizing banks with rock. While riprap is an effective immediate answer to erosion, it impacts riparian health, and its long-term effects can be less than ideal. The hard rock surfaces tend to increase water flow, which reinforces the damaging effects of high flows downstream. The rocks also impact sensitive spawning areas, by heating the water and depriving fish and wildlife of oxygen, food and habitat. Vegetating degraded areas is a lower-maintenance and self-sustaining solution with multiple benefits, such as providing critical habitat for fish and wildlife and creating areas of natural beauty in our urban landscape. Bioengineering can also enhance hydraulic benefits, as the surface roughness associated with plants absorbs energy and reduces water velocities. Evidence shows that bioengineering can outperform riprap alone, with its higher resistance to shear stresses.⁵ The City of Calgary promotes multi-functional bioengineering designs, and significant progress has been made to encourage adoption of these approaches within the community at large. See Supplement One for a discussion of the differences between structural and plant bioengineering, as well as examples of successful bioengineering projects in Calgary.
- 2) **Monitor riparian health and evaluate performance.** As restoration projects are conducted, systematic collection of successes and failures helps to identify trends, monitor performance and inform future improvements to procedures and specifications. The City already monitors riparian health conditions and collects data on planting survival rates in restoration sites. This data has been used to develop design recommendations to maximize survival rates and to inform choices related to installation timing, irrigation and environmental factors (TCS 2016).
- 3) **Build capacity for riparian restoration.** Riparian restoration requires specialized knowledge of hydrology, riparian processes, engineering, plant biology, soils and ecology. It also requires the capacity to undertake the work and the ability to monitor and evaluate site performance. Significant portions of Calgary's river and creek banks require restoration in the upcoming years. While The City has some capacity, it will need new and additional resources internally and externally. Superior results may be achieved by investing strategically in partnerships with academia, NGOs and private industry to accomplish this work and build riparian restoration capacity within the community.



Bioengineering incorporates living and non-living plant materials in combination with natural and synthetic support materials.



Many fisheries experts believe that the most critical impacts to fish and fish habitat occur, not as a result of a flood event itself, but rather from our response to the flood. Bioengineering is more ecologically beneficial than hard riprap designs—the practice of armouring and stabilizing banks with rock.



Almost all fish and wildlife depend on the areas bordering our rivers and creeks for some part of their life cycle.

Support tools for practitioners: bank restoration decision matrix

In response to stakeholder demand and identified gaps in process, The City developed a decision-making tool to support river bank engineers and developers choosing the type of bank stabilization design to apply to different areas. See Supplement One.



Bioengineering can outperform riprap—the practice of armouring banks with rock.

⁴ Bioengineering is an approach that incorporates living and nonliving plant materials in combination with natural and synthetic support materials for slope stabilization, erosion reduction and vegetation establishment.

⁵ See Pack and Gaffney (2014).

See the watershed maps in Chapter Three for an overview of planned future riparian restoration projects.

Who will benefit

As more riparian areas are restored to health, current and future Calgarians will benefit from improved water quality in our waterways, improved drainage and improved public safety due to increased ability to recover from climatic events, including flood and drought. Healthy banks are also more aesthetically pleasing, require less engineered bank infrastructure and provide critical habitat and corridors for plant, animal and fish populations.

Partners who can help us

City of Calgary. Parks, Water Resources

Other. Cows and Fish, watershed stewardship groups, external consultant planners and riverbank engineers

Performance measurement

The condition of riparian areas is a critical indicator of watershed health. Riparian areas are strongly influenced by surrounding watercourses and landscapes, including historic and current land uses and activities. Consequently, targets or indicators depend on both location and context. Riparian zones in heavily urbanized areas require targets different from those in riparian areas within intact natural open spaces. The size of a river or creek also influences target-setting.

Table 3. Riparian health indicators and targets

Outcome	Indicator	Area	Baseline	2026 Target
City-wide riparian health is improved.	riparian health index score	City wide	61%	72%
		Conservation zones	65%	77%
		Restoration zones	56%	71%
		Recreation zones	52%	60%
		Flood and erosion control zones	55%	54%

See Supplement Three for a detailed explanation of riparian health index (RHI) score methodology and monitoring protocols.

Flooding, upstream dam operations and influences on riparian health

Seasonal peak flows and occasional large floods are natural processes that renew riparian vegetation. Between the 1950s and 2000s, dam operations, combined with a lack of major natural floods, created a deficiency of new natural vegetation along the Bow River within Calgary. After the 2013 flood, many new gravel bars were deposited or expanded in Calgary, providing suitable conditions for native vegetation to colonize and grow. Observations during summer 2014 revealed extensive balsam poplar seedlings along new gravel bars and scoured floodplain surfaces.

Dr. Stuart Rood of the University of Lethbridge has been working with TransAlta to develop flow “stage ramping” criteria for the Bow River to imitate natural hydrographs and promote the establishment and growth of native balsam poplar and willow. This can be optimized with June peak spring flows of 350-375 m³/s on the Bow in downtown Calgary, followed by a gradual decrease in stage elevations of 2.5 cm per day in June/July, and 1 cm per day in August. Restoring these more natural flows can provide highly efficient restoration compared to riparian plantings, which are only locally effective and may require periodic replenishment and maintenance.



Seasonal peak flows and occasional large floods are natural processes that renew riparian vegetation.

Program area three: education and outreach

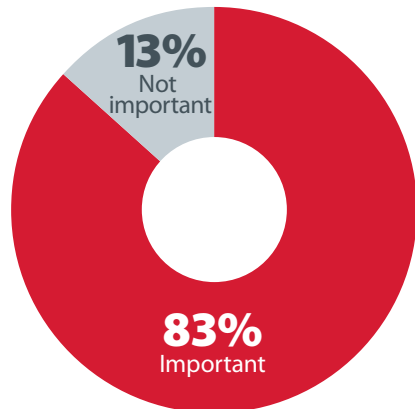
Indicator #4: Community engagement with riparian areas (awareness, attitudes and actions) increases over time.

A general population survey conducted in 2016 provided a baseline of Calgarians' awareness, attitudes and values related to riparian areas. Results show that while the majority (83 per cent) of citizens report that rivers areas are personally important to them, few Calgarians are aware of the true health of riparian areas. Also, a lack of awareness of what to do was reported as the biggest barrier to not doing more to take care of river areas. These findings will help direct long-term riparian education and outreach efforts.

Indicator #5: Community stewardship actions increase over time.

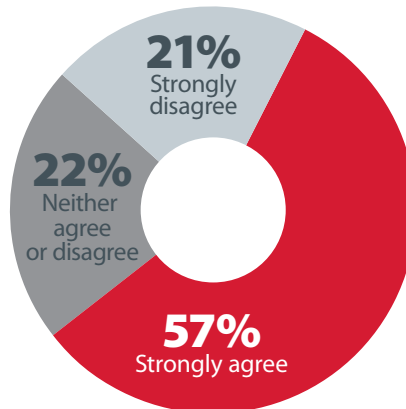
While indicator data, such as polling, give us a sense of how Calgarians are progressing in terms of their awareness, attitudes and actions, community actions bring numbers to life and provide real examples of engagement. Insights from indicator data can be bolstered by stories of community actions and by tracking stewardship activities within City programs and community partners.

Figure 8. Calgarians who say river areas are personally important to them



Source: Ipsos Public Affairs (2016b)

Figure 9. Calgarians who agree not knowing is reason for not acting



Source: Ipsos Public Affairs (2016b)

Three key actions to improve performance

- 1. Tell a holistic story of living with the river.** The unique nature of riparian ecosystems provides a rich and tangible narrative to knit together water conversations that we've often had in isolation or not at all. Riparian areas also offer an important invitation into conversations about past water management decisions and the need for newer, greener solutions to infrastructure challenges and land-use planning.
- 2. Create opportunities for Calgarians to connect.** The tangibility of the river's edge will help make otherwise complicated concepts of ecosystem services and natural assets more real and accessible. Connecting to the river is also a powerful way to foster environmental stewardship and civic engagement. Stakeholders must be given opportunities to be a part of the work happening within their communities from the beginning and to shape and own the success of these riparian projects. In bringing citizens along on the journey of restoration, projects become community celebrations and our civic environmental stewardship is strengthened.

Outcome:
Citizens
and riparian
landowners
value riparian
areas.

71 per cent
of Calgarians
agree that it is
only through
educating the
public that we
will be able to
improve the
health of our
river areas

Ipsos Public Affairs
(2016b)

Utilities and Environmental Protection's Public Art Plan: bringing water into public focus

Utilities and Environmental Protection's Public Art Plan merges ecology, art and community to bring our creeks, rivers and watershed landscapes into public focus. Integrated public art, which is open to interpretation, is designed to encourage dialogue about watershed protection and strengthen the emotional connection citizens have with their natural environment. Throughout each project, artists incorporate resident neighbourhood perspectives and insights into their work.

In 2010, approximately 20,000 Calgarians took part in The Celebration of the Bow, the plan's first major temporary project, during which illuminated spheres were floated down the Bow River. Currently, there are more than twenty public art initiatives underway. One project completed in 2014 is Bow Passage Overlook, located next to Harvie Passage at Pearce Estate Park. From a series of terraces and a grotto-like seating area, visitors can capture views of the Bow River and surrounding landscapes, while pathways and river-access points bring them to the river's edge. Visitor experiences like these enrich our urban life and help renew the public's relationship with our watershed.



Celebration of the Bow

3. Prioritize and focus engagement and education efforts. While we are all connected to the river, some stakeholders are more connected than others by virtue of being a landowner or living in a community close to the river's edge. Similarly, some riparian initiatives will be of greater priority than others due to restoration or protection needs. Rather than applying a one-size-fits-all approach, it will be important to prioritize landscapes and focus on those stakeholders best positioned to make change in that area. Riparian landowners, developers, civil and community planners, as well as residents and communities near riparian areas, will need to be equipped, properly supported and empowered in the protection and maintenance of their landscape. A second aspect of this key action is to identify existing riparian stewardship groups/programming and focus municipal efforts on building capacity only where needed.

Who will benefit

Current and future Calgarians will benefit from a greater connection to Calgary's rivers and creeks. Other watershed groups working within the area of riparian protection and restoration will also benefit through increased watershed literacy among citizens, increased support for their work and specific opportunities to partner with The City.

Partners who can help us

City of Calgary. Water Resources, Parks, municipal land owners, City of Calgary employees

Other. Residents, community leaders, private land owners, community associations, non-governmental organizations involved with water management, the development industry, technical consultants, golf courses and regional partners

Performance measurement

The City is currently developing baseline measures and indicators of the value of riparian areas for communities.

Table 4. Riparian education and outreach indicators, baselines and targets

Outcome	Indicator	Aspect	Baseline	2026 Target
Citizens and riparian landowners value riparian areas.	Stakeholder engagement with riparian areas	Awareness of riparian health	26%	↗ trend
		Lack of awareness of what to do	57%	↘ trend
		Personal importance of river areas	83%	→ maintain
		Behaviours taken by citizens	To come	↗ trend
Customer satisfaction	Customer satisfaction	Satisfaction with City's performance to protect and restore river areas	58%	↗ trend
Community stewardship actions	Community stewardship actions	Citizens engaged in restoration and stewardship activities	To come	↗ trend
		Riparian spaces restored or stewarded by community groups/members	To come	↗ trend

See Supplement Three for detailed explanation of education and outreach methodology and monitoring protocols.

Monitoring and adaptive management

The Riparian Action Program (RAP) includes annual check-ins and adjustments. This includes two minor program reviews as part of The City's business planning and budgeting processes and a comprehensive 10-year program review in 2026. Over time, successes and failures will be documented, and the program will be updated accordingly. This adaptive management approach can deal with the uncertainty and complexity involved in resource management. It is a structured, science-based process that integrates experience and scientific information. Adaptive management also enables continual improvement, accountability and transparency, and addresses the dynamic nature of riparian systems.

The RAP adaptive-management process follows a six-step cycle:

• Assess problem

At this step, knowledge is assessed and synthesized to evaluate resource conditions and establish high-level direction. All background riparian studies conducted from 2008-2013 were part of this step, including (i) baseline riparian health inventories; (ii) riparian mapping studies; and (iii) the Riparian Strategy.

• Design.

The second step consists of program design, including the establishment of explicit outcomes, delineation of key actions and timelines, establishing methods to monitor results over time and setting appropriate indicators and targets. The Riparian Action Program represents the output of the program design process.

• Implement

During this step, projects and actions outlined in the program plan are carried out. Riparian implementation activities began in 2014 with the release of the Riparian Decision Matrix for River Engineering Projects (see Supplement One on page 54) and through the planning and initiation of several restoration and research projects. Implementation is expected to continue throughout future business cycles.

• Monitor.

The monitoring of indicators is undertaken to determine whether the observed effects match predictions. Post-flood monitoring of riparian health conditions and future monitoring of indicators over time fall under this step.

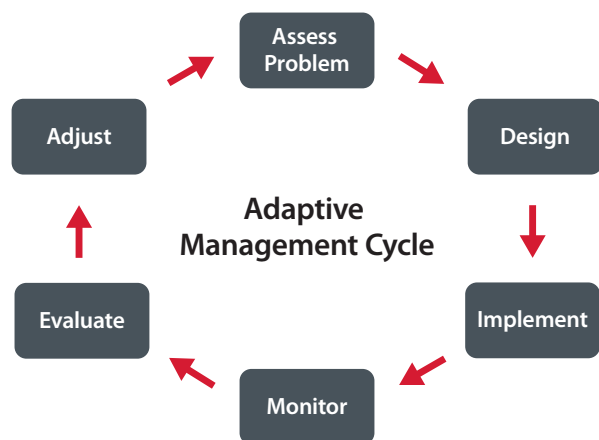
• Evaluate.

Over time, successes and failures need to be documented and the program reviewed, adapted and updated as necessary. This will include a minor five-year program review in 2021.

• Adjust.

Adjustments will be made during a 10-year program review, currently planned for 2026.

Figure 10. The Riparian Action Program follows an adaptive management approach



Restoring riparian landscape more empowering than you might think

Volunteer restoration activities involve participants in active relationships with the natural environment around them. Connecting to the land not only provides vivid examples of how our watershed works, it also kindles and fosters a desire to preserve and maintain our collective natural environment.

Studies demonstrate that:

1. Stewardship volunteering enhances civic engagement among participants.
2. Restoration activities deepen existing environmental ethics.
3. Self-identifying as a steward exerts the strongest influence on our intention to behave in pro-environmental ways.
4. Spending time with like-minded stewards is the most effective way to translate attitudes into eco-behaviour.
5. The stronger a person's emotional attachment to a place, the more they engage in pro-environmental behaviours.

As well, restoration and stewardship activities provide important outlets for action.



Connecting to the river is also a powerful way to foster environmental stewardship and civic engagement.

Almost all fish and wildlife depend on the areas bordering our rivers and creeks for some part of their life cycle.

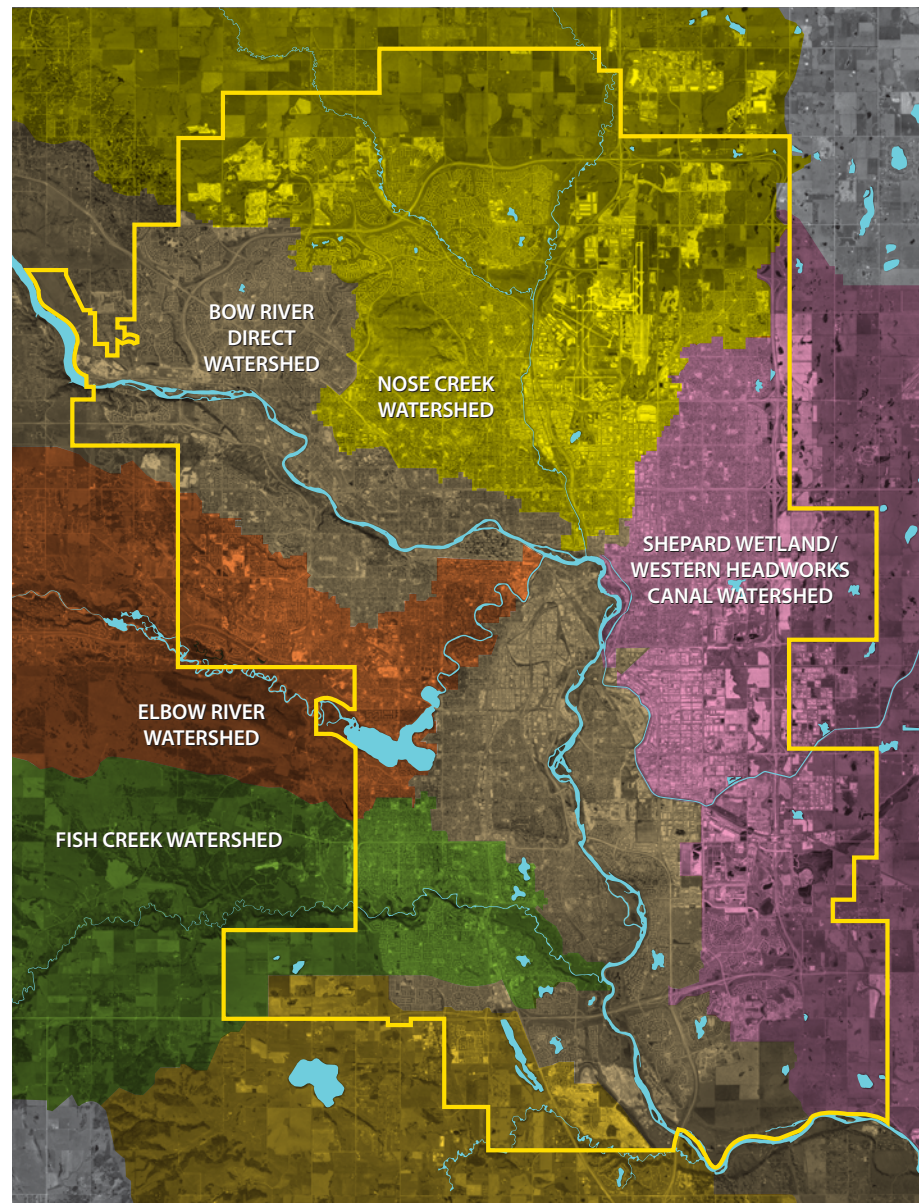
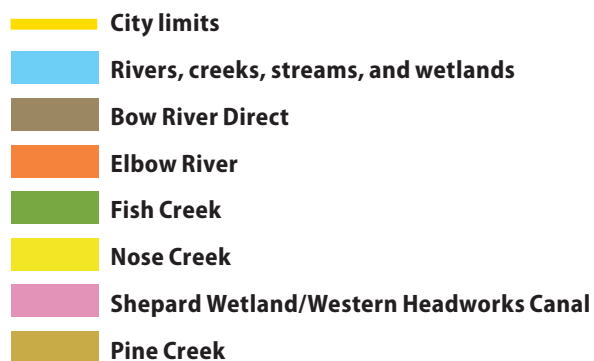


Chapter 3. Calgary's commitment to our river areas

Beneath Calgary's built environment—such as roads and buildings—lies an ecological landscape defined by the flow and storage of water. The following maps tell a holistic story of how riparian areas in Calgary are used and how this program integrates with the **Flood Resiliency and Mitigation Program** and stormwater management. They knit together several collections of information, including riparian restoration priorities and restoration techniques. They are the culmination of years of research and mapping and are a defining tool in The City's commitment to the protection of riparian areas.

Within city limits, Calgary is situated within the Bow River Watershed and includes six major sub watersheds.

The information in this chapter corresponds to The City of Calgary's data as of March 2016. The information and maps are made available in good faith, but accuracy and completeness cannot be guaranteed. The City's riparian data and maps may be updated from time to time as resources allow.



Upper Bow River Direct Watershed

Watershed summary

The Bow River Basin includes over 25,000 km² of land, from the headwaters in Banff National Park to the confluence with the Oldman River in semi-arid southeastern Alberta. Virtually all of Calgary is within the Bow River Basin, as most land drains into one of six watersheds that are tributaries to the Bow River. Within city limits, the Bow River Direct watershed includes all areas that drain to the Bow River without passing through a major tributary first (e.g., Nose Creek).

Importantly, the Bow is the source water for the Bearspaw Water Treatment Plant, which provides approximately 60 per cent of The City's water supplies to Calgarians. Due to the extensive nature of the Bow River Direct watershed, which spans all of Calgary, it has been subdivided into upper and lower sections.

Upper Bow River direct watershed

The Upper Bow River direct watershed includes lands in Calgary draining directly to the Bow River upstream of the Elbow River confluence, as well as smaller catchments associated with Coach Creek and 12 Mile Coulee Creek.

Riparian land uses

- Extensive (>2,800 ha) riparian areas fringe the Bow River in Calgary.
- Parks and recreation areas cover 52 per cent of Calgary's riparian areas along the Bow. This includes many of Calgary's defining parks, including Bowness Park (donated to the City in 1912 by a developer), Bowmont Park, Edworthy Park, Shouldice Park, Prince's Island Park, and Saint Patrick's Island.
- Residential land uses intersect 11 per cent of the Bow's riparian zones in Calgary, including the neighbourhoods of Bowness, Hillhurst, Sunnyside, and Eau Claire. The East Village mixed use development intersects about one per cent of the Bow River's riparian area.
- Railways and major highways (Stoney Trail, Crowchild Trail) occupy almost eight per cent of the riparian areas in this watershed.
- Commercial areas occupy about four per cent of the riparian zone along the Bow, concentrated in the downtown core.
- The legacy of urban development along the Upper Bow River in Calgary has created considerable flood risks to people, businesses and infrastructure, and requires careful ongoing management.
- Riparian habitats are also located along Coach Creek (18 ha) and Twelve Mile Coulee (39 ha). The majority of these have been retained as open spaces within Crestmont and Tuscany.

Vegetated rip rap – outfall B134



Home Road bank stabilization

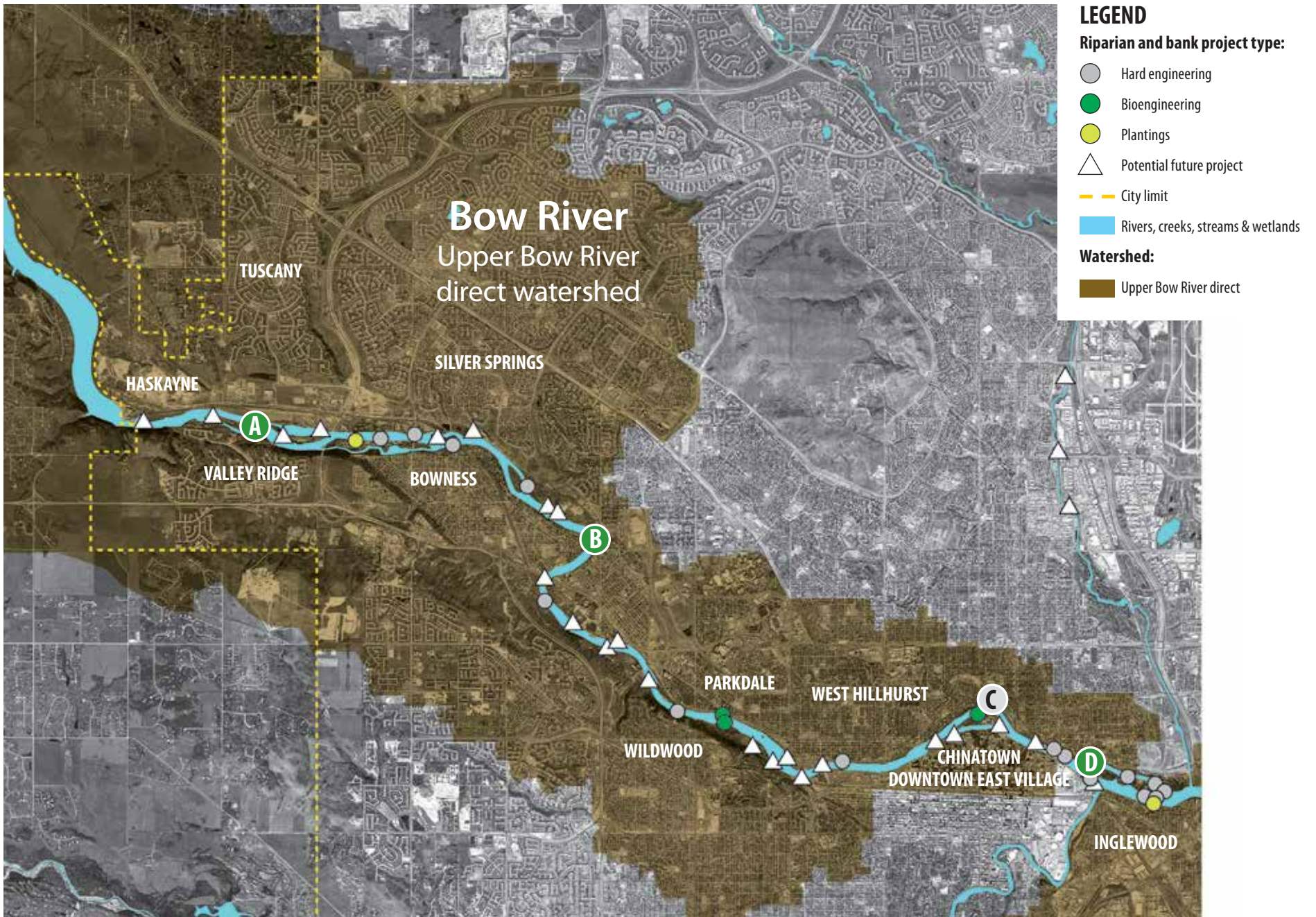


Rip rap and groynes – Sunnyside, Memorial Drive



St. Patrick's Island – Calgary Municipal Land Corporation





Lower Bow River Direct Watershed

Watershed summary

The Bow River Basin includes over 25,000 km² of land, from the headwaters in Banff National Park to the confluence with the Oldman River in semi-arid southeastern Alberta. Virtually all of Calgary is within the Bow River Basin, as its lands drain to one of six watersheds that are tributaries to the Bow River. Within city limits, the Bow River Direct watershed includes all areas that drain to the Bow River without passing through a major tributary first (e.g., Nose Creek).

Lower Bow River direct watershed

This highly urbanized watershed includes all lands within Calgary that drain to the Bow River downstream of the Elbow River confluence. This section of the Bow River experienced severe erosion during the 2013 flood, particularly along stretches with unhealthy riparian areas.

Riparian land uses

- Extensive (>2,800 ha) riparian areas fringe the Bow River in Calgary.
- Parks and recreation areas cover 52 per cent of Calgary's riparian areas along the Bow. This includes many of Calgary's defining parks in South East Calgary, including Pearce Estate Park, the Inglewood Bird Sanctuary, Beaverdam Flats, Sue Higgins Park, Carburn Park, and Fish Creek Provincial Park. This category also includes two major golf courses: Inglewood Golf Course and McKenzie Meadows Golf Course.
- Residential land uses intersect 11 per cent of the Bow's riparian zones in Calgary, including the neighbourhoods of Inglewood, Bridgeland, Riverbend, Quarry Park, and Cranston.
- Major Infrastructure is the third most common land use category, occupying eight per cent of the Bow's riparian areas. This includes The City's three Wastewater Treatment Plants, as well as railways, railyards, and major highways (Deerfoot Trail, Stoney Trail).
- Commercial areas occupy four per cent of the riparian zone along the Bow, including the Deerfoot Meadows shopping centre.
- Significant riparian lands, particularly those downstream from Cranston within City limits, are currently unplanned, but will be under pressure for future development as the City continues to expand outwards.
- Flood risks to people and infrastructure along the Lower Bow have been reduced by: the Inglewood flood berm, which protects the community of Inglewood up to a 1:100 year flood event. Land Use Bylaw overlay regulations developed in the 1980s have also reduced flood risk to newer communities such as Douglasdale, Deer Run, Quarry Park, Chaparral and Cranston, although these areas could still be affected by extreme floods beyond the design standard.
- Some SE Calgary residential areas were developed with insufficient setbacks from the Bow River valley, creating slope stability issues and a need for expensive erosion control projects (e.g., Diamond Cove, McKenzie Lake).

Inglewood community planting "Street to Stream" project



Inglewood critical erosion site – construction 2014



Timber crib wall – upstream of Glenmore Trail



Timber crib wall – Sue Higgins Park

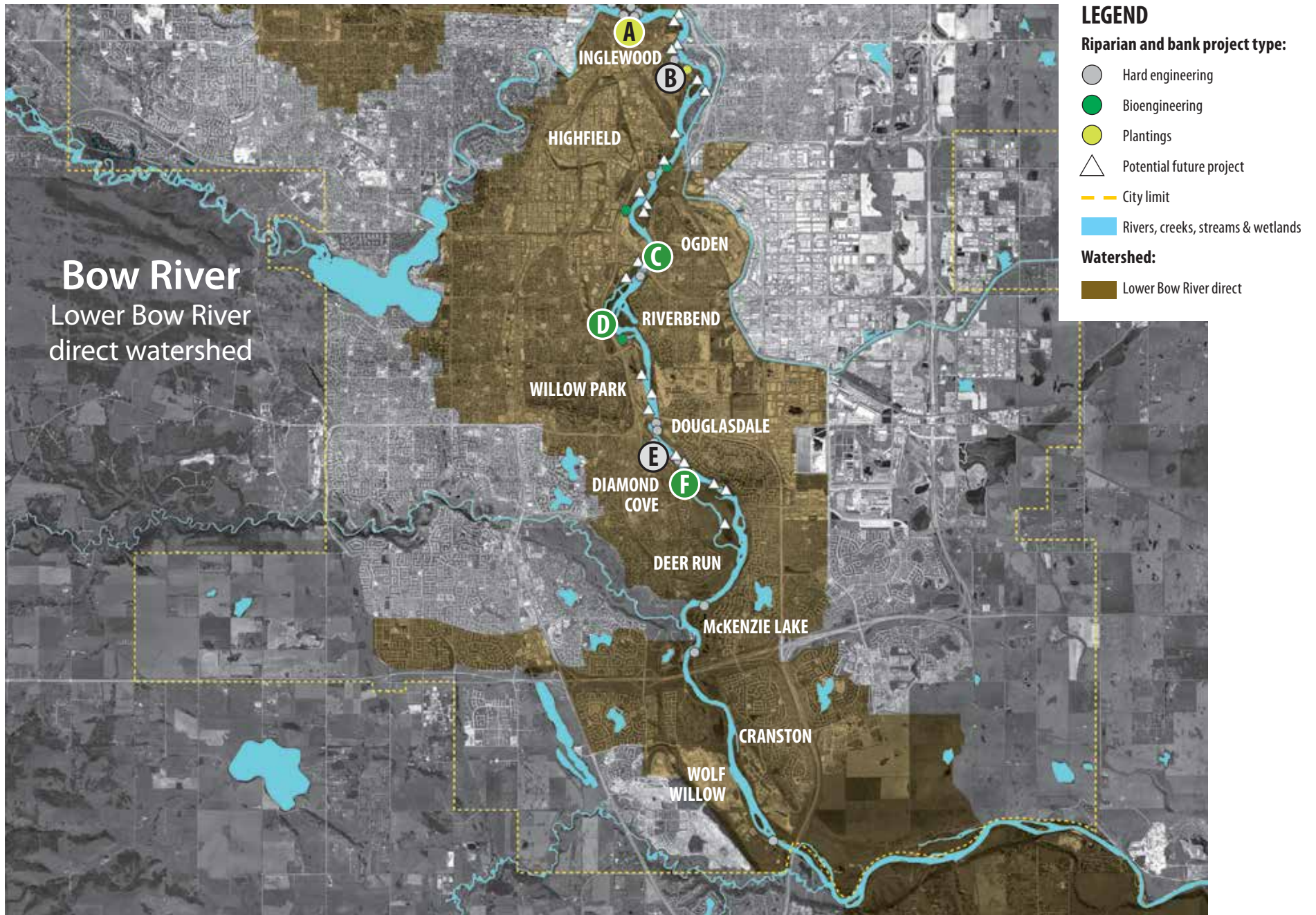


Diamond Cove rip rap and slope toe protection



Mallard Point bioengineering project – Trout Unlimited





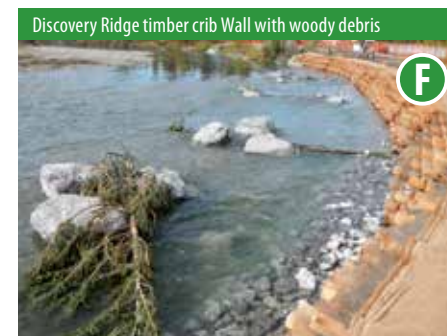
Elbow River Watershed

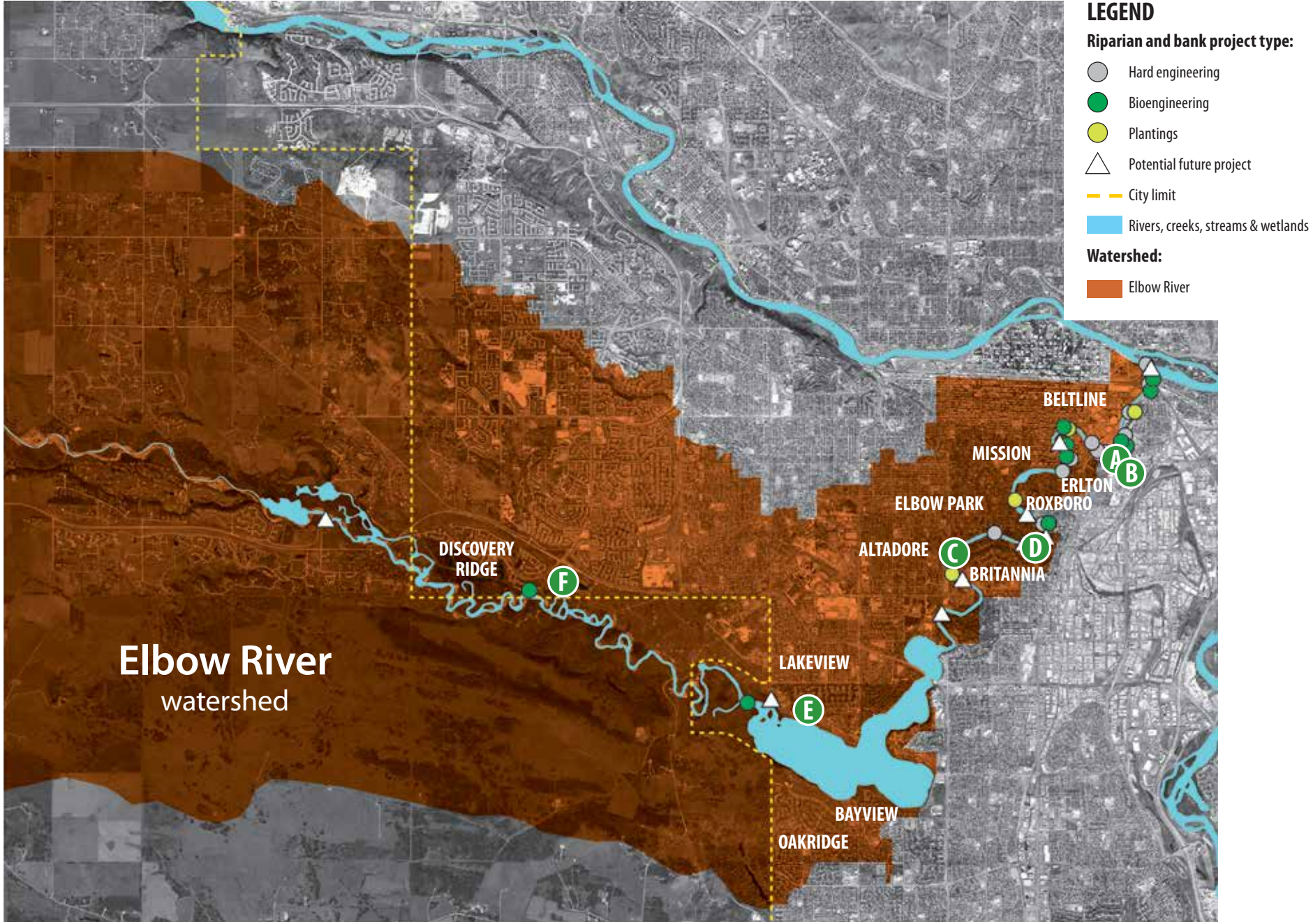
Watershed summary

The headwaters of the Elbow River watershed begin in the mountains of Kananaskis Country. Moving downstream, landscapes in the watershed gradually change from mountains to foothills, to rural agriculture and country residential in Rocky View County, then to suburban neighbourhoods and finally high-density urban areas in Calgary. Importantly, The Elbow feeds the Glenmore Reservoir and provides source water to the Glenmore Water Treatment Plant, which supplies 40 per cent of The City's water supplies to Calgarians. Many South West Calgary communities are located in the Elbow River watershed. Communities upstream from the Glenmore raw water intake include Springbank, Rutland Park, Glamorgan, Discovery Ridge, Lakeview, and Oakridge. Further downstream, Altadore, Elbow Park, Britannia, Roxboro, and Mission, and a large portion of the downtown Beltline also drain into the Elbow River.

Riparian land uses

- Extensive riparian areas fringe the Elbow, including over 728 ha within City limits.
- About 56 per cent of these are designated parks and open spaces, such as Griffith Woods, The Weaselhead, Sandy Beach Park, The Calgary Golf and Country Club, Stanley Park, and Lindsay Park.
- In contrast, 38 per cent of this area has been developed, including residential communities (Elbow Park, Roxboro, Erlton), commercial and mixed uses (Mission), and the Calgary Stampede grounds.
- These land-use legacies have created significant flood risk to people and businesses along the Lower Elbow, which requires careful ongoing management. Finally, undeveloped private lands represent a small fraction of the Elbow's riparian area along The City's western edge.





Fish Creek & Pine Creek Watersheds

Pine Creek

The headwaters of Pine Creek begin in forested areas just west of Calgary. Pine Creek flows east through largely rural areas in the M.D. of Foothills before entering The City of Calgary. Pine Creek eventually drains into the Bow River just east of Heritage Pointe. The Pine Creek corridor is largely undeveloped at this point. Radio Tower Creek, located in the southwest of the city, is a meandering water body that contains two separate small tributaries that feed into Pine Creek.

Fish Creek

The headwaters of Fish Creek originate in the rolling Rocky Mountain foothills southwest of Bragg Creek. West of the City it crosses the M.D. of Foothills, the Priddis area, and the Tsuu T'ina Nation. Resident beaver populations continually shift the watercourses within the watershed, creating dynamic floodplains with many oxbow wetlands.

Riparian land uses

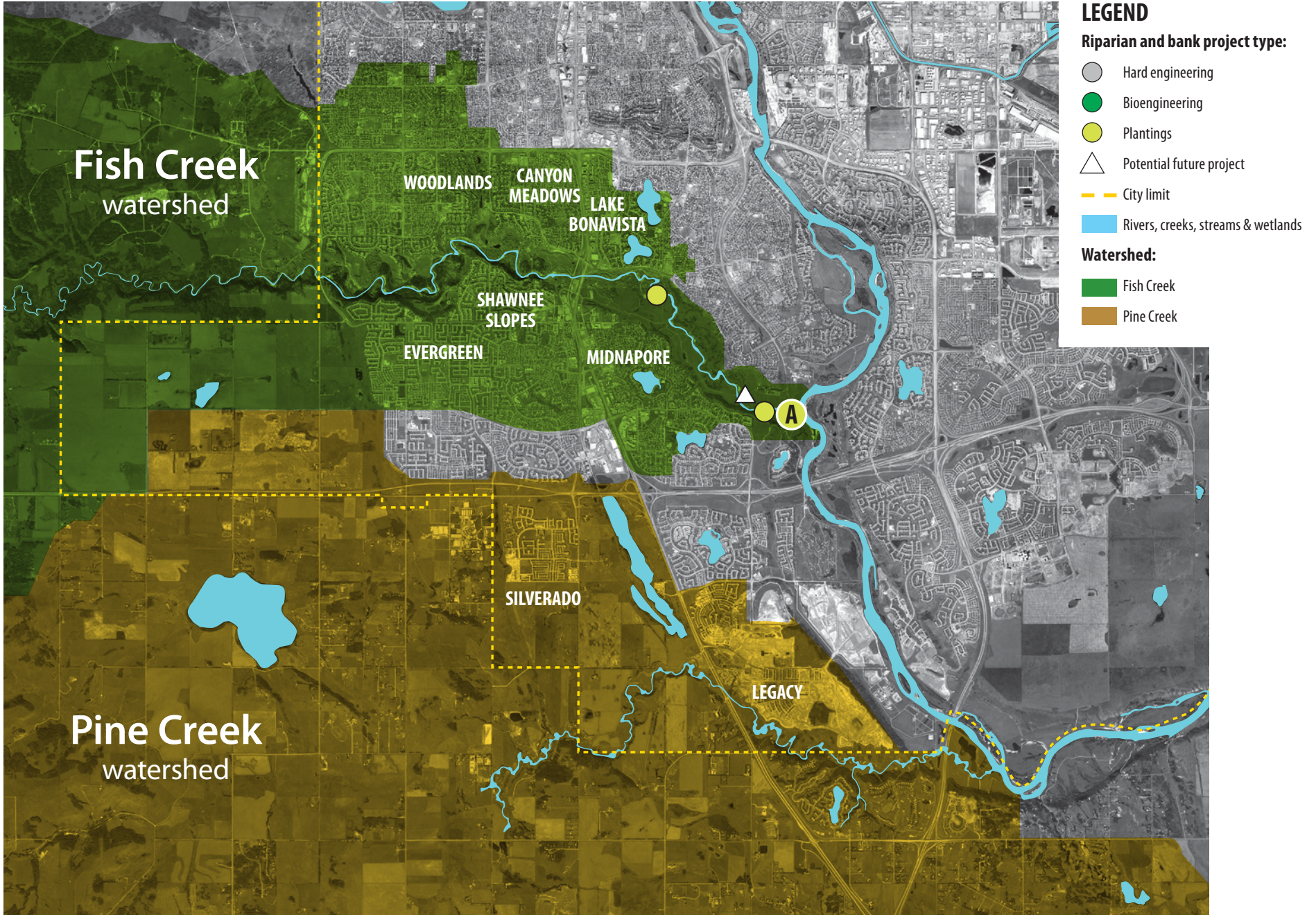
Within Calgary, Fish Creek's riparian floodplains are entirely protected by one of the largest urban parks in North America. Fish Creek Provincial Park stretches 19 km from east to west and occupies over 13 km². As a provincial park, it was largely protected from development by Peter Lougheed's government in 1973, and has since then become a rare wild natural riparian area within our built environment.

Pine Creek's riparian areas are largely undeveloped within a steep ravine system, and a large portion of these areas were recently retained as open space in the recent Legacy residential subdivision.

Radio Tower Creek's current riparian land uses in Calgary include:

- 23 per cent designated parks and recreation areas (including the Bridlewood wetland).
- 23 per cent within the Transportation and Utility Corridor.
- 17 per cent residential (largely within the communities of Bridlewood and Evergreen).
- 37 per cent currently remains unplanned (largely in agriculture), whereas the recently approved Providence Area Structure Plan (2015) flags most of this area as Environmental Open Space that may be retained as open space during future subdivision.





Nose Creek Watershed

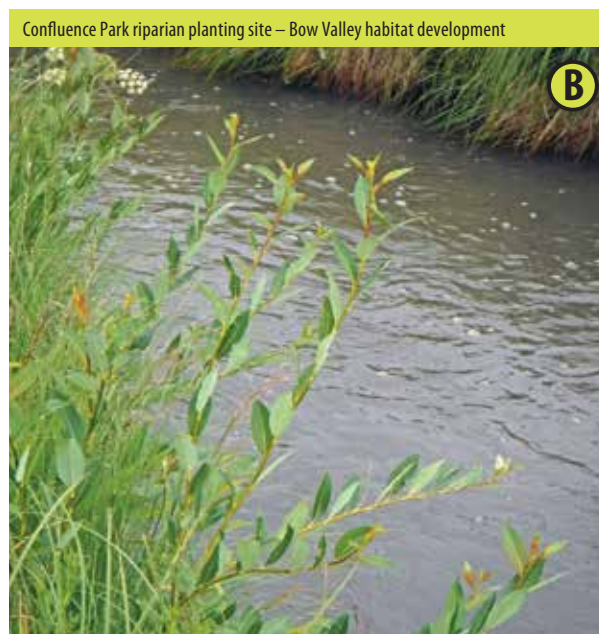
Watershed summary

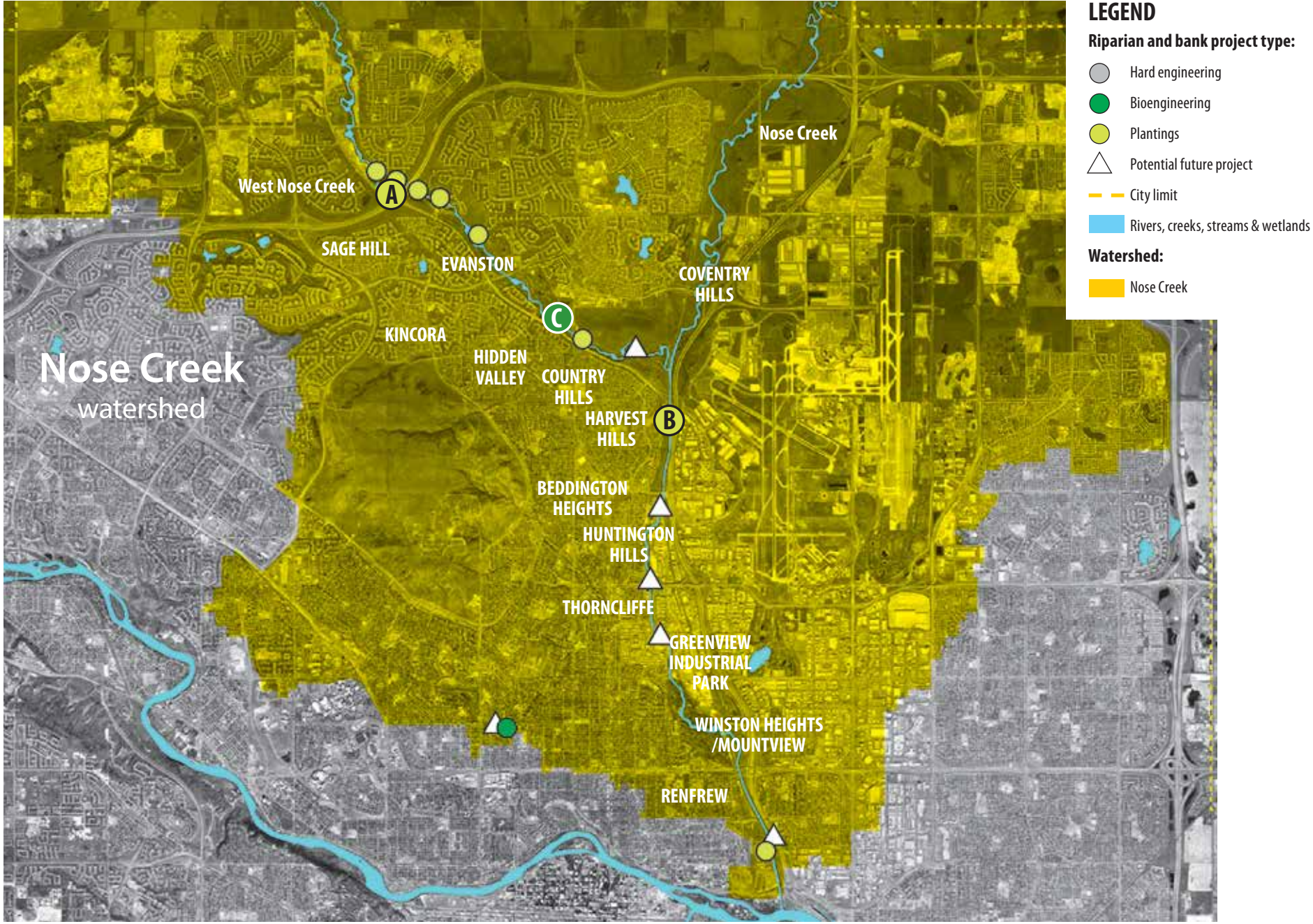
The Nose Creek watershed originates in Rocky View County north of Calgary. Nose Creek flows south for 75 km through Airdrie, Balzac, and Calgary, before joining the Bow River near the Calgary Zoo. The West Nose Creek and Confederation Creek drainage basins are also included in the Nose Creek watershed.

The Nose Creek watershed and its riparian areas are heavily impacted by urban and agricultural uses, channelization, stormwater inputs, and chronic erosion and water quality concerns. Urban communities in the Nose Creek watershed include Coventry Hills, Harvest Hills, Country Hills, Huntington Hills, Winston Heights, and Renfrew. Newer communities such as Sage Hill, Evanston, Hidden Valley and Panorama Hills are located in the West Nose Creek subwatershed. Confederation Creek is bordered by the communities of Capitol Hill, Rosemont, Collingwood, and North Mount Pleasant.

Riparian land uses

- Approximately 468 ha of riparian areas are located in this watershed within Calgary along the Nose Creek, West Nose Creek, and Confederation Creek systems.
- Most of these riparian areas (59 per cent) are designated as parks and open spaces such as:
 - Laycock Park, the Elks Golf Club, and Bottomland Park along Nose Creek.
 - A largely unbroken riparian greenway extending from Sage Hill to Confluence Park along West Nose Creek.
 - Confederation Park along Confederation Creek, before the creek disappears into a large concrete stormwater vault upstream of Highland Park.
- Major infrastructure such as highways (Stoney Trail, Deerfoot Trail, Beddington Trail) and railways intersect 14 per cent of the riparian areas in the watershed, and often restrict the meandering of Nose Creek across its floodplain.
- Undeveloped areas also intersect 14 per cent of riparian areas in the watershed; however the approved Glacier Ridge Area Structure Plan (2015) and Nose Creek Area Structure Plan (2015) provide direction that these riparian areas are to be retained as open spaces within future communities.
- Industrial lands occupy 12 per cent of Nose Creek's riparian area, primarily within the Greenview industrial area.
- Residential riparian land use is very sparse in the watershed, occupying less than four per cent of all mapped riparian areas.





Shepard Wetland and Western Headworks Canal Watershed

Watershed summary

This watershed, covering the eastern areas of Calgary, is notable for its high cover of wetlands in a 'prairie pothole' landscape. The Western Headworks Canal, which supplies water to the Western Irrigation District, bisects the watershed. Forest Lawn Creek, as well as the large constructed Shepard Wetland and Shepard Ditch systems, are other major drainage features in the watershed.





Forest Lawn Creek, which runs through a heavily industrialized area of Southeast Calgary, is surrounded by undeveloped lands owned by The City of Calgary, although the surrounding areas will be developed to industrial lots by The City in the near future. Parts of Forest Lawn Creek were recently rerouted and restored into a series of in-stream constructed wetlands as part of the Peigan Trail expansion, completed in 2013.

Riparian land uses

Around the Forest Lawn Creek corridor, 84 per cent of the riparian areas are currently unplanned, but are intended to be incorporated as open space in the future Forest Lawn Creek industrial land development led by The City. The remaining 16 per cent of Forest Lawn Creek's riparian areas are impacted by major infrastructure, such as Stoney Trail, a railway line, the Transportation and Utility Corridor, and Stoney Trail.

LEGEND

Riparian and bank project type:

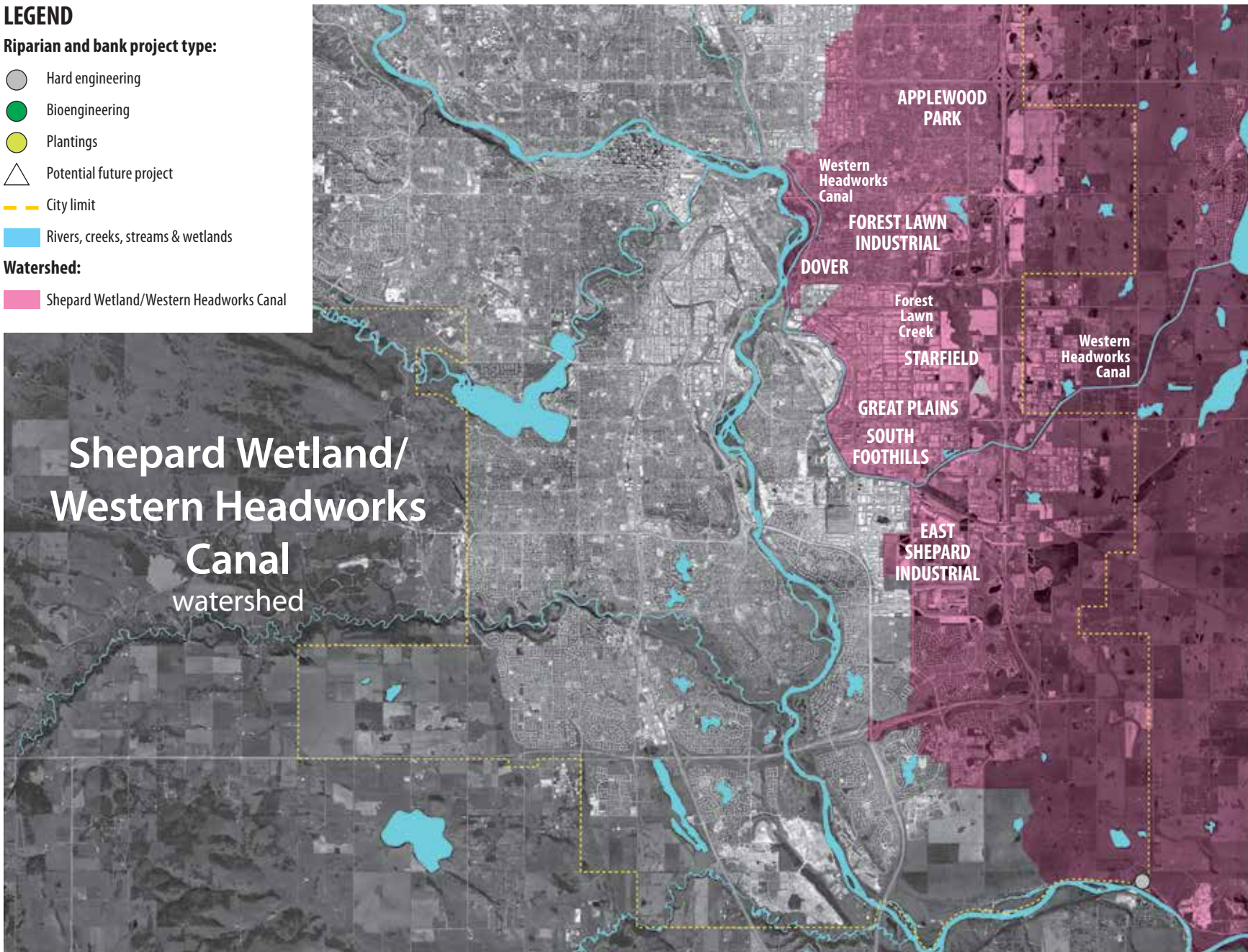
-  Hard engineering
-  Bioengineering
-  Plantings
-  Potential future project

City limit

Rivers, creeks, streams & wetlands

Watershed:

-  Shepard Wetland/Western Headworks Canal



Appendix: Ten year program area workplans

The Riparian Action Program provides guidance by linking Calgary's previous riparian technical research and data collection to specific program area outcomes and actions over the next ten years. The following timeline provides a brief history of The City of Calgary's work to date followed by work plan tables, which outline specific actions in the areas of land use planning, health restoration and education and outreach.

Figure 11. Timeline of riparian research, data collection, planning and reporting

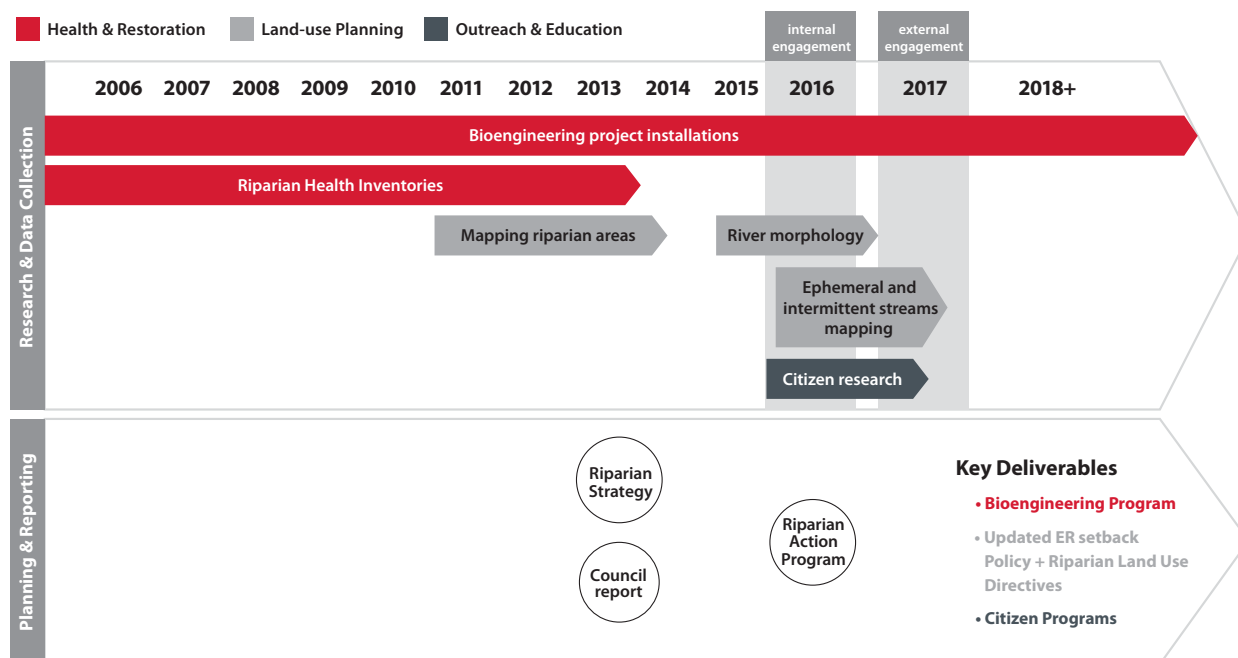


Table 5. Work plan for riparian land-use planning

Timeframe*	Project or action	Lead business unit	Stakeholders and level of engagement**		
			Collaborate	Consult	Listen & learn
Short-term	Mapping: Ephemeral and intermittent watercourses in Calgary.	Water Resources	Parks	Planning	developers, consultants, NGOs
Short-term	Research: Assess river geomorphology to better understand how the river and riparian areas will change.	Water Resources	Parks, University of Lethbridge	Planning	developers, consultants, NGOs, riparian landowners
Short-term	Policy/process: Update riparian information in the new Stormwater Management and Design Manual.	Water Resources	Other	Parks	other developers, consultants
Short-term	Process: Support internal Water Resources staff and other City business unit staff (Parks, Planning, etc.) with maps and decision support, processes, tools and policies related to land-use approvals and riparian areas.	Water Resources and Parks	Parks, Planning	developers, consultants	
Mid-term	Policy/process: Define the scope of integration of riparian and floodplain data in urban planning policies, processes, tools and bylaws.	Water Resources	Planning, Parks	developers, riparian landowners, consultants, NGOs	community associations, citizens
Mid-term	Policy/process: Update the Environmental Reserve (ER) Setback Guidelines.	Water Resources	Parks, Planning, Law	developers, riparian landowners, consultants, NGOs, Council	community associations, citizens
Mid-term	Policy/process: Investigate additional new bylaws and land use policies supporting riparian area protection.	Water Resources	Parks, Law Planning	developers, riparian landowners, consultants, NGOs Council	citizens
Mid-term	Research: Complete a detailed riparian land-acquisition study.	Water Resources	Parks, Planning, Corporate Properties, Law	developers, riparian landowners	
Mid-term	Research: Ecosystem-services valuation scoping/research studies for riparian areas.	Water Resources	post-secondary institutions	developers, Office of Sustainability, Corporate Economics	
Ongoing	Process: Continue with decision support to City staff.	Water Resources	Parks, Planning	n/a	

Notes:

*Short-term=2016-2019; mid-term=2020-2023; long-term=2023-2026.

** Levels of engagement are defined in The City's engage! policy at: <http://www.calgary.ca/CA/city-clerks/Documents/Council-policy-library/CS009-engage.pdf>

Outcome:
Further loss of riparian areas is minimized.

Table 6. Work plan for riparian health restoration

Timeframe*	Project or action	Lead business unit	Stakeholders and level of engagement**		
			Collaborate	Consult	Listen & learn
Project-specific	Restoration: Design and construct new projects to restore riparian health.	Water Resources or Parks	Parks, Water Resources	consultants	local communities, citizens, NGOs
Project-specific	Restoration: Integrate bioengineering designs in riverbank stabilization projects.				
Ongoing	Engagement: Support city staff, consultants and contractors with maps, information and decision support tools (e.g., riparian decision matrix for river engineering projects) to promote bioengineering designs.	Water Resources		Parks, consultants, riparian landowners	Local communities, citizens, NGOs
Ongoing	Assessment/monitoring: Monitor vegetation establishment at restoration sites.	Water Resources	Parks, consultants		
Ongoing	Research: Facilitate research projects on riparian health (e.g., post-flood riparian recruitment studies, ephemeral and intermittent water courses analysis, etc.).	Water Resources	post-secondary institutions		
Long-term	Restoration/engagement: Design and implement new tools, procedures and checklists to restore and manage riparian lands.	Water Resources	Parks		
Long-term	Policy/process: Standardize processes, tools, roles and responsibilities.		Parks		
Long-term	Assessment/monitoring: Monitor/report on riparian health improvements by 2026.	Water Resources		Parks, Council	local communities, citizens, NGOs

Notes:

*Short-term=2016-2019; mid-term=2020-2023; long-term=2023-2026.

** Levels of engagement are defined in The City's engage! policy at: <http://www.calgary.ca/CA/city-clerks/Documents/Council-policy-library/CS009-engage.pdf>

Outcome:
City-wide
riparian health
is improved.

Table 7. Work plan for riparian engagement and education

Timeframe*	Project or action	Lead business unit	Collaborate	Stakeholders and level of engagement**		
				Collaborate	Consult	Listen & learn
Short-term	Research: Develop and execute mixed-methods research plan that scopes, explores and validates how citizens and riparian landowners understand and live with riparian areas.	Water Resources		research consultant	riparian landowners, Parks, gov't agencies, relevant WPACs	citizens
Short-term	Planning: Develop education-program framework, work plan and evaluation plan.	Water Resources		Consultant		
Short-term	Communications: Develop strategic-communications strategy to identify audiences, partners/messengers, key messages, programming, media and evaluation measures (including social media campaign).	Water Resources		WR communications		
Mid-term	Partnerships: Establish partnership agreements with organizations.	Water Resources				
Mid-term	Education: Develop education/restoration site-selection criteria and identify specific riparian health restoration initiatives/sites to engage citizen-based restoration activities.	Water Resources		Parks		
Mid-term	Education: Develop program(s) to support riparian area enhancement on private landowner sites.	Water Resources			private landowners	
Mid-term	Partnerships: Identify public arts-based programming opportunities (i.e., Watershed+) that help promote the value of riparian areas.	Water Resources		UEP Public Art		
Mid-term	Education/communication: Develop and produce educational materials.	Water Resources				

Notes:

*Short-term=2016-2019; mid-term=2020-2023; long-term=2023-2026.

** Levels of engagement are defined in The City's engage! policy at: <http://www.calgary.ca/CA/city-clerks/Documents/Council-policy-library/CS009-engage.pdf>

Outcome:
Citizens
and riparian
landowners
value riparian
areas.

Glossary

adaptive management (i) a dynamic process of task organization and execution that recognizes that the future cannot be predicted perfectly. Adaptive management applies scientific principles and methods to improve management activities incrementally as decision-makers learn from experience, collect new scientific findings and adapt to changing social expectations and demands (AESRD, 2008). (ii) a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs. Its most effective form – “active” adaptive management – employs management programs designed to experimentally compare selected policies or practices by evaluating alternative hypotheses about the system being managed (BCMFR, 2014).

alluvial aquifer a non-confined aquifer comprised of groundwater under the influence of surface-water bodies, such as rivers and lakes. It typically occurs within alluvial sediments deposited by a river or other body of flowing water (BRBC, 2012).

aquifer (i) an underground water-bearing formation that is capable of yielding water (SSRP 2014); (ii) a sub-surface layer or layers of porous rock that hold water within the spaces between the rocks (interstitial spaces) (BRBC 2012).

bank the margins of a channel. Banks are called right or left as viewed when facing in the direction of the flow (USGS, 1995).

base flow the component of stream flow that can be attributed to groundwater discharge into streams.

bed and shore land covered so long by water that vegetation is either wrested from it or marked by a distinctive character where it extends into the water. In Alberta, the province owns most of the beds and shores of all naturally occurring bodies of water pursuant to s.3(1) of the Public Lands Act.

bioengineering an approach to riverbank/streambank engineering that incorporates living and nonliving plant materials in combination with natural and synthetic support materials for slope stabilization, erosion reduction and vegetation establishment (USDA, 2007).

buffer a strip of land managed to maintain desired ecological processes and provide economic and societal benefits.

channel (watercourse) an open conduit, either naturally or artificially created, that periodically or continuously contains moving water or forms a connecting link between two bodies of water (USGS, 1995).

channelization the modification of a natural river channel, which may include deepening, widening or straightening.

cost distance model a spatial modelling approach to delineate riparian areas. Inputs include stream channel locations, the rate of elevation change (“cost”) as one moves away from the river, and field sampling that includes GPS delineation of riparian vegetation edges in undisturbed open spaces. Riparian extents selected are calibrated to observations along different stream and river systems (Hemstrom, 2002; O2, 2013).

coulee (i) a deep, steep-sided gulch or valley that is often dry during the summer months (**Canadian Dictionary of the English Language**); (ii) a dry stream valley, especially a long steep-sided ravine that once carried melt water (**Alberta EAP Integrated Standards and Guidelines**).

cumulative effects the combined effects of past, present and reasonably foreseeable future land-use activities on the environment (SSRP 2014).

drainage course See watercourse.

ecosystem function processes that are necessary for the self-maintenance of an ecosystem, such as primary production, nutrient cycling, decomposition, etc. Ecosystem “function” is primarily distinguished from “ecosystem” values (SSRP 2014).

ecosystem services ecosystem services are the benefits people obtain from nature (WRI, 2003). These include provisioning services (i.e., clean water supplies); regulating services related to disturbances (floods, droughts, pest outbreaks); supporting services (i.e., soil formation, nutrient cycling); and cultural services (i.e., recreational, spiritual, religious, etc.) (WRI, 2003).

environmental reserve (ER) land designated as Environmental Reserve by a subdivision authority under section 664 of the **Municipal Government Act**.

ephemeral watercourse (i) watercourse that flows briefly in direct response to precipitation; these channels are always above the water table (USEPA 2015). (ii) A watercourse that flows only during and immediately after snowmelt or heavy rainfall (<10% of the time) (Hedman & Osterkamp, 1982).

erosion the natural breakdown and movement of soil and rock by water, wind or ice. The process may be accelerated by human activities (AESRD, 2008).

flood, maximum probable the largest flood for which there is any reasonable expectancy in this climatic era (Leopold & Maddock, 1954; USGS, 1995).

flood fringe (i) The portion of the flood hazard area outside of the floodway; water in the flood fringe is generally shallower and flows more slowly than in the floodway (COC, 2014). (ii) Those lands abutting the floodway, the boundaries of which are indicated on the floodway/flood fringe maps, that would be inundated by floodwaters of a magnitude likely to occur once in one hundred years (City of Calgary Land Use Bylaw 1P2007).

floodplain (i) the area of land adjacent to a river that stretches to the base of the enclosing valley walls and experiences flooding during periods of high river flow (COC, 2014); (ii) an area adjoining a body of water that has been or may be covered by flood water (AESRD, 2008).

floodway (i) the portion of the flood hazard area where flows are deepest, fastest and most destructive. The floodway typically includes the main channel of a stream and a portion of the adjacent area (COC, 2014). (ii) the river channel and adjoining lands indicated on the floodway/flood fringe maps that would provide the pathway for flood waters in the event of a flood of a magnitude likely to occur once in one hundred years (City of Calgary Land Use Bylaw 1P2007).

1:100 (or 100 Year) Flood a flood level with an estimated 1 per cent chance of being equalled or exceeded in any year based on historical records (COC, 2014).

green infrastructure green infrastructure uses vegetation, soils and natural processes to create healthier urban environments. On the scale of a city, green infrastructure refers to the patchwork of natural areas that provides habitat, flood protection, cleaner air and cleaner water. On the scale of a neighbourhood or site, green infrastructure refers to stormwater management systems that mimic nature by soaking up and storing water (USEPA, 2014).

gully a trench that was originally worn in the earth by running water and through which water often runs after heavy rain or snowmelt (Merriam-Webster dictionary).

hydrology the study of water on the earth and in the atmosphere, its distribution, uses and conservation.

indicator (i) a measurable surrogate for outcomes that are of value to the public (Noss, 1990); (ii) a direct or indirect measurement of some valued component or quality in a system, such as an ecosystem or organization. For example, an indicator can be used to measure the current health of the watershed or to measure progress towards meeting an organizational goal (AESRD, 2008).

integrated water resources management (IWRM) co-ordinated water and land management that achieves economic and social benefits without compromising ecosystem sustainability (Global Water Partnership 2012).

integrated watershed management focuses on retaining or enhancing natural features and hydrologic functions within the landscape.

intermittent watercourse (i) a watercourse or portion of a watercourse that flows continuously only at certain times of year. At low flow, dry segments alternating with flowing segments can be present (USEPA 2015). (ii) a watercourse that flows for part of each year (e.g., flow occurs 10 to 80 per cent of the time) (Hedman & Osterkamp, 1982).

live stakes live, woody cuttings tamped into the soil to root, grow and create a living root mat that stabilizes the soil by reinforcing and binding soil particles together and extracting excess soil moisture (UNEP 2004).

low impact development a land planning and engineering design approach to managing stormwater runoff. The approach includes land use planning and conservation, as well as engineered hydrologic controls to replicate the pre-development hydrologic regime of watersheds by infiltrating, filtering, storing, evaporating and detaining runoff close to its source.

meander belt the land area on either side of a watercourse representing the farthest potential limit of channel migration. Areas within the meander belt may someday be occupied by the watercourse; areas outside the meander belt typically will not.

outcome a desired future condition guiding the development and implementation of an organization's related programs.

perennial watercourse: (i) a watercourse or portion of a watercourse that flows year-round (USEPA 2015); (ii) a watercourse that generally flows continuously year-round (e.g., flow greater than 80 per cent of the time) (Hedman & Osterkamp, 1982); (iii) watercourses where base flow is dependably generated from the movement of groundwater into the channel

(USEPA, 1998); (iv) perennial channels that convey water throughout the year (AESRD, 1998).

project a temporary activity designed to produce a unique product, service or result. A project is temporary in that it has a defined beginning and end in time and, therefore, defined scope and resources (PMI, 2014).

ravine (i) a small, narrow, steep-sided valley that is larger than a gully and smaller than a canyon, usually worn by running water (Merriam-Webster Dictionary); (ii) a deep, narrow valley or gorge in the earth's surface worn by running water (Canadian Dictionary of the English Language).

resilience (i) the ability of a social or ecological system to absorb disturbances while retaining its functions and capacity to adapt to stress and change; (ii) the capacity of a system to deal with change while continuing to develop.

riparian "riparian" is derived from the Latin word "ripa," meaning bank or shore, and refers to land adjacent to a water body.

riparian area The following definition has been developed by the Alberta Water Council Riparian Land Conservation and Management Project Team. It provides a common, science-based, ecological characterization of riparian areas for the province of Alberta and our work.

Riparian lands are transitional areas between upland⁶ and aquatic ecosystems. They have variable width, extend above and below ground, and perform various functions. These lands are influenced by, and exert an influence on, associated water bodies⁷, including alluvial aquifers⁸ and floodplains. Riparian lands usually have soil, biological and other physical characteristics that reflect the influence of water and hydrological processes (Alberta Water Council, 2013).

riprap a layer of stone, pre-cast blocks, bags of concrete or other suitable materials, generally placed on the upstream slopes of an embankment or along a watercourse as protection against wave action, erosion or scour (AESRD, 2008).

river a natural watercourse of fairly large size flowing in a well-defined channel or series of diverging and converging channels (Random House Kernerman Webster's College Dictionary, 2010).

setback minimum distance that must be maintained between a land use or development and a water body. The distance is measured from the legal bank of the water body to the boundary line of the adjacent development.

stream a flowing body of water, especially a small river (Canadian Oxford Dictionary, 2nd edition).

target a specific, quantitative value assigned to an indicator that reflects a desired outcome.

terrace abandoned floodplain remnants.

timber crib wall hollow, box-like interlocking arrangements of untreated logs or timber filled above base flow with alternating layers of soil material and live branch cuttings that

⁶ Upland is land located above the alluvial plain, stream terrace(s), or any similar area associated with a water body.

⁷ A water body is any location where water flows or is present, whether or not the flow or presence of water is continuous, intermittent or occurs only during a flood. It includes, but is not limited to, wetlands and aquifers.

⁸ Alluvial aquifers are defined as areas where groundwater is under the direct influence of surface water.

root and gradually take over the structural functions of the wood members (UNEP, 2004).

triple bottom line (i) refers to the goal of sustaining our growing economy, while considering economics with Albertans' social and environmental goals (SSRAC, 2011); (ii) fiscal responsibility, environmental responsibility and social responsibility.

vision statement an aspirational description of what an organization would like to achieve in the mid- to long-term future.

watercourse/drainage course the bed and shore of a river, stream, lake, creek, lagoon, swamp, marsh or other natural body of water, or a canal, ditch, reservoir or other artificial surface feature made by humans, whether it contains or conveys water continuously or intermittently (AESRD, 2008).

watershed all lands enclosed by a continuous hydrologic-surface drainage divide and lying upslope from a specified point on a stream (SSRP 2014).

wetland wetlands are land that is saturated with water long enough to promote wetland or aquatic processes. Wetlands are indicated by poorly drained soils, water-loving vegetation and various kinds of biological activity adapted to a wet environment (AESRD, 2008).



Almost all fish and wildlife depend on the areas bordering our rivers and creeks for some part of their life cycle.



From the river to the tap and back, we all have a connection to the watershed.



When natural systems are no longer intact, infrastructure is typically needed to provide these lost services.

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The Bow supports life in many forms.



Plants help reduce the amount of sediment, pollution and nutrients reaching our rivers.

Supplement One: Bioengineering

Audience: river and civil engineers

During stakeholder engagement, participants clearly told The City of Calgary that civil and river engineers require additional guidance on where to use bioengineering structures in place of hard engineering riprap for the purpose of stream and riverbank erosion control. To better support river and civil engineers, a number of tools have been developed, including:

1. An overview of the differences between structural versus plant-based bioengineering.
2. Examples of past bioengineering projects with The City.
3. A Riparian Decision Matrix for river engineering projects.

Riparian infrastructure tools

Table 8. Structural versus plant-based bioengineering techniques

Treatment features	Structural-based bioengineering	Plant-based bioengineering
Typical applications	Urban or suburban situations where high value infrastructure is adjacent to the waterway	Suburban, rural, or park situations where some movement of the bank line will not endanger life or property
Bank line	Determined by designer and defined by hard material placement	Approximated by designer and defined over time by natural processes
Dynamism	Low to none—successful project is static, with a low tolerance for movement	Moderate—successful project is as dynamic as a natural reach
Materials	Structural materials enhanced with plantings	Living riparian plants and inert materials used for temporary stabilization
Ecological benefits	Terrestrial and aquatic benefits provided by plants and placement of inert material	Terrestrial and aquatic benefits provided by plants and dynamic nature of the resulting project
Self-healing	Limited—if structural component fails, treatment is compromised	Significant—plant material can be severely impacted, yet recover
Examples	Riprap with live cuttings Vertical bundles with a rock toe Log cribs Vegetated gabions Vegetated geogrid Permanent erosion control fabric	Live cuttings Vertical bundles Wattle fence Fascines Brush revetment Temporary erosion control fabric




Inventory of riparian restoration projects and priorities

Since 2008, The City of Calgary has promoted bioengineering practices for bank stabilization and riparian restoration. The erosion stabilization projects constructed immediately after the June 2013 flood were driven by the need to protect critical infrastructure and typically applied hard riprap designs. Current and future restoration sites and priorities set out by The City are based on studies conducted by AMEC Foster Wheeler, engineering consultants, ongoing flood recovery efforts and expert opinions of Water Resources and Parks staff. Priority sites are reviewed and re-established each year.

Examples of riverbank bioengineering projects in Calgary

Since 2008, The City of Calgary has promoted bioengineering practices for bank stabilization and riparian restoration. Key examples of riverbank bioengineering projects are highlighted in Table 9.

Table 9. Examples of riverbank bioengineering projects in Calgary

Project name	Description	Illustration/photo
Riverbank rescue site, Sandy Beach	Between 2008-2010, City of Calgary “Adopt-A-Park” staff, in partnership with the Calgary Herald and Cows and Fish, restored riverbanks along the Elbow River at Sandy Beach Park. Crews and volunteers planted shrubs and installed live sandbar willow stakes. The willow and shrubs act as structural elements to stabilize soils and slow floodwaters—a two-fold approach to preventing bank erosion. Native thorny shrubs deter access to the site to allow vegetation establishment. This site survived the 2013 flood very well.	<div>Sandy Beach Riverbank Rescue, photo taken July 2013</div> 
Deerfoot Meadows/ Southland Park vegetated timber crib wall	In 2009, The City of Calgary installed two timber crib walls interspersed with live willow cuttings along the Bow River near Deerfoot Meadows. Rock was installed underneath the timber crib wall to ensure structural integrity. These structures survived the June 2013 flood exceptionally well, while adjacent areas experienced erosion (photo opposite). The timber crib wall provides higher ecological and aesthetic values at this site compared to more conventional engineering approaches. Furthermore, the cost to design and install this project was lower than for conventional riprap bank hardening.	<div><div>The bioengineered structures survived the June 2013 flood exceptionally well, while adjacent areas experienced erosion. photo credit: Cows and Fish, July 2013</div><div>Deerfoot Meadows/Southland Park vegetated timber crib wall</div></div>

Vegetated gabion across from Stampede grounds

The vegetated Gabion Project, located on the Elbow River, sustained damage during the June 2013 flood.

Vegetated gabion project



Elbow River (right bank) across from Stampede grounds

A vegetated timber crib wall, with willow cuttings that root inside the log structure, was installed in 2014 to repair this area and protect the adjacent Elbow River pathway, which was damaged by the 2013 flood.

Live timber crib wall across from Stampede grounds during installation, summer 2014



Weaselhead ATCO gas pipeline site

Major bank engineering projects within a natural environment park are generally highly undesirable. However, in the Weaselhead Natural Environment Park, the 2013 flood exposed a section of an ATCO gas pipeline. The solution was to provide an integrated erosion control system consisting of a rock layer, geosynthetics, engineered soil media and dense, native shrub plantings and native willow cuttings from the Weaselhead Park. Impacts to bank-swallow nesting habitat were also mitigated by placing a blanket down in the spring prior to the nesting period. The result is a bank engineering project that effectively balances infrastructure protection, aesthetics and the environmental requirements of the site.

Weaselhead ATCO Gas riparian restoration site



Riparian Decision Matrix for river engineering projects. The following matrix (Figure 10. Riparian Decision Matrix for river engineering projects below) was developed by Water Resources and is intended as a decision support tool for City of Calgary projects involving bank stabilization, restoration and/or river engineering. Project engineers and consultants involved with these projects are currently being directed to use this matrix in project management, design, administration and construction. The purpose of the matrix is to ensure bioengineering practices are applied to the maximum extent possible within Calgary.

Table 10. Riparian Decision Matrix for river engineering projects

Riparian Management Zone	Hard Engineering	Bioengineering / Soft Engineering	Example Sites*
Flood and erosion control zones	Permitted As necessary	Preferred Must be evaluated during design	Memorial + 19th St. Alyth Yard Bridge MacDonald Bridge Elbow Rail Bridge
Conservation Zones	Prohibited	Required Designs should minimize environmental impacts	Discovery Ridge Parkdale
Restoration zones	Discretionary Highly discouraged	Preferred Must be evaluated during design	Douglasdale South Highfield
Recreation zones	Discretionary Highly discouraged	Preferred Designs should minimize environmental impacts	Lindsay Park Inglewood Golf Course

*Contact City of Calgary Water Resources for more information about example sites and locations.

Understanding the width of natural riparian zones is a critical step towards informed land-use planning, understanding risk and, ultimately, protecting public safety.

Supplement Two: Riparian land-use planning

Audience: land-use planners, developers, civil engineers and stormwater professionals

To better understand and protect Calgary's riparian ecosystems during planning and development, The City has undertaken considerable work to map and delineate these areas and to develop tools that better support practitioners. The following supplement provides:

1. An overview of mapping activities/methodologies and riparian management categories.
2. Land-use planning procedures for riparian areas.
3. Land-use planning decision trees for permanent, intermittent and ephemeral streams.
4. Guidance on biophysical/ecological assessments and riparian areas.
5. Guidance on master drainage plans and riparian areas.

Riparian area mapping

Variable-width modelling of riparian areas

Generally, the farther lands are from water, and the higher they are, the less likely they are to support riparian conditions. To define Calgary's riparian areas, a variable-width riparian areas model was applied along Calgary's major rivers and streams. This model was developed based on three simple variables: 1) river and streambank locations, 2) digital elevation models and 3) field data on natural riparian vegetation occurrences. Maps and digital files were then created depicting the extent of current and historical riparian areas along permanent rivers and streams. The variable-width riparian areas model defined four zones:

- Inner Riparian Zone
- Middle Riparian Zone
- Outer Riparian Zone
- Potential Outermost Riparian Zone

Inner Riparian Zones typically correspond with the 1:5 year floodplain boundary; **Middle Riparian Zones** tend to occupy the 1:20 year floodplain boundary; **Outer Riparian Zones** tend to occupy between the 1:50 and 1:100 year floodplain boundaries; and the **Potential Outermost Riparian Zone** typically extends beyond the 1:100 year floodplain. Given the size of the Bow and Elbow rivers, adjacent riparian areas tend to be much larger than those adjacent to the smaller creeks in the city. Table 9 on page 59 shows the typical range of riparian widths observed in Calgary.

Table 11. Range of riparian widths along major Calgary rivers and streams

River or creek	Typical range of riparian widths* (m)
Bow River	145 m – 350 m
Elbow River	105 m – 290 m
Nose Creek	35 m – 60 m
West Nose Creek	25 m – 40 m
Forest Lawn Creek	70 m –120 m
Radio Tower Creek	30 m – 50 m
Pine Creek	35 m – 50 m
12 Mile Coulee Creek	20 m – 35 m
Coach Creek	15 m – 25 m

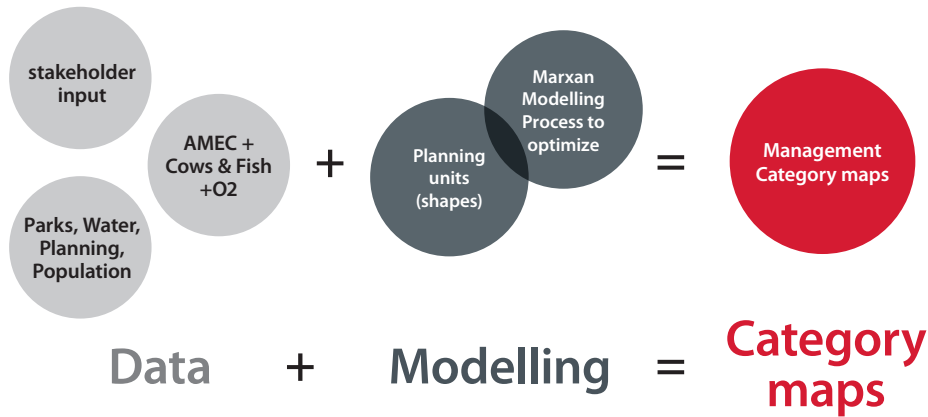
Note: *Based on 2nd quartile to 4th quartile range of the mapped riparian edge, rounded to the nearest 5 m

Riparian Management Category mapping

Mapping riparian management zones is a critical step towards developing land-management categories that guide how we restore and protect riparian areas. The following section discusses the category modelling process in more detail.

Step one of the category mapping process (see Figure 11) involved a stakeholder-led process to define possible management categories for Calgary’s riparian zones. The resulting recommendations placed riparian landscape categories on a continuum based on patterns of land use ranging from completely built environments (e.g., downtown commercial high rises) to completely natural open space).

Figure 12. Overview of Riparian Management Category modelling process



Riparian mapping data sets are available online at The City of Calgary’s Open Data Catalogue.

Step two involved a technical process of multi-criteria spatial modelling. More than 47 layers of data, representing various resource values and conditions, such as the presence of infrastructure or recreation features, were used to model and map each of the five riparian management categories along Calgary's major rivers and streams. The variable-width riparian zone data were also a key input in the modelling process, as they identified the physical area occupied by riparian areas; inner and middle riparian zones were weighted to have high conservation value.

Mapping river morphology An on-going project includes mapping river morphology to better account for how water channels change and migrate overtime. River morphology delineates channel migration zones at the outset of planning, makes room for the river and can help prevent expensive damage to infrastructure and eliminate the need for expensive bank-hardening projects used to prevent flooding and erosion. Areas of significant river morphology will be identified and future development in those areas will be considered.

Ephemeral and intermittent streams Ephemeral and intermittent streams are small headwater-drainage features that generate the majority of a river's flow and play a critical role in maintaining water quality on a cumulative, regional basis. Intact, well-vegetated riparian areas in and along ephemeral and intermittent watercourses reduce the mobilization of sediment, excessive nutrients and other pollutants downstream. Mapping of these areas is in progress and potential limits of acceptable change related to the loss of ephemeral and intermittent watercourses can and will be defined.

Land-use planning procedures for riparian areas

Growth in Calgary is co-ordinated by a series of plans within a planning hierarchy. Riparian area boundaries and setbacks should be flagged as early as possible in the planning process, so that constraints and opportunities can be made clear far in advance of development. Planning procedures to incorporate riparian values and boundaries in new developments are important at all levels in the planning hierarchy.

Part 17 of the Municipal Government Act (MGA) addresses planning and development in a municipality and gives the municipality the authority to require dedication of lands, including Environmental Reserve (ER) and Municipal Reserve (MR), at subdivision. Of particular relevance to riparian areas is Section 664(1) of the MGA ⁹, which states:

"An area of land may be designated as Environmental Reserve if it consists of:

- a) a swamp, gully, ravine, coulee or natural drainage course,
- b) land that is subject to flooding or is, in the opinion of the subdivision authority, unstable, or
- c) a strip of land, not less than 6 metres in width, abutting the bed and shore of any lake, river, stream or other body of water for the purpose of (i) preventing pollution, or (ii) providing public access to and beside the bed and shore."

Any of the landscape features noted above can fall within the definition of potential ER and be identified as such in a planning document. However, whether dedication of potential ER lands is actually required at subdivision is left to the discretion of the Subdivision Authority.

By identifying potential ER related to riparian areas and other landscape elements (e.g., wetlands, steep slopes, etc.) in ASPs, expectations regarding environmental constraints and opportunities can be established. Subsequently, the Outline Plan will fill any remaining information gaps and provide more detail and refinement for decision-making purposes, including the actual designation of riparian-related ER.

In accordance with the MGA, there are six landscape elements that can qualify as potential ER. Table 10 below lists each of these, along with existing data sources and criteria, responsibilities for mapping and recommended timing of supporting studies. An Ecological Inventory Framework ¹⁰ is required to support ASPs, and Biophysical Impact Assessments (BIAs) are required to support Outline Plans.

Draft riparian decision-analysis trees have been created to support land-use planning applications (see Figure 13 and Figure 14). These are primarily intended for use within the ASP and Area Redevelopment Plan (ARP) processes. However, in the future, more refined criteria will be developed for the Outline Plan, Tentative Plan and Development Permit stages.

⁹ Anticipated changes to the Municipal Government Act may offer municipalities new tools for riparian protection.

¹⁰ <http://www.calgary.ca/CSPS/Parks/Documents/Construction/Ecological-Inventory-Framework.pdf>

Table 12. Potential environmental reserve, as specified in the Municipal Government Act ¹¹

Potential environmental reserve element	Legal basis in Municipal Government Act	Data source/criteria	Timing of mapping studies
Gully, ravine or coulee (with escarpments >15%) ¹²	664(1) (a)	Landform mapping from digital elevation models	Prior to/during ASP
Wetlands	664 (1) (a) 664(1) (b)	City wetlands data, provincial merged wetlands inventory, current and historical air-photo interpretation	During ASP field confirmation during growing season prior to Outline Plan
Natural drainage course	664 (1) (a)	Mapped stream vectors Ephemeral/intermittent watercourse mapping study Field studies of areas	As available Flag at ASP Refine at Outline Plan
Land subject to flooding	664 (1) (b)	Current floodplain maps Riparian maps for streams/rivers*	Include current floodplain boundaries (not just floodway) in ASPs, incorporate updates as available
Land that is, in the opinion of the subdivision authority, unstable	664 (1) (b)	River geomorphology study Geotechnical studies	Flag at ASP Refine at Outline Plan
A strip of land, not less than 6 metres in width, abutting the bed and shore of any lake, river, stream or other body of water for the purpose of: (i). Preventing pollution (ii). Providing public access to and beside the bed and shore	664 (1) (c)	2007 Environmental Reserve (ER) Setback Guidelines-base + modifier** Ephemeral + Intermittent stream mapping study (once complete)	Current ER Setback Guidelines map tool available now Incorporate updates as available

*Available in City of Calgary Open Data Catalogue.

**Alluvial aquifer zones directly affecting surface water should be protected using tools other than ER; these have been mapped previously at a 1:50000 scale (Alberta Research Council 2010; Moran 1984).

¹¹ Please note that the Municipal Government Act is under review and will be updated. Definitions are subject to change. For more information, please visit <http://mgareview.alberta.ca>.

¹² AESRD (2012) – Stepping Back from the Water; UNEP (Integrated Watershed Management - Ecohydrology and Phototechnology Manual, 2004) – hill slopes with slopes greater than 15 per cent directly enclosing a stream or river are considered to be an element of a riparian area corridor.

Riparian land-use planning decision trees

The following Riparian land-use planning decision trees integrate directions and policies regarding riparian areas from a wide-range of documents, including the **South Saskatchewan Regional Plan** (2014), **Municipal Development Plan** (2009), **New Communities Planning Guidebook** (2013), **Environmental Reserve (ER) Setback Guidelines** (2007), **Riparian Areas Mapping Project** (2013), **River Flood Mitigation Panel Report** (COC, 2014), **Biophysical Impact Assessment Framework** (under review), water and watershed management plans (e.g., **Bow Basin Watershed Management Plan**, **Nose Creek Watershed Management Plan**) and **Calgary Land Use Bylaw**.

These decision trees are drafts and advisory in nature and do not preclude further changes as a result of any future federal, provincial, or municipal policy or legislation enacted to enhance flood resiliency, environmental quality or municipal authority.

Figure 13. Riparian land-use planning decision tree: step one

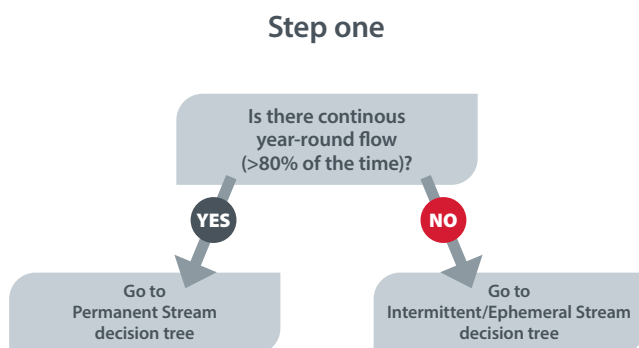


Figure 14. Riparian land-use planning decision tree: permanent streams

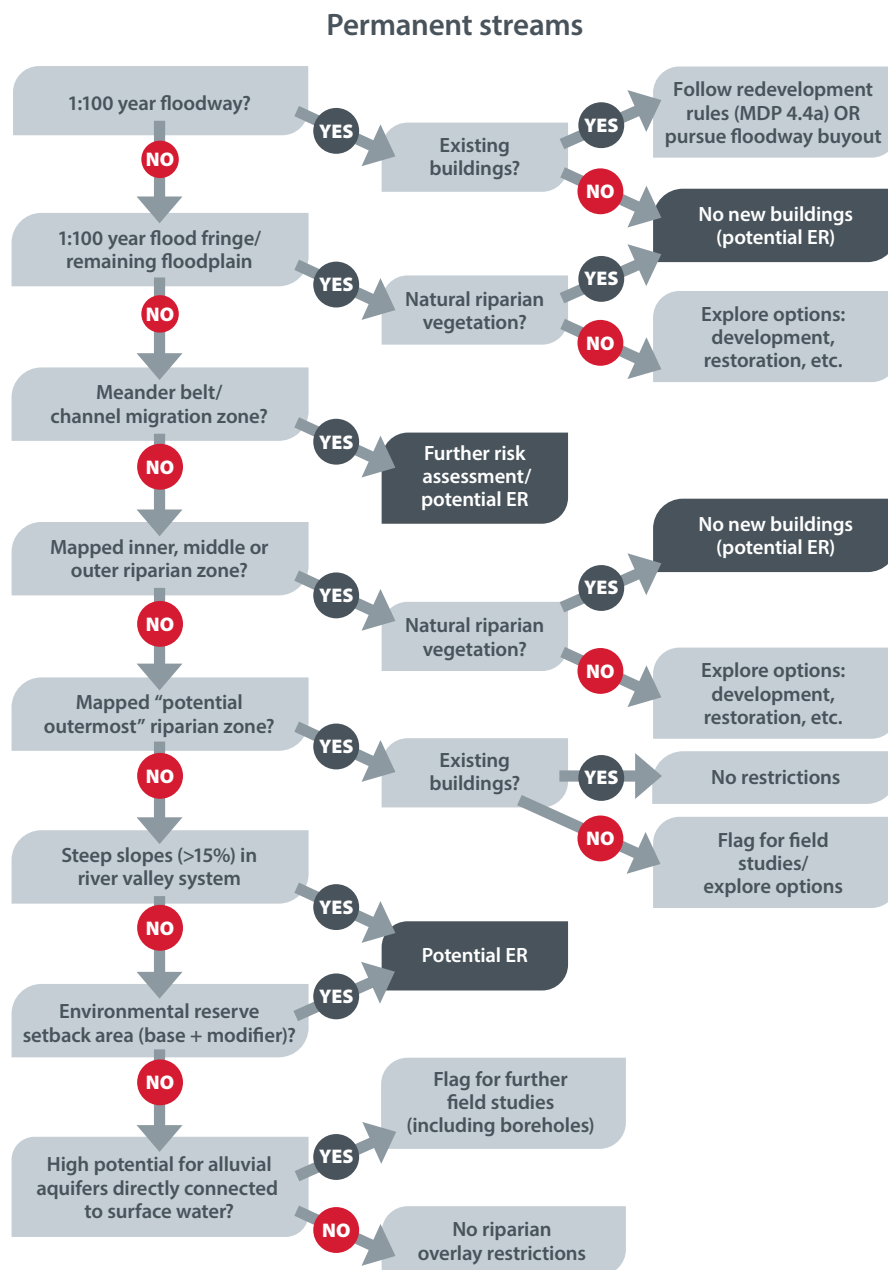
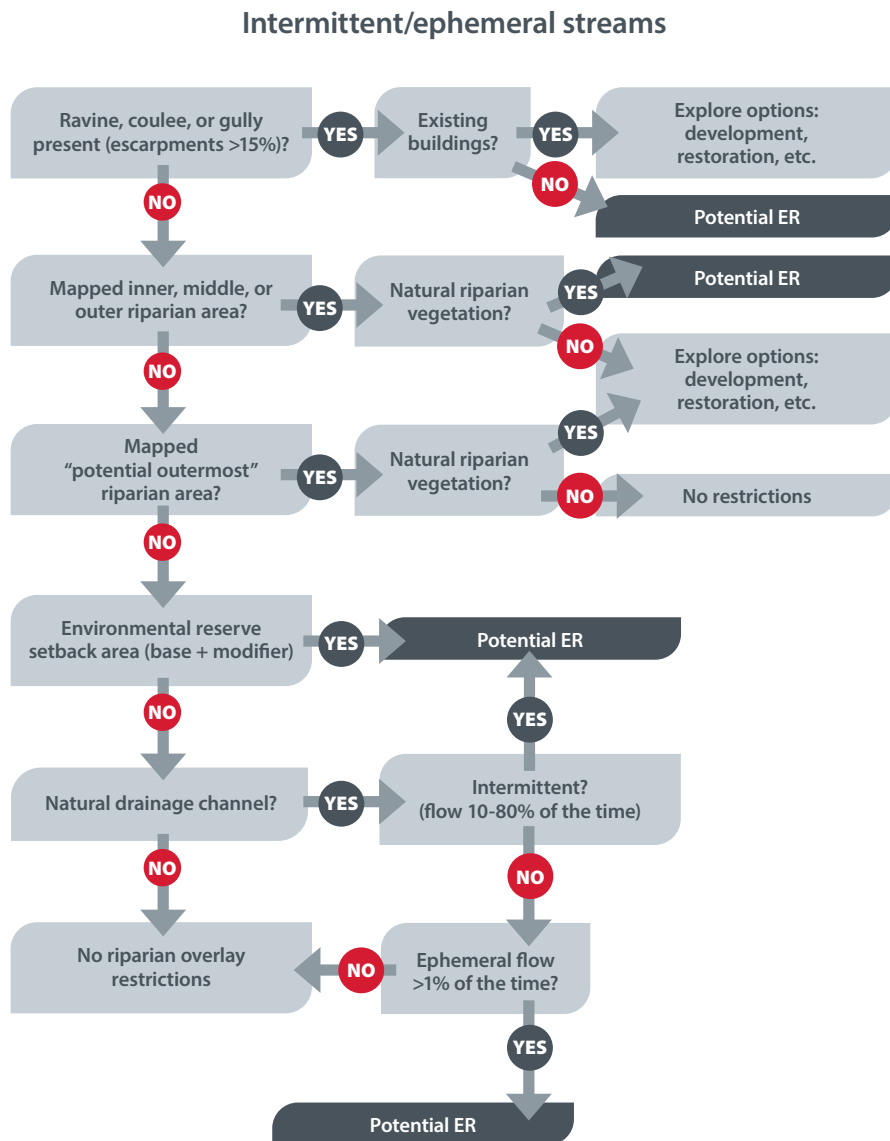


Figure 15. Riparian land-use planning decision tree: ephemeral + intermittent streams



The challenge of identifying lost or impacted riparian areas in the field

When the signature of natural riparian vegetation has been erased in the field by development or agricultural activities, care must be taken when interpreting and mapping riparian boundaries based on field data alone. If riparian restoration opportunities are being explored, broad scale riparian mapping data should complement site-specific field data. The broad scale riparian mapping data has been calibrated to include lost/developed riparian areas along major rivers and streams in Calgary.



Biophysical ecological assessments and riparian areas

Riparian area GIS mapping data and biophysical/ecological assessments Existing city-wide riparian-area mapping boundaries provide key information for initial desktop Ecological Inventory Framework or Biophysical Impact Assessment (BIA) review purposes, as required by The City of Calgary Parks. All consultants and developers should be referred to this source of reference information as early as possible in development planning processes. Any users of the data must also review the metadata, including associated data limitations (e.g., its restriction to riparian areas along major rivers and streams in Calgary). Supplementary city-wide ephemeral and intermittent stream mapping is also planned for 2016 and will be used to update data on City Online once finalized. Mapping ravine and coulee boundaries based on a systematic city-wide process is also underway.

Riparian-area field assessments Field verification of riparian-area boundaries is required, as broader-scale mapping may not capture site-specific riparian variability. In addition, many ephemeral and intermittent watercourses and associated riparian areas cannot be mapped accurately with desktop exercises alone. Field assessments combined with hydrological mapping will generally improve the accuracy of riparian-area delineation. Strong plant-taxonomy skills and hydrological knowledge, including knowledge of soils, are required to accurately delineate riparian areas in the field. Experience with identifying permanent high water, ephemeral high water (e.g., spring run-off) and high water marks associated with flood events is crucial for field delineation of riparian areas (Clare & Sass, 2012). Soil pits should be examined to determine riparian boundaries based on soil mottling or gleying, or in situations where there may be questions regarding water permanency (e.g., red indicates oxidization in areas that experience full saturation). Vegetation surveys are also critical. Where vegetation is disturbed, principles outlined in Stewart and Kantrud (Classification of Natural Ponds and Lakes in the Glaciated Prairie Region, 1971) can also be used during field assessments of riparian areas. In agricultural environments with non-native vegetation, the crop draw-down phase and presence of colonizing invasive species can also be field cues showing the presence of riparian conditions. In addition to ground-truthing the extent of the riparian area, characteristics of the site should be assessed to assign a riparian health score (Cows and Fish, 2012).

Riparian setback determination Determination of appropriate riparian setbacks should be based on the land-use planning decision trees above. Riparian setbacks must take into consideration the floodway, riparian areas, meander belts/channel migration zones, steep slopes and existing policies and guidelines, such as the ER Setback Guidelines (2007). Setbacks can also be modified and increased to preserve wildlife movement corridors, species at risk/species of conservation concern, sensitive landscape features, unstable soils, etc. Field assessments should be performed by an experienced environmental professional during the growing season, when the majority of riparian species in the proposed project site are in flower. During the design of the assessment, riparian and floodplain maps must be used to develop a sampling strategy.

Master drainage plans and riparian areas

The City of Calgary's stormwater management planning process involves the integration of plans from the watershed level down to detailed design. Watershed and water management plans provide general guidance and recommendations at the watershed level. Water management plans may include specific stormwater management and riparian-area protection requirements, including water quality and water conservation objectives, maximum allowable release rates, runoff volume-control targets, implementation of LID practices, etc.

A master drainage plan (MDP), which can be developed by The City of Calgary or the developer/consultant is prepared for a large urban drainage area and is typically serviced by a single outfall. MDPs identify the location of stormwater infrastructure (e.g., ponds, trunk sizes, servicing routes, overland drainage routes, water quality-treatment requirements).

An individual MDP must:

- Incorporate stormwater management and watershed protection requirements of the broader scale watershed or water management plan.
- Provide an acceptable level of service and meet the objectives of regional context studies, area structure plans, redevelopment plans and biophysical impact assessments. Depending on various factors, these other documents can be developed before, during or after the development of an MDP.
- Comply with The City of Calgary Stormwater Management & Design Manual and provincial requirements.

One of the technical requirements of MDPs is to confirm post-development runoff rates and volume targets. Increased stormwater runoff due to urbanization can cause channel erosion and pollution, and can have adverse impacts on aquatic species. The City has developed runoff rate volume and water quality targets for greenfield and redevelopment projects.

Technical requirements for MDP reports can be found in the Stormwater Management & Design Guidelines, as well in the Terms of Reference issued for the scope to be included in individual Master Drainage Plans. Generally, Master Drainage Plans will include the following requirements pertaining to drainage courses and associated riparian areas:

- Establish stormwater targets and objectives from relevant regional Watershed and Water Management Plans
- Refer to The City of Calgary's Riparian Action Program as well as Wetlands Management Plans and Policies for alignment and consistency purposes
- Document, including with site inspections and photos, existing wetlands and drainage pathways, as well as all perennial, intermittent, and ephemeral drainage courses, man-made drainage infrastructure, and flow directions
- Assess and align stormwater concepts with available draft or final Biophysical Impact Assessment (BIA) reports
- Evaluate the stability thresholds and conveyance characteristics of existing streams and ravines, with specific attention to those drainage courses and ravines that may convey concentrated urban runoff in the future
- Identify the extent of drainage courses deemed to be important for maintaining in a natural-like state
- As part of a planning-level hydrogeological assessment, assess groundwater impacts relevant to the preservation of existing drainage courses or wetlands in a natural-like state
- Prepare pre-development flow-duration curves for ravines and drainage courses, and verify that flow frequency curves following the introduction of controlled, treated stormwater releases do not exceed pre-development flow-frequency curves
- In consultation with Water Resources, determine requirements for sampling and monitoring of water quality (e.g., TSS, P, N, Cl, metals, hydrocarbons, PAHs, etc.) and/or water flow rate monitoring for streams within the study area
- During drainage system design, locate all stormwater infrastructure (except outfalls or perimeter rain gardens or bioswales) outside of riparian areas, floodplains, and meander belt widths
- Evaluate whether and describe how existing water bodies or potential/contested water bodies might need to be sustained by the stormwater drainage system
- Give preference to the use of native wetland and riparian vegetation in constructed wetlands and stormwater management features
- Evaluate considerations for appropriate stream setbacks addressing the following setback objectives:
 - Safe flood conveyance
 - Stream movement
 - Water quality/treatment
 - Access for maintenance
 - Habitat and wildlife movement
 - Groundwater protection
 - Geotechnical slope stability
 - The City of Calgary's existing riparian and stream mapping products, including identified riparian extents, 2007 ER Setback guideline locations, and new mapping and classification of perennial, intermittent, and ephemeral streams as they become available
 - Educational, interpretive, and recreational functions
- Identify overland drainage routes, including the use of streams as overland escape routes

Supplement Three: Riparian Monitoring Protocols

Audience: specialized technical staff and/or consultants

The Riparian Action Program (RAP) is based on an adaptive management approach that includes regular monitoring and adjustments. It is a structured, science-based process that plans for and integrates experience and research into programming along the way. Adaptive management enables continual improvement, accountability and transparency and best addresses the dynamic nature of riparian systems.

On a regular basis, for example once every five years, trained City staff and/or contractors will conduct assessments to monitor and measure indicators. City of Calgary Watershed Planning staff will assume overall responsibility for co-ordinating the monitoring of this work, as well as reporting and sharing the results more broadly.

The following supplement provides an overview of the methodologies and protocols related to each of the three program areas: riparian land-use, riparian bank health, and education and outreach.

Program area one: riparian land-use monitoring protocols

This section outlines the methodology undertaken to measure baseline (2012) land uses in riparian areas and outlines a relatively straightforward method to conduct ongoing monitoring of riparian land uses as part of future monitoring efforts. The expert conducting this work will be a senior geographic information systems (GIS) technician assigned to Water Resources (e.g., Infrastructure and Information Services – Water Design staff), under the overall direction of the assigned Watershed Planning staff.

Indicator #1: Riparian open spaces (major creeks and rivers) are mapped. The City of Calgary already has a process in place to systematically update geospatial data sets on designated land-use districts as planning and development decisions proceed, a process integrated with the Land Use Bylaw. This process is encapsulated in The City's SDE GIS layer, currently named: "CALGIS.CNTST_LANDUSE_1P2007". Although this data layer includes areas that are zoned but not yet built or developed, these areas do represent major land-use decisions and, therefore, signify the intent to allow development within them.

Therefore, for the purpose of monitoring how riparian land uses are changing along Calgary's major rivers and streams, this data layer (or future updates to it) is relatively suitable. To use this data for future monitoring purposes, the following procedure is recommended:

1. The first step in monitoring riparian land use is to clip the city land use layer to the same boundary used to measure baseline land use data. This area includes the maximum extent of those areas mapped as riparian (includes the Outer Riparian Boundary, i.e., everything classified as Inner, Middle and Outer Riparian zones) or the ER Setback buffer width, whichever is greater. This boundary is encompassed by the outer spatial extent of the O2 (2013) geodata set representing major land uses, saved on the Water Resources' server.
2. Once the land use district data has been clipped to the riparian extents as described above, the data is to be combined into the simplified categories shown in Table 12 below, based primarily on the major land use district field.

Table 14. Assumptions for grouping land uses into Developed and Undeveloped categories

Developed land use categories		
Commercial	Residential	Institutional
Includes all C- districts, and CC-COR, CC-MH, and CR-20 centre city districts.	Includes all R- districts (Low, Medium and High Density), Multi-Residential, and CC-MH and CC-MHX districts.	Includes all health, religious, educational institutions, mostly in the S-CI land use district.
Industrial	Mixed use	Major infrastructure
Includes all I- districts.	Includes all CC-East Village districts, CC-X.	Includes the ring road/transportation and utility corridor, Deerfoot Trail, major roadways, railways, Ogden Rail Yards, Stampede grounds, wastewater treatment plants.
Open space (undeveloped) land use categories (for the purposes of riparian land use monitoring)		
Parks, recreation + public education - Includes all S- districts. - Includes St. Patrick's Island + Calgary Zoo (reclassified from FUD). - Golf courses where symbolized differently on the map.		Future urban development (S-FUD) - Includes all lands on the periphery "awaiting urban development and utility servicing" (COC, 2008). It accommodates extensive agricultural uses prior to rezoning during future planning.

1. One drawback to the CALGIS.CNTST_LANDUSE_1P2007 data layer is the large number of Direct Control (DC) land use districts, which vary greatly in terms of actual major land use type. To provide a consistent, more useful layer for interpretation and city-wide summary purposes, it is necessary to reclassify these into one of the categories noted above prior to conducting any statistical summaries. The DC_LUD data field can be consulted, but current air photo imagery should also be examined while reclassifying DC polygons within riparian areas. During baseline data analysis conducted in 2012, all of the Direct Control –DC land use districts were reclassified to a new major land-use class identity by referencing the data set and current aerial photography imagery in the GIS. The interpreter then reclassified these DC parcels to a new major land use class identity, as per the table above.
2. Once this data processing is completed, the current riparian land use data can be summarized statistically and compared to the baseline 2012 values. Current statistics by river system must also be generated, as summarized in the "ExistingLandUse%inRiparianAreas" tab in the Excel database, saved on the Water Resources server at: riparianStatsOct2014.xlsx.
3. For the purposes of indicator monitoring, the total developed area along each river/stream should be summarized and compared to baseline values from 2012 (e.g., 27 per cent developed city-wide; 25 per cent developed along the Bow River; 38 per cent developed along the Elbow River; 33 per cent developed along Nose Creek and West Nose Creek). If desired, more detailed land use categories can be created, to track and summarize trends, but it is not necessary to address the intent of the established indicator.

Indicator #2: Conversion of riparian areas to new development along ephemeral and intermittent watercourses are monitored. This indicator methodology will require further development once an inventory and map of ephemeral and intermittent watercourses has been completed and potential limits of acceptable change related to the loss of ephemeral and intermittent watercourses are appropriately defined.

Program area two: riparian and bank-health monitoring protocols

Within Calgary, different methods have been developed and applied to assess riparian health versus bank health. The riparian health assessment is a more detailed method that includes field surveys of the entire riparian area. Bank health assessment is a rapid tool applying only to banks, using observations from river floats.

Indicator #3: City-wide riparian health index is scored by management zone Riparian health and bank health are different indicators with their own assessment methods, and they address different components of the riparian system. The differences between these two indicators are summarized in Table 13 below.

Table 15. Riparian-health versus bank-health methodologies

	Riparian health	Bank health
Area of assessment	Focused on the entire riparian area	Focused only on banks
Method of transport	Conducted on foot across the site	Conducted from the river during river floats
Level of detail	More detailed field assessments	Reconnaissance-level, simplified field assessments
Time	More time-intensive	Less time-intensive
Cost	Higher cost	Lower cost

To date, targets have been based on the riparian health metric, as it captures the full-extent of the riparian zone and not just the bank. The riparian health metric reflects program outcomes and intent. Based on extensive discussions held during 2014, it was decided that the riparian health indicator was more appropriate for ongoing monitoring and reporting. Although it is generally advised against changing this decision for purposes of consistency, future targets for bank health could also be considered and monitored, particularly if budget or time is a limiting factor. Further explanation of bank-health monitoring protocols is available in Cows and Fish (2012).

The following section summarizes monitoring protocols, including site-specific protocols, and methods for statistically summarizing riparian health sets at city-wide scales using geographic information systems (GIS).

Riparian health monitoring Riparian health was assessed within Calgary by the Alberta Riparian Habitat Management Society (more commonly known as Cows and Fish) between 2007 and 2010. In total, 31 sites along the Bow River were assessed between 2008 and 2010; 16 sites along the Elbow River were assessed from 2007 to 2010, and 13 sites within the Nose Creek watershed were assessed between 2007 and 2009, including sites along Nose Creek (six sites), West Nose Creek (six sites) and Beddington Creek (one site). These riparian-health surveys were focused along publicly owned open spaces, including 23 city parks and several golf courses. Additionally, four sites were assessed on OLSH property along Forest Lawn Creek in 2008 and again in 2013. An additional 36 privately owned residential riverfront properties were also assessed in 2009, based on the voluntary participation of private landowners.¹³ It is important to stress that this effort was not an inventory of all riparian areas within the city, but rather a sampling of a subset of riparian areas.

The methodology applied to site-level riparian-health assessments was the Riparian Health Inventory (RHI). This method was developed by Cows and Fish in collaboration with Dr. Paul Hansen and William Thompson. For stream and small river systems, RHI scores are derived from an evaluation of 11 key vegetation and soil/hydrology health parameters assessed in the field. For the Bow River, RHI scores are based on an evaluation of eight of these parameters in addition to seven others mainly related to tree cover and hydrology (see Table 14 and Table 15). The parameters assessed are largely based on visual estimates made in the field by trained observers, supplemented by measurements. The riparian health scores (ratings) are expressed both as a percentage score and in terms of one of three health categories: healthy, healthy with problems and unhealthy.

¹³ However, due to confidentiality agreements with landowners at the time these surveys were conducted, the private-lands data collected can neither be used to develop riparian targets, nor integrated into a long-term monitoring program.

Table 16. Riparian health scores

Health category	Score range	Description
Healthy	80 to 100%	Little to no impairment to any riparian functions
Healthy, but with problems	60 to 79%	Some impairment to riparian functions due to human or natural causes
Unhealthy	<60%	Severe impairment to riparian functions due to human or natural causes

Table 17. Riparian health parameters assessed in the RHI methodology

Riparian health parameter assessed	Streams and small rivers	Large rivers
Vegetation		
Vegetation cover	✓	
Cottonwood and poplar regeneration		✓
Regeneration of other tree species		✓
Preferred shrub regeneration		✓
Preferred tree/shrub regeneration	✓	
Preferred tree/shrub utilisation and woody vegetation removal by other than browsing	✓	✓
Dead/decadent woody material	✓	✓
Total canopy cover of woody plants		✓
Invasive plants	✓	✓
Disturbance plants	✓	✓
Physical		
Root mass protection	✓	✓
Human-caused alteration to banks	✓	✓
Human-caused bare ground	✓	✓
Human-caused alteration to rest of site	✓	✓
Floodplain accessibility		✓
Channel incisement	✓	
Removal or addition of water from/to river system		✓
Control of flood peak and timing by upstream dam		✓

GPS receivers are used by surveyors to record the locations of upstream and downstream ends of the riparian polygon (site). For monitoring purposes, benchmark photographs facing upstream and downstream are taken at each end of the site.

Additional photographs are taken where warranted to document features of interest or concern (e.g., weed infestations, bank erosion). Where possible, the upstream and downstream site boundaries are placed at distinct locations or landmarks, such as a bridge or stream confluence, for ease of future monitoring. The lateral extent (outer boundary) of the riparian area was previously determined in the field by Cows and Fish, and mapped onto a 2009 orthophoto (1:3000 to 1:8000 scale). Boundaries were based on the presence of hydrophytic vegetation, hydric soils and other signs of the presence of water, seasonally or regularly, on the surface or close to it. Due to human-caused disturbance of riparian-vegetation indicators in Calgary, the lateral boundary of RHI sites were often delineated based on topographic breaks or land use/management boundaries (e.g., fence lines, paved trails, roadways). In future surveys, consideration should be given to using the mapped City of Calgary riparian boundary (outer riparian boundary) to determine the edge of the riparian area prior to conducting field surveys.

Riparian health index: baseline statistical summaries While the RHI indicator is often reported in terms of the three health categories (see Table 14 on page 75), health categories reduce data resolution and therefore can pose difficulties in effectively tracking changes over time. For example, an RHI health score of 11 per cent is clearly much worse than an RHI health score of 57 per cent, yet both would be reported as “**unhealthy**.” Therefore, **average** RHI scores were the key variable selected for reporting on riparian health and its change/trend over time. Average scores allow for a more thorough integration of numbers into a single indicator and a more comprehensive understanding of the data and trends behind the resulting summaries, while reducing the number of data points for reporting and communication purposes.

The city-wide baseline average RHI riparian health score was calculated as **area-weighted** average geostatistics, where larger riparian polygons have a stronger proportional influence on the average compared to smaller polygons. The basic formula applied was:

$$\left(\frac{\sum [((\% \text{ RHI Score of polygon(a)}) \times (\text{polygon area (a)(ha)})) + ((\% \text{ RHI Score of polygon(b)}) \times (\text{polygon area (b)(ha)})), \dots]}{\text{Total Area of All RHI polygons (ha)}} \right)$$

Average RHI scores for the different river systems (Bow, Elbow, Nose/West Nose Creeks, Forest Lawn Creek) were also calculated using a similar process and reported on separately¹⁴:

$$\left(\frac{\sum [((\% \text{ RHI Score Bow River polygon(a)}) \times (\text{polygon area(a) (ha)})) + \dots]}{\text{Total Area of RHI Identity Intersection for all Bow River Polygons (ha)}} \right)$$

Next, to summarize riparian health scores by mapped riparian management categories, the following process was applied:

1. Cows and Fish Riparian Health polygons were intersected with the Riparian Management Category Polygons in GIS (identity function).
2. Any data artefacts with no management category allocations due to small polygon mismatches on edges within the GIS, were removed from the statistical analysis.
3. For each individual management category (conservation, restoration, recreation, flood + erosion control, developed), the area-weighted average was calculated with a similar process, separated by management category:

$$\left(\frac{\sum [((\% \text{ RHI Score Conservation polygon(m)}) \times (\text{polygon area(m) (ha)})) + \dots]}{\text{Total Area of RHI Identity Intersection for all Conservation Polygons (ha)}} \right)$$

$$\left(\frac{\sum [((\% \text{ RHI Score in each Restoration polygon(x)}) \times (\text{polygon area(x)(ha)})) + \dots]}{\text{Total Area of Identity Intersection for all Restoration Polygons (ha)}} \right)$$

etc.

¹⁴ Again, it should be stressed that the results of this method represent only areas actually surveyed during the baseline time period, and these surveyed areas are only a sample of all riparian areas in the city, not a complete inventory.

Riparian health index: future targets To establish future riparian health targets, the following process was applied:

Baseline data were summarized city-wide, as well as for each riparian management zone and river system.

Observed changes/trends in riparian health, based on post-flood surveys conducted in 2014-2015, were calculated both city-wide and for each riparian management zone established (see table below).

Table 18. Observed changes/trends in riparian health

Riparian health index (RHI) monitoring variable	CITY WIDE	Conservation	Restoration	Recreation	Flood and erosion control
Total area assessed to date (ha)**	368	212	43	85	8
Baseline 2007-2010 riparian health inventories*					
Baseline area-weighted average RHI Score (%)	60%	65%	55%	52%	54%
2014-2015 Re-visit riparian health inventories					
2014-2015 area-weighted average RHI Score (%)	64%	69%	63%	55%	55%
Change in RHI scores from baseline	+4%	+4%	+8%	+3%	+1%
2026 Future target (based on extrapolation of trend)					
2026 future target (%)	70%	75%	74%	60%	54%
Change in RHI scores from baseline	+10%	+10%	+7%	+8%	0

*Excludes private residential sites and ELB25 (actively under renovation in 2015), ELB53 (nested within ELB26) and BOW75 (eroded entirely by the 2013 flood).

**As of Spring 2016

1. Observed improvements in riparian health scores and the reasons for those improvements, as documented in Cows and Fish (2016), were analyzed and summarized as follows:
 - City-wide, the area-weighted riparian health score improved by approximately four per cent over baseline.
 - 25 per cent of the 57 sites re-visited showed “improving” health scores (i.e., >5 per cent increase), including:
 - Several sites where recent restoration projects/plantings have improved riparian health.
 - Sites where the 2013 flood beneficially impacted riparian areas by stimulating new vegetation and/or depositing fresh sediment.
 - One site along West Nose Creek in what is now the Evanston Urban Reserve showed an improvement of the health score from 65 per cent in 2007 to 85 per cent in 2014, primarily due to a shift from in-land agricultural use to urban open space, which removed livestock trampling as a disturbance.
 - 72 per cent of re-visited sites showed a relatively static health trend (less than 5 per cent change in scores).
 - Only 2 sites (4 per cent of all sites) registered a “declining” health trend, with a greater than 5 per cent decrease in scores.
2. Building on observations, continued improving trends were predicted based on the following assumptions:
 - Post-flood natural riparian-vegetation recruitment is expected to continue.
 - Preferential targeting of priority areas for riparian health restoration projects will occur.
 - Community and public stewardship actions are expected.
 - Some flow ramping criteria applied to dam operations may be applied to help enhance recruitment.
 - Future construction and riverbank engineering projects will aim to minimize impacts and maximize bioengineering designs. However, flood protection berms and riprap installed in flood and erosion control zones are likely to have some impact on riparian health scores.



Plants slow water down and their roots grab soil, helping to reduce erosion and stabilize banks.



A sprouting willow.

Caveat on scale mismatches: RHI polygons versus management category polygons Riparian health surveys were generated based on field specialist assessments of average representative health conditions in relatively large field-surveyed polygons. When large polygons are subdivided into smaller areas based on the location of management categories, conditions in the smaller sub-areas may not necessarily represent average health scores assigned to the larger riparian polygon. Therefore, the riparian health scores assigned to the smaller polygons introduce mismatches between site-specific health conditions and the broader riparian health scores from field data. For the purposes of a city-wide assessment, this is not necessarily a major issue, and various site-specific errors will likely cancel one another out when city-wide averages are calculated, as long as the variance between polygon sizes is not large. However, the smaller the management category polygons are, the greater the likelihood that the value assigned by the field database does not accurately represent actual site conditions. This is an issue for categories represented almost entirely by small polygons, including the Flood + Erosion Control and Developed management categories. However, the total area of these polygons represents only 3.9 per cent of all riparian areas in Calgary. As such, the overall city-wide average is still considered to be a valid estimate.

Program area three: education and outreach monitoring protocols.

Indicator #4: Community is engaged with riparian areas (awareness, attitudes and actions) In partnership with a third-party research vendor, The City of Calgary conducted an online survey with a randomly selected sample of 750 adult Calgarians in 2016. The margin of error for a sample of $n=750$ is ± 3.6 percentage points, 19 times out of 20, and a credibility interval of ± 3.7 percentage points. Quotas were set by quadrant, age and gender, and the final data was weighted to ensure it is representative of adult Calgarians based on census data. Questions will be measured bi-annually to track engagement trends within the general population.

The overall outcome of the education and outreach program is that stakeholders and citizens value riparian areas. A reasonable proxy measure for values are attitudes and actions related to riparian areas, as research shows that values underlie both (Stern, 2000; Stern, Dietz, Abel,



A healthy river depends on healthy riverbanks.



Plants help reduce the amount of sediment, pollution and nutrients reaching our rivers.



The Bow supports life in many forms.

Guagnano, & Kalof, 1999). Attitudes and actions are also derived from an awareness of the beneficial or harmful consequences to valued riparian spaces and, as such, are appropriate measures of the effectiveness of environmental education programming.

In total, three to four “ballot” questions form a baseline measure of community engagement with riparian areas. These include three questions related to awareness of healthy riparian areas and benefits, care for riparian areas and one question related to stewardship actions taken with the intent to benefit these areas. Citizen satisfaction related to The City's performance to protect and restore river areas will also be measured.

Programmers and community partners will also be asked to include these ballot questions (and a suite of standardized questions) in pre- and post-program evaluations to gauge progress before and after participating in education activities. This information will enable standardized program reporting and inform specific and broad-scale adaptations. It will also allow programmers to measure how participants trend against the general population.

Indicator #5: Community stewardship actions increase over time. While indicator data, such as polling, give us a sense of how Calgarians are progressing in terms of their levels of awareness and actions, actual community actions bring polling numbers to life and provide real examples of levels of engagement. As part of the conditions of agreement between The City of Calgary and community partners, organizations will be asked to annually report the number of stewardship events, actions and people who took part in their activities. The City will also track and report on its own stewardship programming. Partners will also be asked to report on the riparian spaces restored or stewarded by community groups or members. Similar program information is already tracked and compiled by the Water Resources education and outreach team.

Supplement Four: Riparian engagement planning

Audience: Water Resources Management, City Council, key stakeholders

To date, the project team and consultants have engaged dozens of key stakeholders both internal and external to The City of Calgary. This work has helped to identify the priorities and plans outlined within the Riparian Action Program and supported the development of new tools and frameworks related to riparian programming. Future engagement work will follow The City of Calgary's official Engage! ¹⁵ process and focus on raising awareness of the riparian program, defining roles and responsibilities and collaborating with internal and external stakeholders to develop the tools, processes and policy required to better support riparian

land-use planning, maintaining or improving riparian health and education.

The following supplement provides 1) a summary of key riparian policy gaps, 2) an overview of key engagement activities and 3) an overview of proposed future engagement.

Past stakeholder engagement

In 2013, a riparian areas workshop was held at The City of Calgary Water Centre. More than 45 attendees were present, including municipal planners and staff, regulators, watershed stewardship groups and partners. One of the workshop topics included the identification and discussion of riparian policy gaps for protection and management. Based on further consultations, key gaps were summarized, as shown in Table 17.



¹⁵ The City's engage! policy is available at: <http://www.calgary.ca/CA/city-clerks/Documents/Council-policy-library/CS009-engage.pdf>

Table 19. Summary of key riparian policy gaps

Identified policy gaps	Planned policy responses/actions	
River and bank engineering design process		
Not enough guidance provided to civil and river engineers on appropriate locations for hard engineering riprap vs. bioengineering structures for stream/riverbank erosion control.	Riparian Decision Matrix for River Engineering Projects decision support tool was completed and released in October 2014. Intended to help promote more bioengineering projects by informing the scope of work for consultants designing riverbank engineering works.	✓
Land-use planning and policy		
Riparian and stream valley corridors are not fully protected in land-use planning processes.	Align plans, policies and regulations to ensure consistent, clear protection of critical riparian areas.	
The Municipal Government Act is open to interpretation on Environmental Reserve (ER) dedication for riparian areas, and ER Setback Guidelines (2007) do not protect all riparian areas.	Review the ER Setback Policy to provide greater clarity, including permitted and prohibited uses within different riparian zones.	
Multiple overlapping plans, policies and regulations create complexity and lack of clarity.*	Develop and apply clear guiding documents, flow charts and maps to ensure consistent interpretation and integration.	✓
Land Use Bylaw 1P2007 only prohibits new development in the mapped 1:100 year floodway and allows filling and development in the flood fringe and other riparian areas.	Identify riparian boundaries and adjacent setbacks in all new regional context studies, area structure plans, area redevelopment plans, outline plans, biophysical impact assessments (BIAs), master drainage plans, etc.	
Understanding riparian areas		
Long-term river landscape changes.	Identify meander belts/channel migration zones and add them to land use planning documents.	
Ephemeral and intermittent drainages: Disagreements between administration and development proponents on stream order mapping criteria and protection of ephemeral and intermittent watercourses.	Study and map ephemeral and intermittent watercourses and appropriate setbacks. Review the ER Setback Guidelines to increase clarity, using up-to-date information and data.	
No strong measures in place to consider and protect alluvial aquifer zones with strong connections to surface watercourses.	Where possible, use Environmental and Municipal Reserve dedications to protect alluvial aquifers in Local Area Plans.	

* See Supplement One of the Riparian Strategy for a full list of plans, policies and regulations related to riparian areas.

Key engagement activities

- December 2013: 23 experts engaged in a web survey.
- February 2013: 45 experts engaged in a World Café workshop.
- Spring 2014: Presentations by Water Resources at the Alberta Society of Professional Biologists conference (Edmonton, AB) and the Canadian Water Resources Association conference (Calgary, AB), as well as to Calgary River Valleys.
- 2014: More than 100 City of Calgary staff were consulted in various riparian-specific meetings and draft-document circulations. Participating departments/offices included:
 - Water Resources
 - Parks
 - Planning, Development and Assessment
 - Office of Sustainability
- 2015: More than 25 City of Calgary staff were consulted in Riparian Action Program engagement meetings to summarize program contents and report back on how their feedback was used.
- April 2015: Presentation by Water Resources at the Bow River Basin Council Science Forum, Mount Royal University, Calgary, AB.
- March 2016: 85 City staff attended presentations and workshop communicating program implementation plan to City staff
- June 2016: General citizen survey
- June - August 2016: Semi-structured interviews with watershed community groups
- September 2016: Stakeholder workshop with watershed community groups to present research and interview findings

Future engagement priorities

Future engagement work will focus on raising awareness of the riparian program, defining roles and responsibilities and collaborating with internal stakeholders to develop the internal tools, processes and policy required to support better riparian land-use planning, health and education. It is anticipated that specific work plan activities (i.e., review of the ER setback policy) will require extensive engagement with both internal and external stakeholders.



Water & Waste Policy Branch
Oxbridge Place, 7th Floor
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Canada
Telephone: 780 643 9369
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September 2, 2020

Standing Policy Committee on Utilities and Corporate Services
The City of Calgary
PO Box 2100, Station M
Calgary, AB, T2T 2M5

Subject: City of Calgary Draft Source Water Protection Policy

Dear Committee Members:

On behalf of Alberta Environment and Parks, I wish to express support for the City of Calgary's draft Source Water Protection Policy. The draft policy demonstrates the City's commitment towards managing source water, including ensuring the provision of quality drinking water to the public. I believe the draft policy will help achieve the foundational goals of Alberta's *Water for Life* Strategy.

Albertans expect high quality drinking water, and each level of government has a role to play to ensure our communities have that access. As the first line of defence to proactively protecting drinking water and aquatic ecosystems from contamination and other risks, source water protection is essential to providing Albertans with safe, secure drinking water and reliable quality water supplies for a sustainable economy.

Developing and implementing source water protection efforts in Alberta is a priority and requires the collaborative efforts and commitment of a wide range of participants. I applaud the City and its efforts to develop the draft policy. Our department appreciates your commitment to our shared goals of protecting the sources of drinking water in Alberta

Sincerely,

A handwritten signature in green ink, appearing to read "Heather von Hauff".

Heather von Hauff
Executive Director
Water & Waste Policy Branch



August 28, 2020

Standing Policy Committee on Utilities and Corporate Services
The City of Calgary
PO Box 2100, Station M Calgary, AB, T2T 2M5

RE: City of Calgary Source Water Protection Policy

Dear Committee Members:

On behalf of the Alberta Water Council (AWC), I am pleased to provide this letter of support for the Source Water Protection Policy that is being presented to you on September 16, 2020.

The AWC is a multi-stakeholder partnership that provides leadership, expertise, and sector knowledge to engage and empower industry, non-governmental organizations, and governments to achieve the outcomes of the *Water for Life* strategy. The City of Calgary (Calgary) has been an active member of the AWC since our inception in 2004, participating on the board of directors and on project teams working to address provincial-scale water management issues, and we appreciate your ongoing support.

Source water protection is a critical component of an integrated water management approach that supports clean, safe, drinking water; healthy aquatic ecosystems and recreation opportunities; and reliable water supplies for commercial and industrial activity. Protecting Calgary's drinking water at its source in the Bow and Elbow watersheds is critical for ensuring high quality drinking water is maintained for Calgary and other downstream communities that also depend on the rivers.

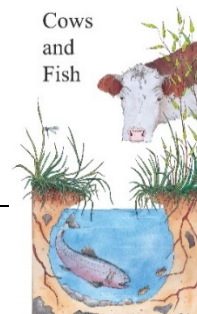
The new Policy is an important, and leading-edge tool, to support continued progress on future water security, and integrated watershed management. It helps ensure that watershed protection is an early consideration in the planning process by highlighting vulnerable areas that must be safeguarded and ensuring that water quality impacts are understood and mitigated. This will lead to improved and integrated watershed and land use outcomes for Calgary and the region.

Investing in source water protection reduces risks to future water supply and enables the City to continue delivering high quality drinking water, while avoiding expensive capital costs required to treat contaminated water.

Partnerships with the Province, regional municipalities, Indigenous Peoples and communities, and the private sector are critical for successful source water protection. The Policy, and continued work on the Source Water Protection Plan and Riparian Action Program, provides a unique opportunity to demonstrate leadership in watershed management by working collaboratively to address source water risks.

Sincerely,

Andre Asselin
Executive Director



Cows and Fish

Alberta Riparian Habitat Management Society

2nd Floor, Avail Building
530 – 8th Street S
Lethbridge, AB T1J 2J8

Telephone (403) 381-5538
Email: nambrose@cowsandfish.org
www.cowsandfish.org

September 1, 2020

Standing Policy Committee on Utilities and Corporate Services
The City of Calgary
PO Box 2100, Station M
Calgary, AB, T2T 2M5
Via email to: Jen.Pouliotte@calgary.ca

RE: City of Calgary, Source Water Protection Policy

Dear Members of the Standing Policy Committee on Utilities and Corporate Services,

The Alberta Riparian Habitat Management Society (Cows and Fish) is pleased to provide this letter in support of The City of Calgary's Source Water Protection Policy.

Now more than ever, strategic, long-term efforts to safeguard Calgary's drinking water supply are a high priority. Increasing land use development pressures and population growth, coupled with climate change risks are a concern to water security. As such, Calgary's Source Water Protection Policy, a pro-active, innovative and collaborative approach to integrating land and water management is key in addressing this challenge. We very much appreciate that the policy highlights goals for protecting source watersheds through improved land use planning, innovative stormwater management techniques, leveraging key partnerships for risk mitigation, and community involvement in education and research. Importantly, the policy also has a focus on promoting environmental stewardship and conservation in our source watersheds—a message that is core to our work. The City's Policy represents an important commitment under Alberta's South Saskatchewan Regional Plan toward enhancing integrated watershed management and building sustainable communities. In our work with the City, we see that the Policy, in combination with The City's Riparian Action Program, the Bioengineering Education and Demonstration Project and ongoing efforts to update Calgary's Stormwater Management Strategy, The City of Calgary is well positioned to become an integrated watershed management leader provincially and globally.

Our organization, The Alberta Riparian Habitat Management Society (Cows and Fish) has been integrally involved with promoting riparian area stewardship in Alberta's watersheds for over two decades. We have a strong understanding of the key linkage between healthy landscapes and

maintenance of beneficial ecological goods and services, including those related to maintaining safe, secure and stable water supplies. We have forged strong relationships with watershed groups, private landowners, as well as municipal and provincial agencies across Alberta. We recently contributed to provincial efforts aimed at strengthening riparian area protections as part of the Alberta Water Council's *Riparian Land Conservation and Management Team* and contribution to the provincial "*Stepping Back from the Water: A Beneficial Management Practices Guide for New Development Near Water Bodies in Alberta's Settled Region*". We have also been involved directly with riparian health monitoring and community engagement efforts in Calgary since 2007.

We offer our strong support of Calgary's Source Water Protection Policy, and look forward to contributing, wherever possible, to aligned collaborative riparian projects with The City and our municipal, provincial, First Nations, private landowner and watershed group partners in the Bow River Basin. We commend The City for this proactive, collaborative and community based approach and see it as a vital component of long-term watershed management.

Sincerely,



Norine Ambrose, Executive Director
Alberta Riparian Habitat Management Society-"Cows and Fish"



Working towards a healthy Elbow River watershed

Sep 3rd, 2020

To: The Standing Policy Committee on Utilities and Corporate Services, City of Calgary
Attn: Cllr. Sutherland, Cllr. Demong, Cllr. Chahal, Cllr. Colley-Urquhart, Cllr. Farrell,
Cllr. Keating, Cllr. Jones, Mayor Nenshi

Re: The City of Calgary Source Water Protection Policy

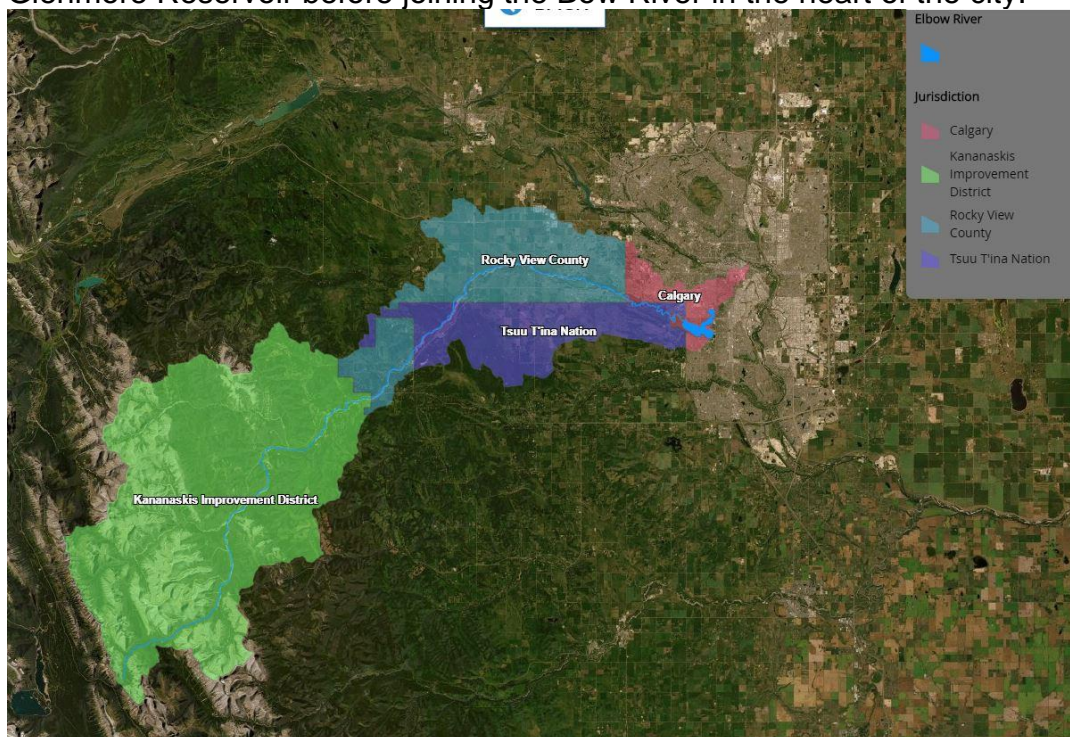
We embrace this opportunity to speak to you and highlight the Elbow River watershed, as well as the alignments in our organizations' goals and The City of Calgary's objectives via the Source Water Protection Policy.

A bit about us; the Elbow River Watershed Partnership (ERWP) is a not-for-profit organization formed in 2004 to bring stakeholders together to protect and enhance water quality and quantity in the Elbow watershed, with the vision of working together for a healthy Elbow River Watershed. In addition to providing a forum for learning about watershed management and the land-water connection, we use local knowledge and scientific expertise to promote watershed management improvement through collaborative, targeted and cost-effective projects with stakeholders as partners.

The ERWP has produced a range of projects and programs over the years. I will highlight just one with you; our flagship program, the *Freshwater Field Study Program*. The Freshwater Field Study program is operated/administered in partnership with the Elbow River Watershed Partnership and Kananaskis Country, Environmental Education Program and couldn't happen without the support from sponsors and partners including **The City of Calgary**, Rocky View County, The Bow River Basin Council and volunteers for the Elbow Casino. Each year we hire new interns to deliver the Freshwater program. Partners that support training the new interns every year include; Alberta Parks, Kananaskis Region, Alberta Tomorrow, Bow River Basin Council, **The City of Calgary**, Colpitts Ranch, Elbow River Watershed Partnership, Glencoe Golf & Country Club, Glenbow Museum, Shell Canada Ltd., Spray Lake Sawmills, Trout Unlimited, Tsuut'ina Cultural Museum, University of Calgary, Earth Sciences. Over 20,000 students between grades 8 and 11 have participated in the program since its' inception in 2005. Over 2,370 volunteers and 273 schools participated in the program between 2005 and 2019. Most of these students are from Calgary while also including the surrounding community schools in the Bow and Elbow valleys (Bragg Creek, Redwood Meadows, Tsuut'ina, Springbank, Banff, Canmore, Exshaw, Stoney-Nakoda, Cochrane). Students participating in the Elbow program travel by bus to the Elbow Falls area, take water samples and observe the land uses. They stop 3-4 more times while moving downstream. Students usually notice changes (a degradation) in the water quality as they move downstream. This decrease in water quality is a result of the cumulative effects of land use impacts. After experiencing this Freshwater Field Study program, one of the take-home messages we hope the students conclude is '*what happens on the land, happens in the water*'.

A bit about the Elbow Watershed. The Elbow watershed crosses several jurisdictional boundaries and there are a range of stakeholders that either work, live or play in the watershed. Approximately 40-50% of Calgary's drinking water comes from the Elbow.

The Geography of the watershed - Starting upstream in the East Slopes of the Rocky Mountains, the Elbow waters start collecting high on Mt Rae, just above Elbow Lake. Moving downstream and relatively steeply downslope, the waters then gather from lands in Kananaskis Country, Rocky View County, Tsuu'tina Nation, then into the Glenmore Reservoir before joining the Bow River in the heart of the city.



The Elbow river is relatively short and steep, dropping more than 1km over its' 120km journey. This means changes upstream can be quickly seen as there is little room to attenuate sudden large quantities of water or to filter contaminants. This means the river is prone to both flood and drought as well as water quality contaminants. As we virtually move downstream, the activity level on the landscape increases and yet the landowners can be affected by what happens upstream as well as downstream. There are ways we can make the watershed more resilient to both flood and drought as well as minimizing water quality degradation through better land and water management and practices.

Source Water Protection Policy - Our organization understands The Policy builds on existing work to maintain water quality upstream of Calgary's water treatment plants. We anticipate this Policy document will provide strategic direction to The City of Calgary's Administration and Council to protect watershed health and resiliency, safeguard drinking water quality, and guide a more systematic and consistent application of source water protection in city planning processes and decision making. Our understanding is The Source Water Protection Plan and the Riparian Action Program are the two key implementation plans under the new Policy.

The Source Water Protection Plan aligns with all of these listed ERWP goals:



Working towards a healthy Elbow River watershed

- Encourage individuals and communities take responsibility to protect and enhance water quality and quantity in the Elbow River Watershed
- Encourage best water management and land use practices
- Support cooperation, coordination, and knowledge-sharing among stakeholders
- Minimize the negative impacts of land uses on water quality and quantity

Riparian Action Program – Our common goals to protect and restore riparian areas and to minimize riparian loss through land use changes also align well. Your protection within Calgary and our interest of protection within Calgary as well as upstream and through the entire watershed, together highlight how we can help protect the Elbow River together. The goals of the Riparian Action Program – minimize riparian loss, integrating bioengineering into bank restoration, monitoring riparian health, build capacity for riparian restoration. These are all actions that we also implement and encourage all Elbow watershed stakeholders to follow.

The ERWP is a collaborative organization that encourages open communication and dialogue. We represent a variety of stakeholders including different levels of government, municipalities, First Nations, industry, scientists, recreational organizations, other non-profit organizations, and individuals. With a range of interests in the watershed comes a variety of ideas and opportunities. We aim to focus on recommendations that are science based and that consider the overall health of the river, its' inhabitants and its' users, on a watershed scale.

In conclusion: We support proactive stewardship and management of the land in the Elbow River watershed. Activities or practices that maintain water quality and water quantity as well as biodiversity and riparian habitat in the Elbow watershed are steps in the right direction. We believe by implementing the Source Water Protection Policy, we are moving together on a common path that will help ensure a healthy Elbow River watershed.

We have heard folks from The City of Calgary Water Resources say '**every land use decision is a water management decision**'. We couldn't agree more with this statement, as highlighted in the Freshwater Field Study Program, we aim to share a similar message – "**what happens on the land, happens in the water**".

Again, thank you for the opportunity to talk to you today. We look forward to collaborating and ensuring these policies meet the objectives, for the benefit of all in the Elbow watershed, for future generations.

Respectfully,

Flora Giesbrecht

Coordinator
Elbow River Watershed Partnership



Mayor and Members of Council of The City of Calgary

September 8, 2020

Re: Support for The City of Calgary's Source Water Protection Policy

Your Worship and Members of Council:

Leadership and vision portray the spirit and intent of The City of Calgary's *Source Water Protection Policy (SWPP)*. Sustainable cities and regions need sustainable water sources. We, the Ghost Watershed Alliance Society (GWAS), submit this letter in support of the proactive and holistic approach embodied in The City's proposed Policy.

Background

As a non-profit watershed stewardship group in the Calgary region, established under the *Alberta Water for Life Strategy* (2002), GWAS engages in science and research, ecosystem repair, advice and collaboration, and education and outreach in a significant portion of Calgary's source water landscape. We have on-the-ground experience and knowledge in the Ghost Watershed, a portion of the Bow River source watershed northwest of Calgary. For example, we are currently executing our *Water Monitoring Plan* and hosting a bioengineering workshop as practical actions to protect the region's water supply.

Over the past decade, we have partnered and collaborated with The City of Calgary, continuing to share the vision and values it holds for source water protection. We recently toured The City's watershed planning staff through portions of the Ghost Watershed, discussing our common concerns, opportunities for collaboration, and highlighting visible upstream threats to Calgary's safe drinking water. We would like to emphasize support for two key aspects of the Policy; (1) planning integration and (2) implementation.

Planning Integration

First, we strongly support The City's SWPP's drive towards the integration of land use and watershed planning and management in its source watersheds, from the provincial policy level down to the site-specific planning, approvals and operations level. Water does not recognize administrative boundaries. It flows through the region, making proactive collaboration across jurisdictions essential to ensuring a clean, reliable, resilient and adequate water supply.

We encourage The City to work closely with the Province of Alberta, municipalities, First Nations, watershed stewardship groups and other stakeholders. In particular, we would encourage a focus on sensitive areas in the upper portions of the source watershed. This multi-use area is under great pressure, despite functioning as a major source for the region's water. These lands essentially provide the natural water supply as well as serving as a filtering and storage system for the region. Historically established as Forest Reserves, these areas were recognized and conserved by early visionaries of the post-Confederation era because of their critical contribution to water security in the prairies. Today, we are heartened to see that The City's vision and actions through the SWPP echo the concerns and aspirations of our predecessors.



Specifically, we urge The City to continue to dialogue with the Province to advance:

- sub-regional plans stemming from the *South Saskatchewan Regional Plan* (i.e. footprint and recreational management plans);
- integration of wildfire risk mitigation and forest harvest practices to optimize water quality and stabilize water quantity (i.e. flood and drought mitigation); and
- wetland mapping and inventory creation in these sensitive watershed areas.

Implementation

Second, we strongly support strategies and actions necessary to implement the Policy including:

- conducting a Watershed Investment Study to investigate incentives for upstream stewardship as seen through a long-term lens;
- developing a source water education plan promoting collective responsibility; and
- providing guidance to post-secondary research in the source watersheds.

We believe that The City of Calgary is well positioned as a legitimate voice for safe drinking water in the region. The City must speak not just for Calgarians but also on behalf of the many citizens and businesses in surrounding regional municipalities who currently are (or may be in the future) recipients of Calgary's potable water services. In our view, The City has the responsibility and legitimacy to carry through with the goals of the Policy. Leadership in source water protection has been a hallmark of Calgary's historical efforts through the *Calgary Regional Planning Commission (CRPC)*, and the *Calgary Regional Partnership (CRP)*. And despite historical intermunicipal tensions, The City recognizes the need for proactive and successful collaboration with other jurisdictions and stakeholders; each contributing their unique expertise, capacity, leadership, and vision.

Long term partners

To conclude, please know that our watershed stewardship group strongly supports land use and watershed management integration as well as implementation of key actions in conjunction with other jurisdictions as intended by the City of Calgary's *Source Water Protection Policy*. We will continue our partnership with the City, willingly participating in dialogue and offering opportunities for City staff to be involved in on-the-ground activities in the Ghost Watershed, a portion of the Bow River source watershed.

GWAS applauds The City for its leadership, vision and determination as it looks west to its source watersheds and recognizes the critical role they play in the region's sustainability.

With respect,

Cal Hill
President of GWAS



August 31, 2020

Standing Policy Committee on Utilities and Corporate Services
The City of Calgary
P.O. Box 2100, Stn. M
Calgary, Alberta, Canada
T2P 2M5

Standing Policy Committee on Utilities and Corporate Services;

Re: Source Water Protection Policy

The Nature Conservancy of Canada (NCC) is Canada's leading national land conservation organization. Since 1962, NCC and our partners have helped to conserve 35 million acres of ecologically significant land nationwide, including 1.1 million acres in Alberta. The mission of NCC is to lead and inspire others to join us in creating a legacy for future generations by conserving important natural areas and biological diversity. NCC is a non-advocacy organization that partners with a variety of stakeholders, including multiple levels of government, corporations and organizations, foundations, and individuals.

The Source Water Protection Policy (the Policy) proposed for the City of Calgary will serve to protect the Bow and Elbow River watersheds, preserving the many ecological services provided by these watersheds, including clean drinking water, flood and drought mitigation, as well as important riparian habitats and the species reliant upon them. The Policy identifies several aspects that align with the mission of NCC and have direct impacts on our work.

The Bow and Elbow River watersheds are under extreme pressure from population growth and land use changes that could result in the loss of thousands of acres of ecologically significant land and degradation of water systems. Preservation of vulnerable areas like waterbodies, floodplains, and riparian areas needs to be balanced with competing pressures to ensure long-term durability. The value of robust land use planning in achieving this balance cannot be overstated. It is critical for safeguarding vulnerable areas and ensures that environmental impacts are better understood and appropriately mitigated, now and into the future. Land use planning at a broader scale also permits integration of planning decisions across the entire watershed from the headwaters, to the tap, and beyond. The Policy would bolster land use planning throughout the watershed and promote collaboration across multiple perspectives and stakeholder groups.





Given the mission of NCC and the work we are already doing in the Bow and Elbow River watersheds, we are a natural partner for this initiative. To date, NCC has protected 23,214 acres of land within the Bow and Elbow River watersheds, through purchase of land and collaboration with landowners to establish conservation easements. NCC has a vested interest in the continued ecological health of these watersheds and actively stewards these lands to improve the health, resiliency, and function of the watersheds.

We understand that alongside the Policy there is discussion of developing a Watershed Investment Strategy focused on conserving key areas within the Bow and Elbow River watersheds. We are excited to discuss ideas, options, and collaborative conservation efforts that would place Calgary as a leader in conserving upstream habitat vital to the city's future. We are also able to leverage additional partnerships through our relationships with landowners in the communities, individual and corporate donors, and funding partners. Our work is currently supported through several major grant programs, including the Alberta Land Trust Grant Program (Alberta Environment and Parks), the Watershed Restoration and Resiliency Program (Alberta Environment and Parks), the Natural Habitat Conservation Program (Environment and Climate Change Canada), and the North American Wetlands Conservation Act (United States Fish and Wildlife Service).

Implementation of the Policy in and of itself is a great step forward for the long-term protection of Calgary's source water and positions the city to respond to existing and future water challenges. The Policy would further NCC's goals to protect the land within the Bow and Elbow River watersheds. Every land use decision is a water management decision.

Sincerely,

A handwritten signature in blue ink, appearing to read "T. Lynch-Staunton".

Tom Lynch-Staunton
Regional Vice President
Nature Conservancy of Canada | Alberta Region
106, 10050 112 Street NW | Edmonton, AB
T5K 2J1
P : 1-877-262-1253, ext. 7226
C : 780-265-4875
tom.lynch-staunton@natureconservancy.ca

A handwritten signature in blue ink, appearing to read "Bryanne Aylward".

Bryanne Aylward, PhD.
Senior Director of Conservation
Nature Conservancy of Canada | Alberta Region
890, 105 12 Avenue SE | Calgary, AB
T2G 1A1
P : 403-515-6823
C : 587-586-4692
bryanne.aylward@natureconservancy.ca





September 8, 2020

Councilor Sutherland (Chair) and members of the Standing Policy Committee
on Utilities and Corporate Services

Re: Letter of Support for the City of Calgary's Source Water Protection Policy

Dear Standing Policy Committee on UCS,

I am writing to provide support for the City's Source Water Protection Policy. We believe that the adoption of this policy is a critical step towards Calgary's long-term source water protection needs. Ultimately, the Policy will help to enhance important partnerships with organizations who have been independently working to protect Calgary's water for many years.

SALTS is a rancher-based land trust that has conserved 30,000 acres of natural landscapes in the Bow and Oldman River watersheds upstream of Calgary and Lethbridge. We work alongside other conservation organizations like Western Sky Land Trust, the Nature Conservancy, Ducks Unlimited, and Cows and Fish. Collectively, these organizations have done significant conservation work along the Bow and Elbow rivers, as well as their tributaries and associated wetlands.

By helping to keep the watersheds upstream of Calgary intact and healthy, these organizations have been directly supporting the City's quality and quantity of water. ***Healthy riparian areas, ranchlands, and wetlands provide many water services including filtration, storage, and slowing of runoff.*** This has become increasingly important as development continues west of Calgary, continually eroding these ecosystem services. Water from natural landscapes is of course much easier and less costly to treat than water running through residential developments or landscapes fragmented with roads.

In addition, the conservation work in Calgary's source watersheds directly supports the City's Water Security Framework. By maintaining the landscape's water storage and runoff slowing abilities, lands to the west of the City will continue to support drought and flood resiliency. If developed, they may instead compound these difficult events in the future.

With a Source Water Protection Policy in place, organizations like SALTS can see a role for themselves in helping to safeguard Calgary's drinking water. This will create the opportunity for us to partner with the City and ensure that our projects maximize their benefit when it comes to Calgary's water.

Sincerely,

A handwritten signature in blue ink, appearing to read "Justin Thompson", is written over the word "Sincerely,".

Justin Thompson
Executive Director

Southern Alberta Land Trust Society
ISC: UNRESTRICTED



August 28, 2020

Founding Member

David Bissett

Standing Policy Committee on Utilities and Corporate Services

Board of Directors

The City of Calgary

PO Box 2100, Station M

Calgary, AB, T2T 2M5

Wade Hawkins, Chair

Spencer Shepherd, Vice-Chair

Dear Committee Members,

Barb Feit, Treasurer

This letter is an expression of support for the Source Water Protection Policy and Watershed Investment Strategy and Riparian Action Program. The proposed program to develop a watershed investment strategy through land acquisition is well designed and will certainly be effective in its stated objective. Simply put, once implemented, this policy will effectively protect a critical resource for the City of Calgary: clean water.

Jeff Curran

Bruce Kendall

Ann Lewis Luppino

Hilary McMeekin

Advisory Committee

Gordon Brown

Don Douglas

Alan Harvie

Jack Nodwell

Jean LeSourd

Western Sky is supportive of the program's strategy and implementation process to protect watersheds and riparian areas, as this work is congruent with our mission and approach to voluntary conservation. Keeping inappropriate development away from river corridors is fundamental to source water protection. Western Sky is focused on the conservation of watershed lands as they are crucial to the quality and quantity of water available to humans and wildlife alike. Natural riparian areas are like recharge zones for groundwater, replenishing an essential source of drinking water. These key watersheds also provide natural resiliency against floods and drought.

Western Sky was established in 2005 to conserve open space and natural areas in the Calgary region. We created a well regarded and successful program called the Bow & Beyond Initiative, which is focused on the conservation of watershed lands along the Bow, Elbow, Highwood, Sheep and Jumping Pound Rivers. This multi-year landowner engagement program has resulted in the conservation of 23,000 acres of watershed lands and we are still going strong with this initiative.

Our area of operation has expanded to all of southern Alberta, with active landowner outreach and projects upstream of Calgary along the

Western Sky Land Trust
Spring Gardens - Building D
861 – 40th Avenue NE

Mail Code # 64 PO Box 2100, Stn. M · Calgary, AB · T2P 2M5

P: 403 268 4721

www.westernskylandtrust.ca

Bow, Elbow, Jumping Pound and Ghost rivers as well as in the Nose Creek catch basin and Beddington Creek areas. All of the riparian lands and neighbouring communities have relevance to Calgary's source water protection plans.

Furthermore, actioning the Bow & Beyond program has given us an excellent knowledge base and familiarity with these landowner communities and provided an opportunity for successful partnerships with landowners, community groups and NGOs. This successful landowner outreach is slated to continue into 2023.

Thank you for this opportunity to express our support for the source water protection policy that will ensure clean water for Calgarians now and generations to come.

Sincerely,



Max Fritz
Executive Director



Wade Hawkins
Board Chair
Western Sky Land Trust

**Utilities & Environmental Protection Report to
SPC on Utilities and Corporate Services
2020 September 16**

**ISC: UNRESTRICTED
UCS2020-0377**

Calgary's Accelerated Lead Service Pipe Removal and Mitigation Plan

EXECUTIVE SUMMARY

The purpose of this report is to provide Administration's response to Notice of Motion PFC2019-1569, Addressing Lead Pipes in Calgary and outline The City of Calgary's (The City's) plan to accelerate the removal of lead service lines in the drinking water distribution system. A service line is the pipe that connects a home to the street's water main on both public and private property. Although Calgary does not have any lead water mains and has one of the lowest numbers of public lead service connections in Canada, The City's goal is to reduce any exposure to lead in drinking water. This accelerated program aims to replace verified lead service lines on public and private property by the end of 2023 and supports Calgary in moving towards being the first major municipality in Canada to eliminate lead service lines.

Based on the latest science, Health Canada has lowered the Maximum Acceptable Concentration (MAC) for lead from 10 parts per billion (ppb) to 5 ppb in order to further reduce exposure to lead. As a result of this change, there is a need to expedite the removal of the remaining 550 public lead service lines, as well as 150 lead service lines on private property, which were installed by private builders at the time of house construction. The cost for the replacement of verified public and private lead water services is estimated to be up to \$14 M over the next three years, with up to \$2.5M of that value potentially recovered from homeowners for private replacements. The program will be primarily funded through utility rates, with some potential recovery from homeowners for the private replacement component. Replacing the public and private portion of a lead service line at the same time not only reduces potential lead exposure, but also allows for more economical pricing for a homeowner.

It is important to note that the high quality of Calgary's drinking water has not changed. The concern remains with older homes built primarily before 1950 that have lead water service lines connecting the home to the water main and/or from pipes and plumbing inside the home.

ADMINISTRATION RECOMMENDATION:

That the Standing Policy Committee on Utilities and Corporate Services recommend that Council direct Administration to:

- (1) Work with customers to replace verified lead service lines on public and private property, excluding all pipes and fixtures downstream of the water meter or basement foundation; and
- (2) Collect repayment for the private service replacement from property owners.

PREVIOUS COUNCIL DIRECTION / POLICY

On 2019 December 16, following a Notice of Motion (PFC2019-1569), Council directed Administration to prepare a report on accelerated removal of lead water pipes, from both public and private properties, returning to Council through the Standing Policy Community on Utilities and Corporate Services no later than Q1 2020, considering:

- Estimated costs and funding options,
- Opportunities for collaboration and cost sharing with private property owners and the Government of Alberta, and
- Timelines.

Utilities & Environmental Protection Report to
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Calgary's Accelerated Lead Service Pipe Removal and Mitigation Plan

BACKGROUND

Protecting public health by providing clean and safe drinking water is a very high priority for The City's Water Utility. The City takes the responsibility to protect public health seriously. Drinking water is tested by The City more than 100,000 times a year, and we continue to meet or perform better on all provincial and federal guidelines.

It is rare to find lead in Calgary's drinking water. Lead is not naturally occurring in the Bow and Elbow Rivers. There are also no lead pipes at Calgary's water treatment plants or in the network of water mains that deliver water to households. In Calgary, any issues of elevated levels of lead are related to older homes, built primarily before 1950 that have lead water service lines connecting the home to the water main under the street, and/or from pipes and plumbing inside the home. Water service lines are a shared responsibility between The City and the homeowner at the property line, as illustrated in Attachment 1.

The National Plumbing Code of Canada permitted the use of lead in piping in homes until 1975, and lead solder until 1986. In Calgary, lead service connections were only used for a short time period, primarily between 1939 and 1947, during World War II when copper was not readily available. Following the war, copper once again became the main material for service lines. The City's data shows that it is rare to find a home built after 1950 that has lead service lines on public or private property. Approximately 5,000 buildings in Calgary were constructed between 1939 – 1947, and approximately 15,000 were constructed prior to 1950. Restrictions on lead content in brass plumbing fittings and fixtures occurred in 2013.

Replacement of lead water service lines is a best practice in lead mitigation across Canada. Today, there are only 550 properties in Calgary with verified public lead service connections, out of a total number of 339,000 service connections.

Cities across Canada are accelerating their plans to remove lead service lines from older homes. The number of public lead service lines ranges from a low in Calgary (550), to Halifax (2500), to Edmonton (4450) and the highest in Montreal (60,000).

The City has been addressing risk related to lead service lines for decades through various Water Service Replacement programs, and since 2008 through the Tap Water Sampling program. The City contacts customers with a suspected lead service, based on age of property and available water service material records, to participate in a free program to sample and test their tap water. If a concentration of lead that exceeds guidelines is found, The City will provide free water filters and work jointly with the homeowner to replace the full lead service line. The City replaces the public portion of the water service upon receiving notice from the homeowner that the private portion of the water service has been replaced.

Replacement of only the public portion of the lead water service line is no longer considered best practice, as recent scientific evidence shows that the disturbance caused by partial replacement increases lead concentrations in the drinking water. The City has verified 150 lead water service lines on private property, as a result of partial (public portion only) service replacements completed in the past.

Calgary's Accelerated Lead Service Pipe Removal and Mitigation Plan

INVESTIGATION: ALTERNATIVES AND ANALYSIS

To address the public health risk posed by lead water services, and from pipes and plumbing inside the home, The City will implement an Updated Lead Mitigation Strategy in 2020. A central component of this Strategy is the accelerated removal of remaining lead service lines.

The City will replace 550 verified public lead services and 150 verified lead services on private property. Working with our customers, The City will endeavor to replace the verified public and private lead water services by the end of 2023. Many factors will contribute to success in meeting this timeline or pose challenges that could slow progress. These factors include cooperation from homeowners, legal agreements for access to private property, quality of data and information, sufficient resourcing within The City, potential Covid-19 impacts, management of an external contractor and effective customer communications.

The City recently completed a pilot study on full water service line replacement on both public and private property. From this pilot an average cost for a full water service replacement is estimated to be \$20,000. The average portion attributed to the homeowner is estimated to be \$3,500. The service replacement will occur up to the foundation of the home and will not include replacement of pipes and plumbing within the home.

The capital cost for the replacement of verified public and private lead water services is estimated to be up to \$14 M. The total recoveries from all homeowners would be up to \$2.5 M (given economies of scale), potentially reducing the City's cost to \$11.5M. The City has reviewed two options for recovering the cost of accelerated lead service line replacement. These options are:

1. the cost of full service line replacement included in The City's utility rates, or
2. the cost of public service line replacement included in The City's utility rates, with cost recovery from property owners for the private service line portion via the following instruments, at the choice of the homeowner:
 - a) immediate cost recovery at the time of replacement, or
 - b) implementation of payment plans collected through property taxes.

It is recommended The City seek repayment for the private service line replacement from property owners through their choice of the above recovery instruments. This recommendation aligns with the homeowner having responsibility for infrastructure on private property as per the Municipal Government Act, The City's previous approach on service line replacements, and the Water Utility's cost of service principles that balance fairness and equity to customers.

The presence of lead in potable water is a complicated issue that requires not just The City, but also customer and property owner participation to address. While removal of lead services is a central component, it is only one part of addressing lead in the tap water on private properties. There is a potential for lead content in internal plumbing systems of homes (pipes, solder, plumbing fittings, and fixtures).

To address the residual risk of lead in drinking water from internal plumbing in homes, The City will implement actions identified in the Strategy focused on customer education, filter distribution, increased sampling and data collection in alignment with Alberta Environment and

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Calgary's Accelerated Lead Service Pipe Removal and Mitigation Plan

Parks Guidance Document for Managing Lead in Municipal Drinking Water Systems in Alberta, Phase 1. The Strategy will recommend a balance of actions to be taken by The City and homeowners to ensure the risks of lead in drinking water are mitigated.

Stakeholder Engagement, Research and Communication

Since 2008, The City has routinely engaged with Alberta Health Services (AHS), Health Canada, Alberta Environment and Parks (AEP), and customers on tap water sampling and lead service replacement programs. Through these annual programs, The City and AHS have communicated and worked directly with customers in older homes to inform them and take action to reduce their risks with lead in drinking water.

In 2019, AEP initiated a provincial working group on lead where The City was a key participant and contributor on how municipalities in Alberta can address the risk of lead in drinking water. Exchanges on knowledge and information have also occurred with major Canadian cities, including Edmonton, as nearly all have lead water services and are utilizing a balance of activities specific to their risk exposure.

The City's public engagement strategy on lead has been focused on the annual Tap Water Sampling Program and direct letters to homeowners, as well as information sharing through 311, and The City's website. Going forward, Administration will be working on education campaigns, website improvements, and access to public infrastructure information to assist customers in assessing the risk within their own home and/or business.

Strategic Alignment

This report and recommendations support the following Council priorities with respect to a Well Run, Healthy and Green City:

- Lead by example and manage regulatory risks to protect public health and the environment,
- Continue to transform the organization to be more citizen-focused in its approach and delivery of service, and
- Effectively manage The City's inventory of public assets, optimizing limited resources to balance growth and maintenance requirements.

The outcomes of this report also support The Government of Alberta's *Water for Life Strategy*, which identifies goals of safe and secure drinking water.

Social, Environmental, Economic (External)

Safe and affordable drinking water is an essential component of community health, and also supports a thriving City. It is imperative that The City continues to maintain public trust with respect to water quality.

Calgary's Accelerated Lead Service Pipe Removal and Mitigation Plan

Financial Capacity

Current and Future Operating and Capital Budget:

Additional resourcing will be required by the Water Utility to conduct accelerated removal of lead service lines. It is expected new resources will be required to manage the replacement contracts, work with individual homeowners to address their unique circumstances, and conduct the required water quality sampling.

There are no Provincial grants specific to lead replacement or mitigation. Administration will seek federal funding for private lead service replacement as a Signature Project through the Federation of Canadian Municipalities. Eligibility and timing of Provincial and Federal funding is uncertain. To support the recommendations in this report Administration will request \$8 M in capital budget for 2021-2022, as part of the mid-cycle budget adjustments process. The remainder of the \$6M is anticipated to be spent in 2023 and will be requested as part of the One Calgary budgeting process.

Risk Assessment

In order for The City's Strategy to be effective, customer participation is essential, particularly with service replacements. To address the risk from lead water service lines, The City will need to work with the private property owners to perform the private service replacements and implement practices to reduce the risk of lead in drinking water.

The City does not maintain detailed records of the infrastructure on private property. However, through the expansion of the water sampling program, and due diligence efforts to verify and confirm private water service line age and material type, The City will be able to further refine the understanding of where risks to customers remain and inform future phases of The City's Strategy. If lead services are identified through these efforts, these services will be added to the replacement plan.

Additionally, customers may be unaware of other sources of lead within their homes, such as old plumbing and fixtures, and actions they can take to reduce the risks these sources pose. The City understands the importance of educating the customer and working collaboratively with homeowners to ensure the risks of lead in drinking water are mitigated.

REASON(S) FOR RECOMMENDATION(S):

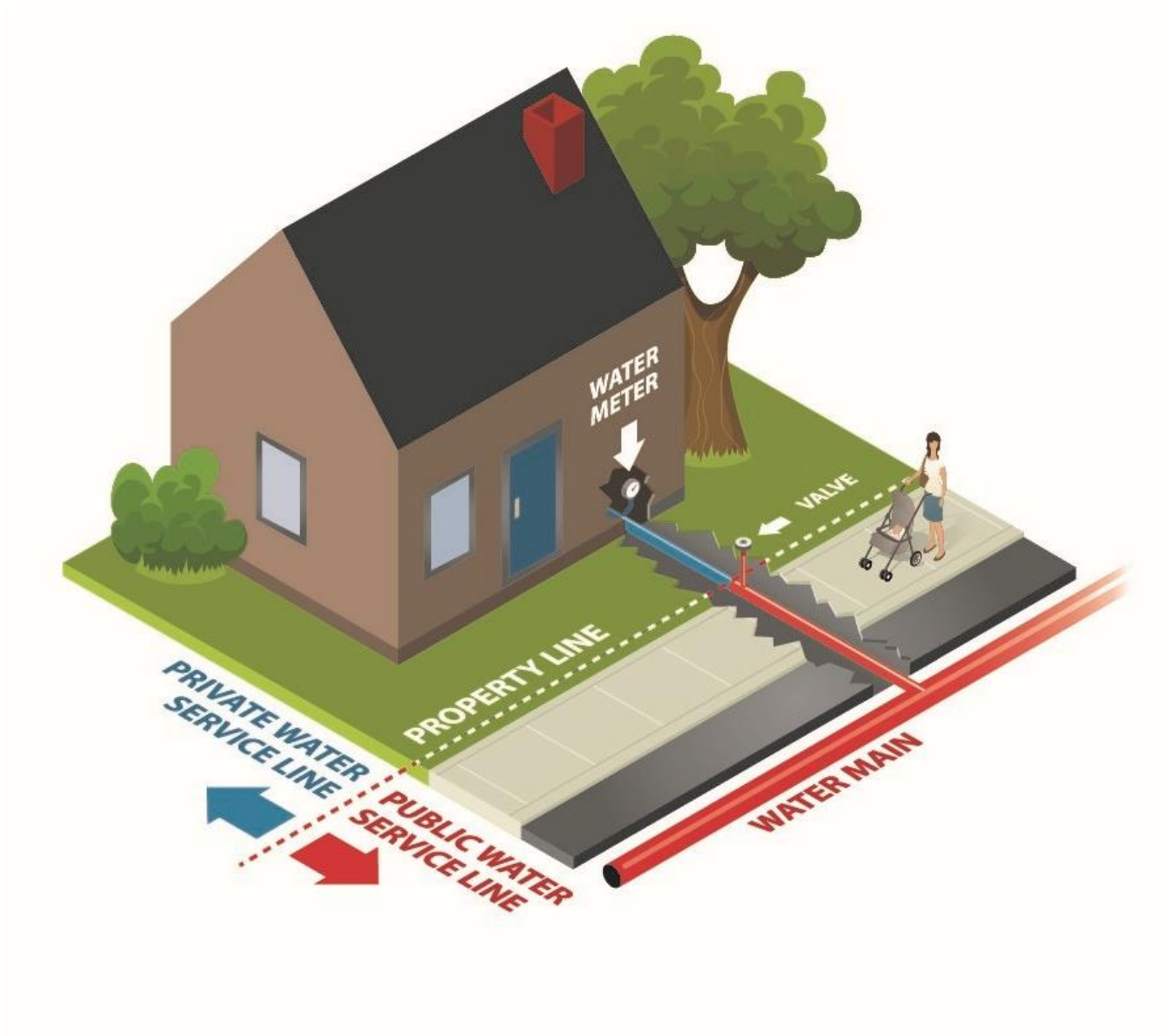
To reduce the risk of lead in drinking water from lead water services, and from pipes and plumbing inside the home, The City will implement an Updated Lead Mitigation Strategy in 2020. A central component of this program is an accelerated replacement of lead water services.

It is recommended The City seek repayment for the private service replacement from property owners. This recommendation aligns with the homeowner having responsibility for infrastructure on private property as per the Municipal Government Act, The City's previous approach on service line replacements, and the Water Utility's cost of service principles to balance fairness and equity to customers.

ATTACHMENT(S)

1. Attachment 1 – Shared Responsibility of Water Service Lines – UCS2020-0377

Shared Responsibility of Water Service Lines



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ISC: UNRESTRICTED
UCS2020-0887

Alberta Collaborative Extended Producer Responsibility Study Report

EXECUTIVE SUMMARY

Administration is reporting back on Notice of Motion C2019-0129 regarding Extended Producer Responsibility (EPR), as directed at the 2019 February 4 Combined Meeting of Council. The Alberta Collaborative Extended Producer Responsibility Study (ACES) was a collaborative effort funded by the Cities of Calgary and Edmonton, the Alberta Urban Municipalities Association (AUMA) and the Canadian Stewardship Services Alliance (CSSA). A further 35 Alberta municipalities supported the ACES work by either passing motions, writing letters of support or supplying data to inform the study. The AUMA and Rural Municipalities of Alberta (RMA) have both passed motions supporting EPR at their most recent conventions.

The ACES report provides baseline information about recycling programs in urban and rural Alberta municipalities, and the possible impacts to stakeholders of an EPR regulatory framework in Alberta. The ACES report confirms that EPR can save taxpayer dollars, reduce waste, and attract jobs and investment to Alberta. Alberta municipalities spent approximately \$107 million in 2018 collecting and marketing 197,000 tonnes of packaging and paper products (PPP). With an EPR framework in place in Alberta, that cost would be partially or wholly shifted to producers. The implementation of EPR in Alberta would mean that residents of Calgary would see Blue Cart fees reduced or eliminated, potentially reducing costs for every single-family household in Calgary by up to \$100 each year.

ADMINISTRATION RECOMMENDATION:

That the Standing Policy Committee on Utilities and Corporate Services recommends that Council reaffirm its support for Extended Producer Responsibility (EPR) and direct Administration to continue advocating for EPR in collaboration with other Alberta municipalities, industry and affected stakeholders.

PREVIOUS COUNCIL DIRECTION / POLICY

On 2019 February 4, Council approved Notice of Motion C2019-0129 (Attachment 1) and directed Administration to cooperate with other Alberta municipalities, AUMA, producers and recyclers of packaging and paper products, and the Province of Alberta to develop a baseline that can inform the design of a provincial EPR program by researching:

- The benefits, challenges, and risks of an EPR program in Alberta for these groups and their constituents; and
- The current recycling systems and supply chains across the province, and potential impacts of an EPR program in Alberta.

Administration was directed to report back on this work through the Standing Policy Committee (SPC) on Utilities and Corporate Services (UCS) no later than 2019 October. On 2019 October 16, the SPC on UCS approved a Deferral Request for this report to January 2020 (UCS2019-1303). On 2019 January 29, the SPC on UCS approved a Deferral Request for this report to March 2020 (UCS2020-0150).

BACKGROUND

Waste & Recycling Services invited a group of municipalities, not-for-profit organizations and industry representatives to guide the development of the baseline study requested by Council. A

**Utilities & Environmental Protection Report to
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UCS2020-0887**

Alberta Collaborative Extended Producer Responsibility Study Report

Governance Committee and Project Team were created to oversee ACES. The Governance Committee and Project Team consisted of representatives from:

- The City of Calgary (funding partner)
- The City of Edmonton (funding partner)
- The Alberta Urban Municipalities Association (funding partner)
- The Canadian Stewardship Services Alliance (funding partner)
- The City of St. Albert
- The Town of Whitecourt
- The Rural Municipalities of Alberta (RMA)
- Alberta Ministry of Environment and Parks

The Project Team selected the project consultant and managed their work to ensure ACES included the full scope of information required.

INVESTIGATION: ALTERNATIVES AND ANALYSIS

The full ACES report is included as Attachment 2. Highlights of study findings are as follows:

- Alberta municipalities spent approximately \$107 million in 2018 collecting and marketing 197,000 tonnes of packaging and paper products (PPP). An EPR framework in Alberta, would partially or wholly shift that cost to producers.
- Producers are already financially responsible for managing PPP at end of life in many other Canadian provinces. Given many of the largest producers price their products nation-wide, the costs of recycling PPP in other provinces is included in the price of products purchased in Alberta. If Alberta recycling costs shifted to consumers, the increase would be shared by consumers across Canada. Instead of subsidizing recycling elsewhere, Alberta would benefit from producer funded and managed recycling programs.
- Responsibility for collection, post-collection and processing should be transferred to producers, empowering them to take responsibility and control of the end-of-life management of the PPP that they supply into the marketplace, thereby protecting municipalities from material risk.
- A future EPR framework in Alberta should allow The City of Calgary and all Alberta municipalities the flexibility to continue to provide PPP services complementary to garbage and organics services.
- Future provincial EPR regulations should ensure that a producer funded and managed recycling system is easy for residents to use and understand, and is convenient, consistent and equitable across the province, including ensuring the same PPP materials are collected and recycled across the province.
- It should also ensure that producers that supply quantities of PPP below an established threshold (small businesses) in Alberta are exempted from regulation, ensuring they are not unfairly affected by EPR.

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Alberta Collaborative Extended Producer Responsibility Study Report

Stakeholder Engagement, Research and Communication

Thirty-five Alberta municipalities supported ACES work by either passing motions, writing letters of support or supplying data to help develop the baseline information. The AUMA and RMA have both passed motions supporting EPR at their most recent conventions. The ACES consultant engaged Alberta's urban and rural municipalities, First Nations representatives and industry representatives. The ACES Governance Committee has delivered this report to the Government of Alberta to inform their work on recycling.

Strategic Alignment

Pursuing EPR provides an opportunity to improve the performance of recycling programs across Alberta, and reduce costs to municipal taxpayers, contributing to the 2019 – 2022 Citizen Priorities of a Healthy & Green City and a Well-Run City.

Social, Environmental, Economic (External)

Triple bottom line benefits were determined as part of the future state vision of EPR in Alberta. It is estimated that an additional 21,000 tonnes of PPP would be recycled, increasing the total tonnes recycled to 184,000 annually. It is also estimated that \$4.7 million of disposal and collection costs would be avoided, reducing costs of managing recycling programs. About 219 full-time equivalent (FTE) direct, indirect and induced jobs would be created, resulting in a total of 1,581 jobs as a result of recycling PPP through EPR in Alberta. Finally, an additional 71,900 tonnes of carbon dioxide equivalent (CO₂e) emissions would be avoided, comparable to taking 15,000 passenger vehicles off the road annually. Most importantly, the \$107 million currently being spent annually to manage the collection and processing of PPP will no longer be borne by municipalities and rate payers. The implementation of EPR in Alberta would mean that residents of Calgary would see Blue Cart fees reduced or eliminated, potentially reducing costs for every single-family household in Calgary by up to \$100 each year.

Financial Capacity

Current and Future Operating Budget:

Waste & Recycling Services' current operating budget to collect and manage PPP in Calgary is approximately \$35 million annually. EPR regulation would materially reduce Blue Cart program costs, potentially eliminating Blue Cart fees for single-family households.

Current and Future Capital Budget:

No impact has been identified with respect to this report.

Risk Assessment

The risks and costs for The City of Calgary to collect and manage PPP has increased along with the volatility of global recycling markets over the past several years, and it is expected that these market conditions will continue. Transferring the responsibility for managing PPP and empowering producers with economic incentives and flexibility to establish effective and efficient PPP recycling services in Alberta will decrease risks borne by The City of Calgary.

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Alberta Collaborative Extended Producer Responsibility Study Report

REASONS FOR RECOMMENDATION:

ACES was a collaborative effort funded by The Cities of Calgary and Edmonton, the Alberta Urban Municipalities Association and the Canadian Stewardship Services Alliance. The final report was approved by the ACES Governance Committee. EPR continues to be a high-value target for advocacy because of the economic and environmental benefits it would provide to Calgarians and Albertans.

ATTACHMENTS

1. Attachment 1 – Notice of Motion C2019-0129
2. Attachment 2 – Extended Producer Responsibility for Residential Packaging and Paper Products - Alberta Collaborative Extended Producer Responsibility Study
3. Attachment 3 – 2018-2019 Producer Funding Obligations in EPR Jurisdictions in Canada
4. Attachment 4 – Presentation



Report Number: C2019-0129

Meeting: Regular Meeting of Council

Meeting Date: 2019 February 04

NOTICE OF MOTION

RE: EXTENDED PRODUCER RESPONSIBILITY

Sponsoring Councillor: COUNCILLOR DEMONG

WHEREAS recycling is an important activity for reducing the amount of waste going to landfill, and allows products at end-of-life to be processed into valuable new products,

AND WHEREAS the costs of programs for collecting, processing, and marketing recyclable materials in Alberta are currently carried by local governments, funded by tax-payers,

AND WHEREAS the recycling stewardship programs for five regulated materials in Alberta (beverage containers, electronics, paint and paint containers, tires, and used oil materials) achieve some consistency across the province for how these materials are collected and recycled, but do not cover the full costs of collecting and managing these materials, requiring tax-payers to fund the remainder,

AND WHEREAS the companies that produce products that need to be recycled can design and operate more effective and efficient recycling programs if they work together province-wide than individual municipalities or the Government of Alberta can on their own, allowing for improved waste diversion infrastructure across the province and higher quality end products,

AND WHEREAS extended producer responsibility (EPR) is a policy approach that places the financial and/or physical responsibility for end of life management of products with the companies that produce those products, and would remove the financial burden for recycling programs from taxpayers,

AND WHEREAS Alberta is the only province in Canada that has not legislated EPR for any materials, and is falling behind in its commitments under the Canadian Council of Ministers of the Environment (CCME) Canada-wide Action Plan for EPR,

AND WHEREAS Canadian Stewardship Services Alliance Inc., an organization that manages EPR programs in four (4) Canadian provinces on behalf of obligated producers of packaging and paper product (PPP), has signaled its support for the CCME goal of producer-led EPR in the province of Alberta and is committed to working collaboratively with Alberta's urban and rural municipalities to:

- Assist in the funding of the collection of baseline measurement data that will inform the design of an appropriate EPR framework for Alberta;
- Assist in the development of recommendations for an appropriate EPR regulatory framework for the province; and
- Work with stakeholders to foster support for an EPR program for PPP,

AND WHEREAS producer-led EPR in Alberta would allow recyclable materials from Alberta and British Columbia to be managed as a whole, generating a large volume of higher quality materials that could incentivize the development of processing infrastructure in western Canada, creating local jobs and minimizing the dependence on global recycling markets,

AND WHEREAS at the 2018 March 14-15 Alberta Urban Municipalities Association (AUMA) Municipal Leaders Forum, The City of Calgary presented a Request for Decision (RFD) to advocate that the Government of Alberta develop and implement legislation to establish EPR in Alberta, and the RFD received unanimous support from municipalities in attendance,

AND WHEREAS it is important for the success of an EPR program in Alberta that there is a shared understanding of the benefits, challenges, and risks associated with such a program for communities of all sizes, industry, and the Province of Alberta,

AND WHEREAS to advance the development of an EPR program in Alberta, research is required on the Alberta recycling systems and supply chains, and the potential impacts of an EPR program in this province,

NOW THEREFORE BE IT RESOLVED THAT COUNCIL:

1. Allocate funding from the Fiscal Stability Reserve (FSR) not to exceed \$50,000, to contribute to the work described below, which will require additional funding partners to carry out, and

Direct Administration to:

1. Cooperate with other Alberta municipalities, AUMA, producers and recyclers of packaging and paper products, and the Province of Alberta to develop a baseline that can inform the design of a provincial EPR program by researching:
 - The benefits, challenges, and risks of an EPR program in Alberta for these groups and their constituents;
 - The current recycling systems and supply chains across the province, and potential impacts of an EPR program in Alberta; and
2. Report back through the SPC on Utilities and Corporate Services no later than 2019 October.



Extended Producer Responsibility for Residential Packaging and Paper Products

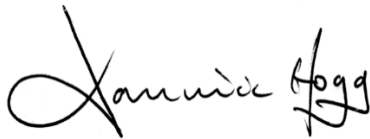
Alberta Collaborative Extended Producer
Responsibility Study

December 6, 2019

**Report for Alberta Urban Municipalities Association, Cities of Edmonton,
Calgary and the Canadian Stewardship Services Alliance**

**Prepared by Dr. Dominic Hogg, Sarah Edwards, Sydnee Grushack, John Carhart,
Sanan Hajiyeu, Maria Kelleher, Samantha Millette, Geoff Love, Stacey Schaub-
Szabo, Tammy Schwass and Salah Borno**

Approved by

A handwritten signature in black ink that reads "Dominic Hogg". The signature is fluid and cursive, with the first name "Dominic" being larger and more prominent than the last name "Hogg".

Dr. Dominic Hogg

(Project Director)

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Disclaimer

Eunomia Research & Consulting has taken due care in the preparation of this report to ensure that all facts and analysis presented are as accurate as possible within the scope of the project. However, no guarantee is provided in respect of the information presented, and Eunomia Research & Consulting is not responsible for decisions or actions taken on the basis of the content of this report.

Version Control Table

Version	Date	Author	Description
FINAL	12/06/19	Sydnee Grushack	Client Approved

Executive Summary

Eunomia Research & Consulting (Eunomia), along with its sub-contractors Kelleher Environmental, Love Environment, S-Cubed Environmental and Morrison Hershfield, has been contracted by the Alberta Urban Municipalities Association (AUMA), the Cities of Edmonton and Calgary and the Canadian Stewardship Services Alliance (CSSA) to carry out an extended producer responsibility (EPR) study for packaging and paper products (PPP) to meet the following key objectives:

- Outline a vision for EPR for residential PPP in Alberta which includes high level assumptions about a future state for the purpose of informing and consulting with key stakeholders;
- Provide an overview of the current state of the residential PPP recycling system and supply chains and their related costs across the province of Alberta; and
- Categorize and detail the potential impacts of a future state, as described in the vision, with an EPR system that outlines the potential benefits, challenges and risks in relation to the major stakeholders.

EPR is one way of facilitating Alberta's transition to a circular economy, where materials and products are used as long as possible and are recirculated into the economy through recycling, refurbishing or repurposing.¹ EPR is a policy approach under which producers are given a responsibility—financial and/or operational—for the end-of-life management of post-consumer products. Assigning such responsibility can, in principle, provide incentives to prevent waste at the source, promote product design for the environment and support the achievement of public recycling and materials management goals.²

To achieve such a system in Alberta, it is necessary to create an outcomes-based EPR regulatory framework that:

- 1) uses audited data to enable insight that will help drive continuous innovation and improvement in packaging and system design, driving higher waste reduction and recycling rates, which are necessary for a circular economy;
- 2) allows municipalities the flexibility to continue to provide PPP services complementary to garbage and organics services;

¹Canadian Council of Ministers of the Environment. (2019). *Canada-Wide Action Plan on Zero Plastic Waste - Phase 1*. <https://www.ccme.ca/files/Resources/waste/plastics/1289_CCME%20Canada-wide%20Action%20Plan%20on%20Zero%20Plastic%20Waste_EN_June%2027-19.pdf>

² OECD Global Forum on the Environment. (2014). *The State of Play on Extended Producer Responsibility (EPR): Opportunities and Challenges*. <<https://www.oecd.org/environment/waste/Global%20Forum%20Tokyo%20Issues%20Paper%2030-5-2014.pdf>>

EXECUTIVE SUMMARY

- 3) provides producers with economic incentives and sufficient flexibility to establish an effective and efficient PPP reverse supply-chain in Alberta;
- 4) provides regulators and producers with the flexibility to adapt to change over time without having to resort to prescriptive regulatory amendments, allowing for quick adaptation to market and environmental conditions; and
- 5) establishes strong governance and an oversight organization that has sufficient power to address non-compliance.

This report compares the triple bottom line benefits associated with a future state where PPP services are delivered under an EPR system in line with current levels of service provision. It also outlines what will need to be considered when moving to, and implementing, a residential PPP EPR system, and how the roles and responsibilities of existing stakeholders will need to change to ensure success.

E.1.1 Future State

Vision

To map the path to a future state for residential PPP services under EPR, a guiding vision for the future state was developed through stakeholder engagement, defined as one that:

- is easy for residents to use and understand;
- is convenient, consistent and equitable across the province;³
- provides municipalities with the option to be involved in the collection of PPP;
- sets outcome-based performance targets;
- transfers responsibility for collection, post-collection and processing to producers, thus enabling producers to take responsibility and control of the end-of-life management of the PPP that they supply into the marketplace and protect municipalities from material risk;
- is operated and financed by producers as a reverse supply-chain for the collection, management and reutilization of PPP in a circular economy;
- incorporates considerations for producers that supply quantities of PPP below an established threshold;
- ensures improved environmental outcomes and drives a circular economy including:
 - increased waste diversion;
 - increased recycling of PPP;
 - reduced contamination and increase in quality of PPP collected and processed;
 - potential reduction in packaging placed on the market;
 - potential improvement in packaging design if Alberta harmonizes with other Canadian EPR frameworks to allow for ease of recycling, and re-introduction of the recycled material into a circular economy model;

³ For instance, standardized PPP materials collected for recycling

EXECUTIVE SUMMARY

- improved tracking and transparency regarding the end-fate of PPP materials; and
- adds value to the Alberta economy.

Roles and Responsibilities

Under EPR the roles and responsibilities of the different stakeholders processing will change. These changes are summarized in Figure E 1 and discussed further in Section 3.0.

Figure E 1: Roles and Responsibilities of Stakeholders



Source: Eunomia

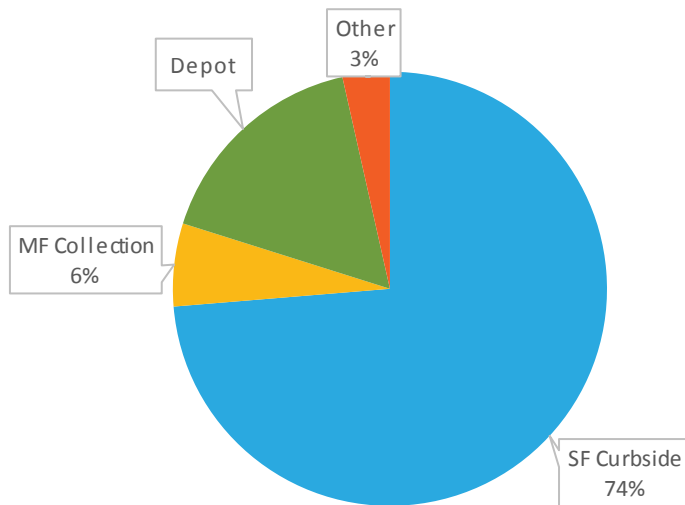
E.1.2 Current State Assessment

Access to PPP collection services varies across the province. While 74% of single-family (SF) households across Alberta are estimated to have access to curbside services for recycling, only 43% of multi-family

(MF) households have collection services provided or managed by the municipality. The relatively high level of access for SF households to curbside services is attributable to the fact that 80% of Albertans live in either cities or towns.⁴ Albertans who live outside of urban areas are less likely to have access to curbside garbage collection and/or recycling service and may be reliant on permanent or mobile depots.

Approximately 197,600 tonnes of PPP were collected for recycling in Alberta in 2018, with an estimated 163,200 tonnes recycled.⁵ The recycled number is lower than the collected number, as the collected tonnes include non-target materials (contamination or residuals) that have to be removed through sorting processes prior to recycling. Figure E 2 summarizes the tonnes of material collected by method of collection.

Figure E 2: Percentage of PPP Collected in Alberta in 2018 by Collection Method



Source: Survey responses and Eunomia calculations

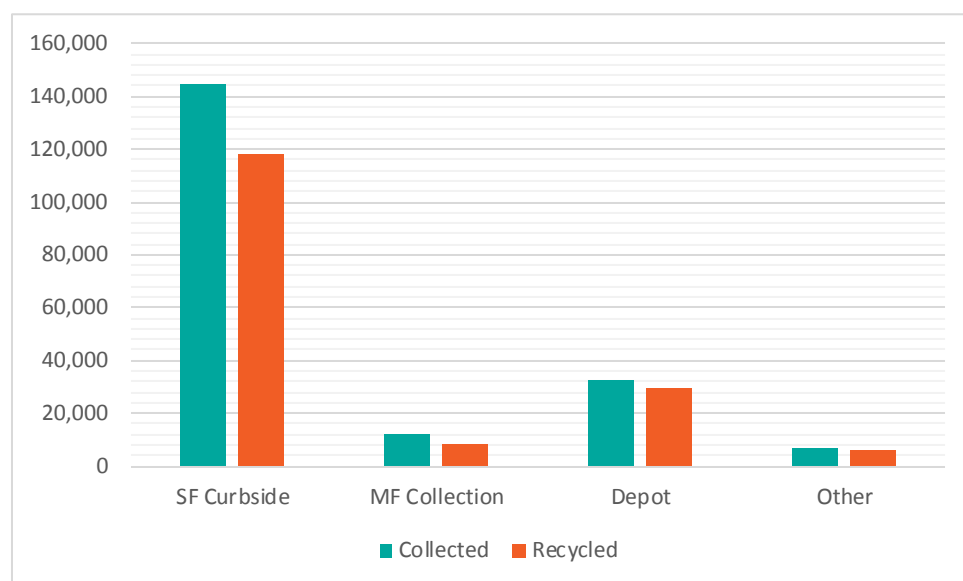
Across all municipality types, SF curbside collected the most tonnes per household annually.

Figure E 3 summarizes the average tonnes collected and recycled per household by collection method.

⁴ 2018 Municipal Affairs Population List

⁵ Calculation based on collection data and provided contamination or residue rates.

Figure E 3: Tonnes of PPP Collected and Recycled per Household by Collection Method in 2018⁶



Source: Eunomia calculations

The total cost of collecting and processing 197,600 tonnes of PPP from households in Alberta is estimated to be approximately \$107.0 million, as shown in Table E 1.

Table E 1: Total Cost of Collecting and Recycling PPP from Households in Alberta in 2018

Municipality Type	Total (\$ million)
Large Municipalities ⁷	48.9
Medium Municipalities ⁸	31.7
Small Municipalities ⁹	15.1

⁶ Includes PPP costs for eco-centres and semi-annual big bin recycling events.

⁷ For the purposes of this study, cities with populations of over 500,000

⁸ For the purposes of this study, cities, towns and specialized municipalities with populations of between 10,000 and 500,000.

⁹ For the purposes of this study: towns, specialized municipalities, villages and summer villages with less than 10,000 residents.

Municipality Type	Total (\$ million)
Other Municipality & Community Types ¹⁰	11.3
Total	107.0

Source: Eunomia calculations

E.1.3 Triple Bottom Line Assessment

Using the vision as a guide, the following assumptions were developed in order to assess the potential triple bottom line benefits of the future state of EPR for residential PPP in Alberta:

- 1) All SF households in large municipalities will retain curbside collection services;
- 2) All MF households in large municipalities will be guaranteed collection services through the EPR system;
- 3) All SF households in medium and small municipalities that already have a curbside garbage service will have curbside recycling service;
- 4) All MF households in medium and small municipalities with municipality-managed garbage service will receive PPP recycling collection service; and
- 5) All depots and curbside programs in large, medium, small and other municipality and community types will accept the same range of material for recycling.

The level of service described in the assumptions above is projected to result in the following benefits:

- An additional approximate 29,300 tonnes of PPP collected (for a total of 226,900 tonnes), of which 20,900 tonnes would be recycled, increasing the total tonnes recycled from 163,200 to 184,100;
- An additional estimated \$4.7 million of avoided disposal and collection costs, reducing costs to taxpayers;
- About 219 full-time equivalent (FTE)¹¹ direct, indirect and induced jobs are created, resulting in a total of 1,581 jobs created by recycling in Alberta;¹² and
- An additional 71,900 tonnes of CO₂e avoided, increasing the total tonnes of CO₂e avoided to approximately 541,600 tonnes¹³ (equivalent to taking over 120,300 passenger vehicles off the road).

¹⁰ For the purposes of this study, this includes: special areas, municipal districts, regional waste authorities, improvement districts, First Nations, Metis settlements.

¹¹ Proportionate to increase in tonnes recycled. Does not incorporate potential reductions in tonnages associated with garbage collection. An assessment of efficiencies in garbage collection would be required to calculate this potential reduction.

¹² Based on the collection and recycling of tonnages of PPP in the future state.

¹³ Calculated using Environment and Climate Change Canada's GHG Model.

A further comparison of the benefits, risks and challenges to different stakeholders under both the current and future state is available in Section 5.2.

Table E 2 summarizes the future costs of the system based on the collection and processing of 226,900 tonnes of PPP. The future costs are an extrapolation of existing costs, although it is expected that a producer financed and operated model will be able to drive efficiencies through economies of scale and consolidation of activities. As such, this is likely to be a high estimation of future costs.

Table E 2: Projected Annual Costs for Recycling Across Municipality Types in the Future State¹⁴

Municipality Type	Total (\$ million)
Large Municipalities	53.1
Medium Municipalities	35.8
Small Municipalities	18.3
Other Municipality & Community Types	12.1
Total	119.3

Source: Eunomia calculations

Of the 226,900 tonnes of material collected, 184,100 tonnes of PPP is expected to be recycled and diverted from the residential garbage stream, reducing costs by an estimated \$38.2 million per year in collection and disposal across the province.

It is estimated that approximately 1,362 FTE direct, indirect and induced jobs were created as a result of the recycling of residential PPP in Alberta in 2018. Under an EPR system, this is expected to rise to over 1,581 FTE. The gross value added (GVA), which is the contribution the sector makes to Alberta's GDP, was estimated to be \$132.4 million in 2018 and is expected to rise to approximately \$148.4 million in the future state.

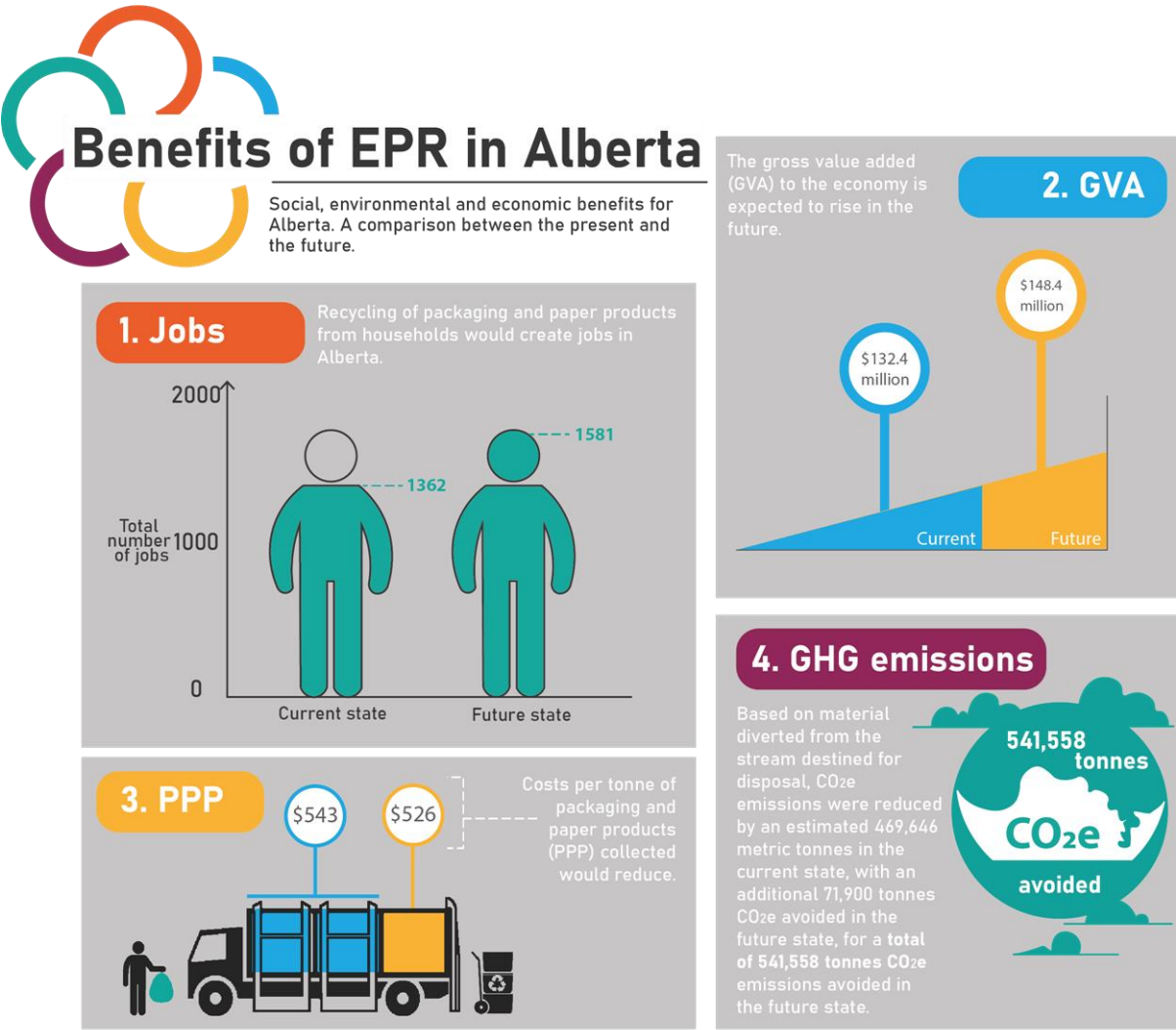
PPP recycling in Alberta in 2018 resulted in a reduction of an estimated 469,700 metric tonnes of CO₂e emissions,¹⁵ with an additional 71,900 tonnes CO₂e predicted to be avoided in the future state, resulting in 541,600 tonnes CO₂e emissions total tonnes avoided.

¹⁴ Projected costs are calculated according to current market conditions and do not include system efficiencies through more centralized provision of services. Calculating these potential efficiencies would require an assessment of current system efficiency, which was outside the scope of this study.

¹⁵ Calculated using Environment Canada and Climate Change's GHG Model.

As described above, the transition to EPR in accordance with the vision will produce many benefits for Albertans; these are summarized in Figure E 4.

Figure E 4: Benefits of Future State Under EPR Summary¹⁶








Source: Eunomia calculations

Table E 3 provides an overview of the changes in costs and benefits from the current to future state.

¹⁶ Projected costs are calculated according to current market conditions and do not include system efficiencies through more centralized provision of services. Calculating these potential efficiencies would require an assessment of current system efficiency, which was outside the scope of this study.

Table E 3: Change in Annual Costs and Benefits from Current State to Future State

Category	Current	Future	Change (%)
 Cost per Tonne Collected	\$543	\$526	-3.0
 Jobs (FTE)	1,362	1,581	+16.1
 GVA	\$132.4 million	\$148.4 million	+12.1
 CO₂e Emissions Reduced	469,700	541,600	+15.3
 Total Tonnes Recycled	163,200	184,100	+12.8

Source: Eunomia calculations

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Glossary

Below are the definitions of terms as they are used throughout this report.

Aseptic Container – a tetrahedron-shaped plastic-coated paper carton, usually used to package liquids like milk and juice or processed food like vegetables and preserved fruits, often referred to by the brand name “Tetra Pak.”

Circular Economy - an economy in which participants strive to (a) minimize the use of raw materials, (b) maximize the useful life of materials and other resources through resource recovery, and (c) minimize waste generated from products and packaging at end-of life.¹⁷

Depot – a staffed or unstaffed facility in which residents’ drop-off their PPP material for recycling; may be referred to by several other terms across Alberta, including: recycling centre, eco-centre, ecostation, drop-off centre.

Expanded Polystyrene (EPS) - a rigid cellular plastic foam found in a multitude of shapes and applications, often referred to by the brand name “Styrofoam.”

Extended Producer Responsibility (EPR) – a policy approach in which a producer’s responsibility, physical and/or financial, for a product is extended to the post-consumer stage of a product’s life cycle. EPR shifts responsibility upstream in the product life cycle to the producer and away from municipalities. As a policy approach it provides incentives to producers to incorporate environmental considerations in the design of their products. EPR also shifts the historical public sector tax-supported responsibility for some waste to the individual brand owner, manufacturer or first importer.

Free-riding – when one firm (or individual) benefits from the actions and efforts of another without paying or sharing the costs.¹⁸

High-density Polyethylene (HDPE) – a strong, durable, lightweight, and chemically resistant plastic material popular for a variety of applications, including milk jugs. Coded as plastic resin #2.

Industrial, Commercial, and Institutional (ICI) – a waste-generating sector. The ICI sector includes hospitals, hotels and motels, office buildings, educational institutions, and large manufacturing establishments.

¹⁷ <https://www.ontario.ca/laws/statute/16r12#BK1>

¹⁸ Canadian Council of Ministers for the Environment. (2007). Analysis of the Free-Rider Issue in Extended Producer Responsibility Programs.
<https://www.ccme.ca/files/Resources/waste/extended/free_riders_1.0_1380_e.pdf>

Large Municipalities – for the purposes of this study: cities with populations of over 500,000.

Low-density Polyethylene (LDPE) – a soft, flexible, lightweight plastic material. It is often used for sandwich bags and cling wrap. Coded as plastic resin #4.

Material Recovery Facility (MRF) – an establishment primarily engaged in sorting mixed recyclable materials into distinct categories and preparing them for shipment.¹⁹

Medium Municipalities – for the purposes of this study: cities, towns and specialized municipalities with populations of between 10,000 and 500,000.

Multi-family (MF) Household – for the purposes of this study, MF households were classified according to census categories that include: apartment in a building that has five or more stories; apartment or flat in duplex; apartment in a building that has fewer than five stories.²⁰

Organics - organic waste refers to biodegradable, compostable waste of plant or animal origin from residential or ICI sources. Examples include food scraps, grass clippings and garden waste and sometimes soiled paper products (e.g., tissue, paper towels), boxboard, and animal or human waste.²¹

Packaging and Paper Products (PPP) – packaging and paper materials designated by provincial regulation as PPP. This may include PPP generated by both the residential and ICI sectors (e.g., primary packaging, transport packaging, printed and non-printed paper). The current list of designated materials varies nationally.²² This study is only concerned with residential PPP.

Polyethylene Terephthalate (PET) – a clear, strong, and lightweight plastic that is widely used for packaging foods and beverages, especially convenience-sized soft drinks, juices and water. Coded as plastic resin #1.

Polypropylene (PP) – a thermoplastic used in a variety of applications to include packaging for consumer products, like yogurt pots and margarine containers and many plastic bottle caps. Coded as plastic resin #5.

Polystyrene (PS) – a transparent thermoplastic that is found as both a typical solid plastic as well as in the form of a rigid foam material. Often used for producing disposable cutlery and dinnerware and coded as plastic resin #6.

¹⁹ Government of Canada. Canadian Industry Statistics. <http://www.opic.ic.gc.ca/app/scr/app/cis/summary-sommaire/56292?undefined&wbdisable=true>

²⁰ Based on 2016 Census categories, as reported on Statistics Canada.

²¹ Giroux Environmental Consulting. (2014). State of Waste Management in Canada.

https://www.ccme.ca/files/Resources/waste/wst_mgmt/State_Waste_Mgmt_in_Canada%20April%202015%20revised.pdf

²² Abridged definition from Recycling Council of Alberta: <https://recycle.ab.ca/about/public-policy/>

Polyvinyl Chloride (PVC) – a common thermoplastic used in construction and generally known for its hardness. Coded as plastic resin #3.

Primary Data – includes direct interviews, data from direct first-hand sources and other primary documents.

Processor – parties that provide services that may include: sorting, counting; weighing; measuring; controlling; surveying, processing and verifications. They may be responsible for scrap buying/selling, overseas shipping and brokering, and materials transformation.

Producer – a producer is an organization or company that is a resident, and a brand owner, first importer or franchisor that supplies designated PPP to consumers in a province where stewardship obligations have been regulated (unless the organization is exempted from these regulations)^{23,24}. Producers finance PPP programs throughout Canada under EPR legislation. Many retailers and brand owners are designated producers in most provinces because they sell products into the province with packaging. The definition of “producer” generally includes de minimis thresholds to relieve small businesses from any EPR fee burden.

Producer Responsibility Organization (PRO) – the entity (usually a not-for-profit organization) designated by a producer or producers to act on their behalf to administer an EPR or product stewardship program. In Canada, a PRO may also be referred to as a “stewardship organization,” an “industry funding organization” or a “delegated administrative organization.”²⁵

Recycled – for the purposes of this study, calculations are based on PPP collection data and provided contamination or residue rates. A more precise definition of recycling is recommended for the future in Section 3.1.1.

Other Municipality & Community Types - for the purposes of this study, this includes: special areas, municipal districts, regional waste authorities, improvement districts, First Nations, Metis settlements.

Secondary Data – involves primarily internet research, including: municipality websites, census information and other publicly-available sources.

²³ Canadian Stewardship Services Alliance. (2019). Helping Businesses Meet Their Packaging & Paper Product Recycling Obligations in Canada. http://guidebook.cssalliance.ca/wp-content/uploads/2019/03/CSSA-Guidebook_Updated-March-2019.pdf

²⁴ Recycle BC. (2019). Packaging and Paper Product Extended Producer Responsibility Plan – Revised June, 2019. http://recyclebc.ca/wp-content/uploads/2019/07/RecycleBCStewardshipPlan_16July2019.pdf

²⁵ Environment Canada (2019). Introduction to extended producer responsibility. <<http://ec.gc.ca/gdd-mw/default.asp?lang=En&n=9D7CBB1C-1466-4A7D-98E5>>

Single-family (SF) Household –for the purposes of this study, SF households were classified according to census categories that include: single-detached house; semi-detached house; row house; other single-attached house.²⁶

Small Municipalities –for the purposes of this study: towns, specialized municipalities, villages and summer villages with less than 10,000 residents.

²⁶ Based on 2016 Census categories, as reported by Statistics Canada.

1.0 Introduction and Overview of Approach

1.1 Introduction

Eunomia Research & Consulting (Eunomia), along with its sub-contractors Kelleher Environmental with Love Environment, S-Cubed Environmental and Morrison Hershfield, have been tasked by the Alberta Urban Municipalities Association (AUMA), the Cities of Edmonton and Calgary and the Canadian Stewardship Services Alliance (CSSA) to carry out an extended producer responsibility (EPR) study for packaging and paper products (PPP) to meet the following key objectives:

- Outline a vision for EPR for residential PPP in Alberta which includes high level assumptions about a future state for the purpose of informing and consulting with key stakeholders;
- Provide an overview of the current state of the residential PPP recycling system and supply chains and their related costs across the province of Alberta; and
- Detail the potential impacts of a future state EPR system, as described in the vision, including the potential benefits, challenges and risks to major stakeholders.

EPR is defined by the Canadian Council of Ministers of the Environment (CCME) as:

“a policy approach in which a producer’s responsibility, physical and/or financial, for a product is extended to the post-consumer stage of a product’s life cycle. EPR shifts responsibility upstream in the product life cycle to the producer and away from municipalities. As a policy approach it provides incentives to producers to incorporate environmental considerations in the design of their products. EPR also shifts the historical public sector tax-supported responsibility for some waste to the individual brand owner, manufacturer or first importer.”²⁷

EPR is one way of facilitating Alberta’s transition to a circular economy, where materials and products are used as long as possible and are recirculated into the economy through recycling, refurbishing or repurposing.²⁸

This report is organized as follows:

- Section 2.0 outlines the vision for the future state, and touches on the core roles and responsibilities of the different stakeholders and the key elements under EPR;
- Implementation considerations for EPR in Alberta are detailed in Section 3.0;

²⁷ Canadian Council of Ministers of the Environment (October 2009) Canada-wide Action Plan for Extended Producer Responsibility. https://www.ccme.ca/files/current_priorities/waste/pn_1499_epr_cap_e.pdf

²⁸ Canadian Council of Ministers of the Environment (2019). Canada-Wide Action Plan on Zero Plastic Waste – Phase 1. https://www.ccme.ca/files/Resources/waste/plastics/1289_CCME%20Canada-wide%20Action%20Plan%20on%20Zero%20Plastic%20Waste_EN_June%2027-19.pdf

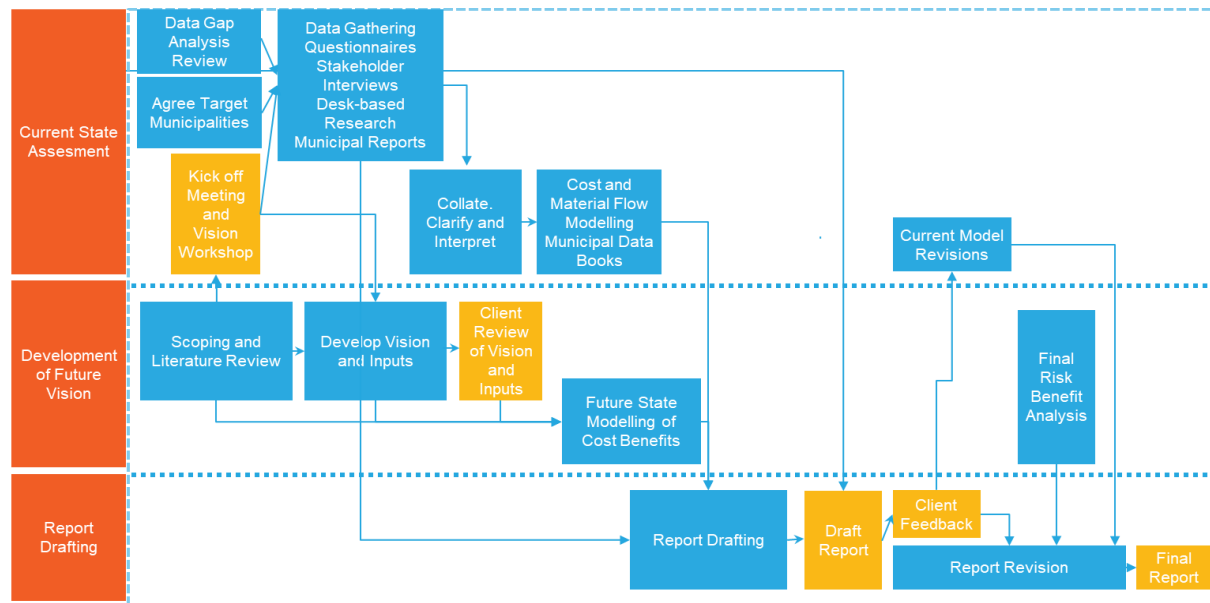
- Section 4.0 provides an in-depth analysis of the current state of recycling in Alberta. A province-wide overview is provided before the analysis for each municipality category is detailed. Each of these sections include a general discussion of the municipalities, their bylaws, collection services and accessibility across single-family (SF) households, multi-family (MF) households, and depots as well as a discussion of processing.
 - The provincial overview is provided in Section 4.2;
 - Large Municipalities in Section 4.3;
 - Medium Municipalities in Section 4.4;
 - Small Municipalities in Section 4.5; and
 - Other Municipality & Community Types in Section 4.6.
- Section 5.0 provides an assessment of the triple bottom line benefits, including number of jobs created, environmental benefits and a stakeholder impact assessment related to the future state vision and additional future considerations.

Eunomia consulted with the Alberta Collaborative Extended Producer Responsibility Study project team and governance committee in order to craft the vision around which the future state was modelled. The current state details the statistics for the present-day reality of recycling in Alberta in order to present a comparison for analysis of the necessary steps to achieve the future state of recycling, with a robust EPR system, in Alberta.

1.2 Overview of Approach

Figure 1-1 provides an overview of the approach taken to deliver the study objectives. The future vision was developed in collaboration with the project team at the same time as data was gathered and analyzed to determine the current state of residential recycling in Alberta. The future state vision and current state assessment were then used to estimate the triple bottom line benefits and comment on the impact of EPR on key stakeholders including municipalities and First Nation communities, the waste management industry, non-governmental organizations, producers, provincial regulators and consumers.

Figure 1-1: Study Methodology

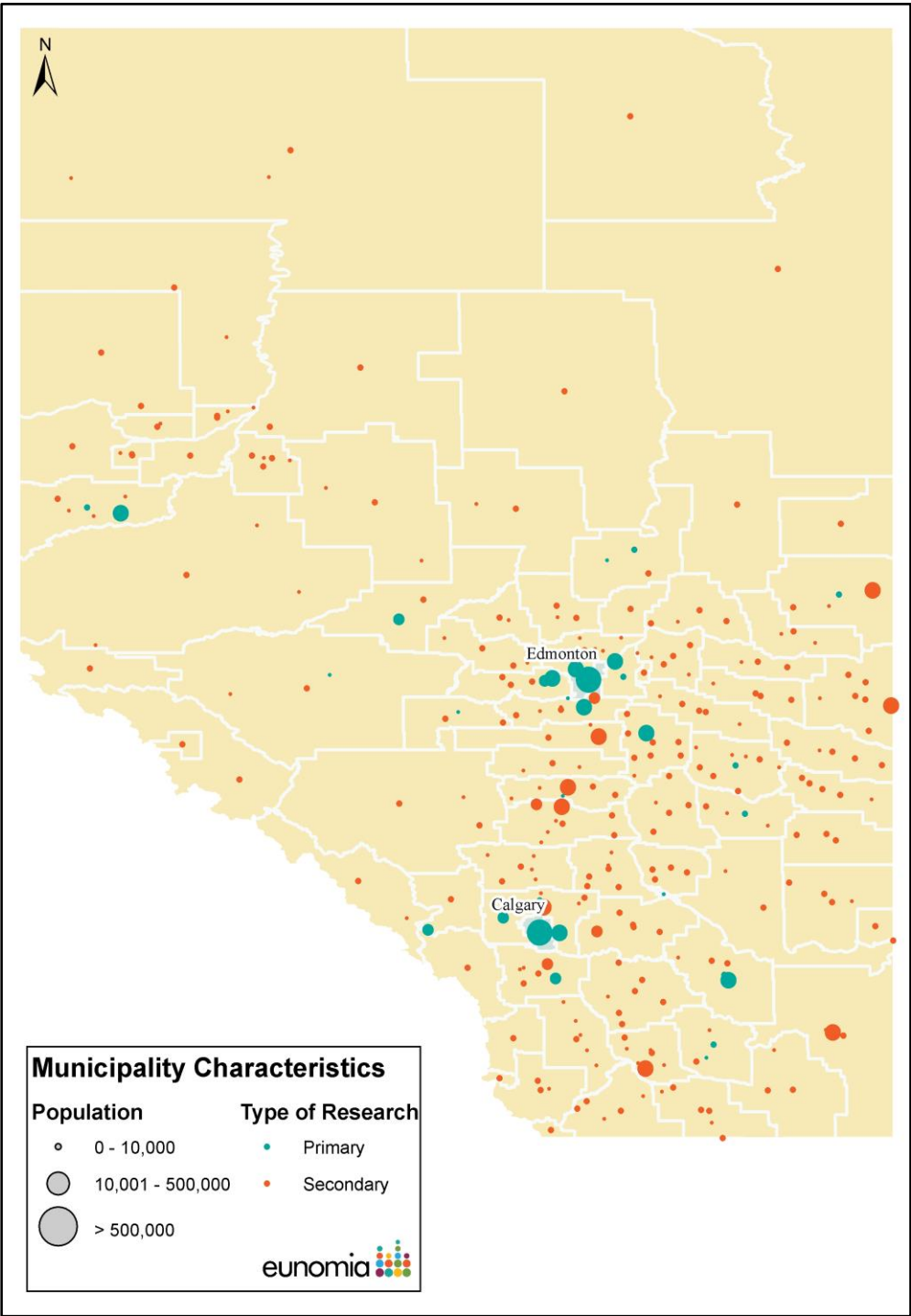


Source: Eunomia

In order to conduct the analysis, primary data was requested from almost 100 municipalities and received from 31 municipalities. Secondary data was collected from 101 additional municipalities. The primary survey data covered 69% of the Alberta population. The map in Figure 1-2 shows the communities from which data was gathered. In addition to the primary and secondary data gathered specifically for this study, data gathered through the *Quantifying the Economic Value of Alberta's Recycling Program* study was also integrated.²⁹ For environmental benefits, we used collection contamination rates as well as MRF contamination rates to account for losses of material before being recycled.

²⁹ Eunomia Research & Consulting Inc and Kelleher Environmental. (2019). Quantifying the Economic Value of Alberta's Recycling Programs. https://recycle.ab.ca/wp-content/uploads/2019/07/RCA_Economic_Analysis_Report_Final.pdf

Figure 1-2: Data Collection from Municipalities Across Alberta



Source: Eunomia

2.0 Future State Vision

EPR is one way of facilitating Alberta's transition to a circular economy, where materials and products are used as long as possible and are recirculated into the economy through recycling, refurbishing or repurposing.³⁰ The Canadian Council of Ministers of the Environment (CCME) defines EPR as:

*"a policy approach in which a producer's responsibility, physical and financial, for a product is extended to the post-consumer stage of a product's life cycle. EPR shifts responsibility upstream in the product life cycle to the producer and away from municipalities. As a policy approach it provides incentives to producers to incorporate environmental considerations in the design of their products. EPR also shifts the historical public sector tax-supported responsibility for some waste to the individual brand owner, manufacturer or first importer."*³¹

To achieve such a system in Alberta, it is necessary to create an outcomes-based residential PPP EPR framework that:

- 1) uses audited data to enable insight that will help drive continuous innovation and improvement in packaging and system design, driving higher waste reduction and recycling rates, which are necessary for a circular economy
- 2) allows municipalities the flexibility to continue to provide residential PPP services and complementary to garbage and organics services;
- 3) provides producers with economic incentives and sufficient flexibility to establish an effective and efficient residential PPP reverse supply-chain;
- 4) provides regulators and producers with the flexibility to adapt to change over time without having to resort to prescriptive regulatory amendments, allowing for quick adaptation to market and environmental conditions; and
- 5) establishes strong governance and an oversight organization that has sufficient power to address non-compliance.

If implemented correctly, EPR is an effective mechanism to improve recycling rates, reduce litter, incentivize efficiency, and reduce costs for end-of-life management of residential PPP. An outcomes-based approach provides producers with flexibility on how to design and implement the system while encouraging innovation and continuous improvement in striving to meet prescribed performance objectives in the most cost effective and efficient manner possible.

³⁰Canadian Council of Ministers of the Environment. (2019). Canada-Wide Action Plan on Zero Plastic Waste – Phase 1. https://www.ccme.ca/files/Resources/waste/plastics/1289_CCME%20Canada-wide%20Action%20Plan%20on%20Zero%20Plastic%20Waste_EN_June%2027-19.pdf

³¹ Canadian Council of Ministers of the Environment. (October 2009). Canada-Wide Action Plan for Extended Producer Responsibility. https://www.ccme.ca/files/current_priorities/waste/pn_1499_epr_cap_e.pdf

2.1 Vision for EPR-based PPP Recycling in Alberta

Based on the feedback received by stakeholders during a visioning workshop held on July 30, 2019, along with information provided by project stakeholders following the visioning workshop (attendees and points of discussion provided in Appendix A.1.0), a vision for a made-in-Alberta EPR residential PPP recycling system has been identified.

A successful and effective residential PPP EPR system in the province of Alberta is one that:

- is easy for residents to use and understand;
- is convenient, consistent and equitable across the province;³²
- provides municipalities with the option to be involved in the collection of PPP;
- sets outcome-based performance targets;
- transfers responsibility for collection, post-collection and processing to producers, thus enabling producers to take responsibility and control of the end-of-life management of the PPP that they supply into the marketplace and protect municipalities from material risk;
- is operated and financed by producers as a reverse supply-chain for the collection, management and reutilization of PPP in a circular economy;
- incorporates considerations for producers that supply quantities of PPP below an established threshold;
- ensures improved environmental outcomes and drives a circular economy including:
 - increased waste diversion;
 - increased recycling of PPP;
 - reduced contamination and increase in quality of PPP collected and processed;
 - potential reduction in packaging placed on the market;
 - potential improvement in packaging design if Alberta harmonizes with other Canadian EPR frameworks to allow for ease of recycling, and re-introduction of the recycled material into a circular economy model;
 - improved tracking and transparency regarding the end-fate of PPP materials; and
- adds value to the Alberta economy.

As Alberta considers EPR for residential PPP, it should take note of PPP programs in other provinces. British Columbia (BC) launched its PPP EPR program on May 19, 2014 with the first stewardship plan submitted to the Ministry of Environment in November 2012. Recycle BC's second stewardship plan was approved by the Ministry in June 2019. In Ontario, municipalities are currently in the process of liaising with the same producers that operate in Alberta on the transition of Ontario's Blue Box program from a system that is partially funded by producers and largely operated by municipalities, to a system that is fully funded by producers and which gives producers more responsibility.

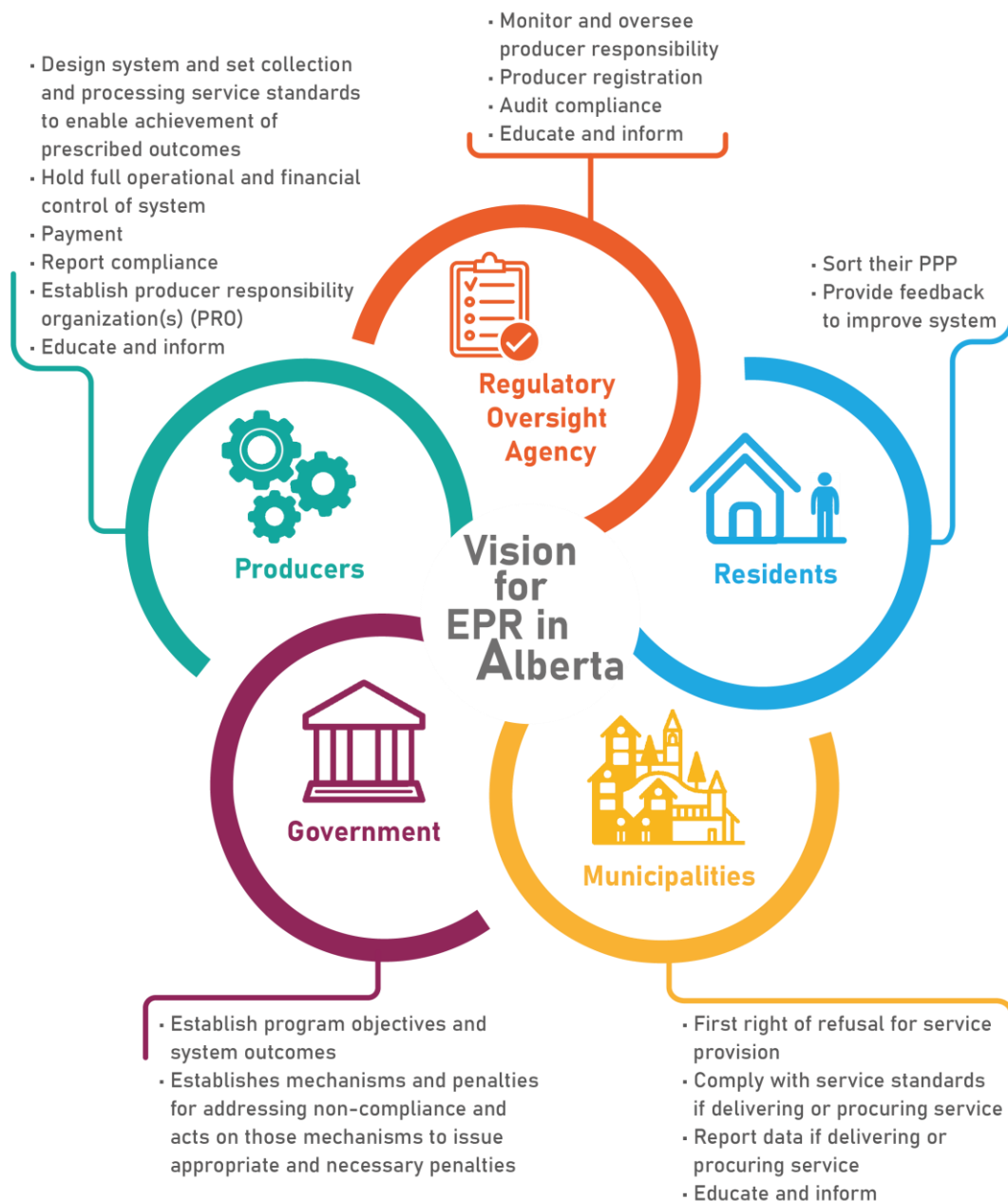
³² For instance, standardized PPP materials collected for recycling

2.2 Core Roles and Responsibilities of Key Stakeholders Under EPR

A residential PPP EPR framework will necessitate an allocation of roles and responsibilities between producers and municipalities and between producers themselves (primarily through their participation in a producer responsibility organization (PRO)³³) and between government and their regulatory agent. This distribution of roles is presented graphically in Figure 2-1 and summarized in the following section, which describes the various factors that need to be considered when implementing an EPR system for PPP.

³³ Defined by Environment Canada and Climate Change as: usually a not-for-profit organization or an industry association, is the entity designated by a producer or producers to act on their behalf to administer an extended producer responsibility or product stewardship program. In Canada, a PRO may also be referred to as a “stewardship organization,” an “industry funding organization” or a “delegated administrative organization.”

Figure 2-1: Roles and Responsibilities of Stakeholders in Future State



Source: Eunomia

2.3 Key Elements of an EPR System for PPP

In line with the vision outlined in Section 2.1, the key elements of an EPR system for residential PPP in Alberta are expected to include:

- 1) Transparency and accountability to Albertans through data-driven reporting and performance measurement to help identify opportunities for increased diversion and recycling in the province;
- 2) A shift in the cost burden of residential PPP services away from municipalities and taxpayers towards producers who have the power to make decisions about the design and recyclability of packaging materials;
- 3) Producers of PPP that are fully responsible, both financially and operationally, for the management of the system;
- 4) Clear definitions for designated products and materials for which producers will take responsibility that are flexible enough to allow for the inclusion of new product and packaging formats as they enter the market;
- 5) A clear definition of “recycled” that ensures that reported diversion rates reflect what is actually recycled and used in the production of new products, and not just collected;
- 6) Provisions for continuous improvements to increase the quantity and quality of material recycled through high targets that increase progressively over time and are set alongside penalties for non-achievement; and
- 7) Provisions for producers that help secure better access to recycled materials so that they can meet their internal circular economy commitments and goals.

To ensure a smooth transition from the existing residential recycling system to the new EPR framework, implementation of the above elements should be carried out in a smart, equitable and planned manner.

3.0 Implementation Considerations for an EPR System for Residential PPP in Alberta

This section describes the various considerations that need to be taken into account when considering transition from the current residential recycling system for residential PPP to an EPR-based system. This section also discusses the roles and responsibilities for the five main stakeholder groups described (i.e., government, regulatory oversight agency, producers, residents, and municipalities), in the framework presented in Figure 2-1.

3.1 Government Role

3.1.1 Establish Program Objectives and System Outcomes

The government's role is to ensure that regulations clearly specify the prescribed outcomes for the program that must be met as well as the penalties that will be imposed if these outcomes are not met. Producers' role is financial and operational responsibility for the system, as well as sufficient flexibility to design the system to be efficient and meet the outcomes prescribed. Municipalities should be given the 'first right of refusal' opportunity to continue in a role delivering recycling collection services to avoid impacts on integrated waste collection services.

The primary desired outcomes of the residential PPP EPR program are to:

- Reduce the amount of PPP that is destined for disposal and support the development of a circular economy by supplying recycled PPP to manufacturers through a reverse supply chain;
- Ensure accessibility to PPP collection through curbside and/or depots for Alberta households; and
- Prevent free riders while incorporating considerations for producers that supply quantities of PPP below an established threshold.

Each of these outcomes is described in further detail below.

Reducing the Amount of PPP Destined for Disposal and Supporting the Development of a Circular Economy by Supplying Recycled PPP to Manufacturers through a Reverse Supply Chain

The most common approach to achieving this outcome is to set high targets that increase over time, accompanied by appropriate penalties to deter non-compliance and under-achievement.

This approach has been used in BC, which recently increased its packaging collection targets, as well as in the EU, which increased its recycling targets (which count only material actually sold back into the reverse supply chain, excluding residues).

When setting targets, there are three important factors to consider:

- The focus and level of the targets;
- The phasing of the targets; and
- The measurement of performance against the targets.

Focus and Level of Targets

It is imperative that targets are material-specific (e.g., different types of plastics, metals, etc.) and set at a level high enough to incentivize phasing out non-recyclable material from the packaging stream. As an example, an overall target of 30% for plastics is likely to result in the collection of only those types of plastics that are easy to recycle (such as bottles made from PET). Harder-to-recycle types, such as plastic films, would then not be addressed. This results in one material type's performance cross-subsidizing another and weakens the incentive for producers to use materials that are easier to recycle. Another example is PP and PS clamshells (such as those used for take-out food), for which there are fluctuating markets in Alberta. This situation is forcing many municipalities to landfill these materials. Under an EPR system with high targets for all material types, producers would be encouraged to either phase out the use of such material or develop markets for these materials in order to be in compliance. The objective should be to set performance standards that drive innovation in collection, processing and market development.

While targets need to be sufficiently granular to drive out non-recyclable material and increase overall recycling performance, care needs to be taken to ensure that this does not become overly burdensome for producers, which could lead to issues such as inaccurate reporting and unnecessary costs. Additionally, material-specific targets and penalties should be set high enough to mitigate the financial incentive not to recycle, which can occur when the costs of disposal are lower than the costs of recycling. This is a particular concern in areas with relatively low landfill fees, such as in Alberta. In these markets, complementary policy, such as disposal bans or taxes can be implemented. In the absence of stringently enforced performance standards (i.e., recycling targets, mandatory accessibility and collection standards), the incentive will be to simply send PPP to disposal. The initial focus should, therefore, be on setting high recycling and diversion targets, with sufficient enforcement and accountability to ensure compliance.

Phasing of Targets

The long-term objective is to ensure that all PPP material sold into the Alberta market is recyclable and that there is sufficient incentive to invest in the necessary recycling infrastructure. Where recycling in Alberta is not economically viable, the phasing out of certain packaging formats may gradually occur. Providing transparency on the trajectory of targets over time will enable producers to make informed packaging design and recycling infrastructure investment decisions.

Mechanism for Measurement of Performance Against Targets

Measuring progress against performance targets is critical to determining achievement of the program vision and subsequent goals. It is recommended that a PPP EPR program be assessed based on not only what is collected, but what is actually recycled, as it is only the material that gets recirculated into new products and packaging is important (from the perspective of a circular economy). Reduction and reuse

of PPP reduce the overall burden to the environment, and the frequency of these methods should also be tracked.

There are other points of measurement that take into account, for example, the amount of material that exits the MRF.³⁴ This approach was used by the European Commission prior to the revision of the definition mentioned above. It should be realized, however, that these calculation methods do not reflect what is actually utilized in a product: the losses of material after sorting at MRFs and before the material is used in a recycling process can be in excess of 15% in the case of some materials, notably, plastics.³⁵ A regulation that includes such a rigorous recycling calculation methodology obviously requires stringent levels of accurate reporting across the whole recycling chain.³⁶ This is likely to be easier where materials are processed within Canada or the US. Processes for tracing the output of material that is passed on to the manufacturing of new products and packaging is likely to require time to establish appropriate processes, but this can be included during the transition.

Calculating the percentage of material recycled involves dividing the amount of material recycled at the point of measurement – the numerator (as discussed above) – by a denominator. In some cases, the denominator is the quantity of material sold into the specific region or country (and reported by obligated producers), and in others it is the quantity of material generated by households as measured by waste audits. A discussion of the points related to the difference in measurement methodologies is included in Appendix A.2.0.

Either way, the obligated producers who are responsible and report their tonnes accurately pay fees for the recycling system. The key with any EPR system is to make sure that all obligated producers are paying their fair share and that free-ridership should be minimized through rigorous enforcement.

Regardless of what forms the denominator, the most important factors are ensuring that the recycling calculation is based on accurate reporting and auditing of the data on which the recycling calculation is based, that Alberta makes an informed decision on the appropriate methodology and that provinces move towards a harmonized approach across Canada. The arguments for using the quantity of material supplied or generated as the denominator need to be carefully thought through in the context of what can be included in the numerator. See sections below for further information on free-riding and de minimis thresholds.

³⁴ According to Article 6(1) of Directive 94/62/EC, “If the output of the sorting plant is sent to effective recycling or recovery processes without significant losses, it is acceptable to consider this output to be the weight of the recovered or recycled packaging waste.” However, given current contamination rates, this scenario seems unlikely, so a more stringent definition is recommended.

³⁵ Conversation with CITEO, France on 30/09/19

³⁶ It should be noted that in the European Union, the targets were established prior to the methodology. It is advisable that the two are developed in unison.

Enforcement of Targets

Many Canadian product stewardship and EPR programs suffer from either a lack of legislated targets or targets that are unenforced. While the target level does not necessarily need to be defined within the legislation, the mechanism for determining and reviewing the targets should be regulated. These calculated targets should be mandatory with penalties for non-compliance. Governments should be ultimately responsible for ensuring compliance with regulation and that necessary steps are taken by parties to discharge their regulated obligation.

Alternative and Complementary Approaches to High Recycling Targets

Standards and targets around reusability, recyclability, and inclusion of recycled content can also be used to encourage design of products, so that only recyclable PPP with a viable market is produced and sold. However, these additional targets should work in tandem with material-specific recycling targets for PPP sold into the provincial marketplace. In respect to recycled content, the CCME is working to create national standards for recycled content thresholds as well as guidelines for government procurement recycling content guidance. For the purposes of facilitating consistency, any potential regulation that may include recycled content standards should be mindful of CCME's work and should ensure alignment with potential future federal policy.

Modulated fees can also help incentivize producers to switch to material types that are more easily recycled, or to develop infrastructure that supports the recycling of a widening range of materials. Fee modulation involves structuring producer fees based on the types of materials used in their products. Materials that are more difficult to recycle are subject to higher fees, which incentivizes producers to design packaging and products out of easier-to-recycle materials that have lower fees.

Reusability and recyclability standards and targets, recycled content requirements and modulated fees are in place in other jurisdictions in addition to specific recycling targets, which are needed in all cases. These additional approaches are more effective when applied at a national scale. Some or all should be considered in Alberta, both to move the conversation forward in Canada, while also pursuing measures to reach a circular economy with greater focus on waste prevention.

Scope of Designated Material

Material designated under the residential PPP EPR system must be clearly defined. A summary of the regulations and definitions of PPP in each Canadian EPR program and also the EU is provided in Appendix A.3.0.

The materials within the packaging and paper categories also need to be carefully defined. Part three of CSSA's National Reporting Guidebook³⁷ sets out a national material list and summarizes which materials

³⁷ Canadian Stewardship Services Alliance. (2019). Part Three: National material list.
<https://guidebook.cssalliance.ca/wp-content/uploads/2019/01/2019-Part-3.pdf>

are covered in each of the four Canadian provincial programs that it supports.³⁸ The range of material that is currently being collected curbside in Alberta by large municipalities is comparable (see Appendix A.4.0). Alberta's PPP program should align as closely as possible with the materials that are legally designated in other provinces with the intention of creating a harmonized EPR system in Canada.

In Canadian PPP EPR systems, newspaper producers are obligated to join the program. Although the financial arrangements differ in each province, newspaper producers generally contribute free advertising rather than contribute fees to the PPP programs. Alberta will need to address an arrangement with newspaper publishers, having regard to arrangements with governments in other provinces.

Two notable examples of the arrangements that other provinces have made with the newspaper industry are:

- In BC, the provincial government pays stewardship fees on behalf of newspapers to Recycle BC. The government contribution is offset by government advertising in member newspapers in the amount of \$40/tonne of newsprint sold into the province.
- In Quebec, newspapers pay \$3.8 million in advertising space and the remaining \$5.3 million in fees. About \$5 million is reimbursed by the provincial government. Fees are paid to Recycles-Médias and Recyc-Québec.

BC is currently consulting stakeholders on expanding the scope of designated material to packaging-like products (i.e., products resembling packaging but sold as a product, such as aluminum pie plates) as well as certain single-use plastic products such as plastic straws and cutlery.

EPR regulations should be written such that new packaging materials that enter the market can easily be incorporated into the list of designated materials so that the producers of these products can contribute to the costs of collection.

Generation Source of Obligated Material

While there is a trend in European EPR schemes to include ICI material in the PPP systems, it is recommended that Alberta's system begin by addressing residential PPP only in order to be consistent with existing programs in Canada. With that being said, there could be a requirement for producers to report on the quantity of PPP sold into the ICI sector, which would help establish a baseline and possible measures to address this waste in the future.

Additionally, a plan to address PPP material that ends up as litter and/or in the garbage stream should be considered, recognizing that this may be part of a phased or longer-term approach. The European Commission's *Single Use Plastic Directive* requires producers to cover the full costs of the relevant

³⁸ CSSA does not summarize the packaging and paper categories that are legally designated in Quebec. That information is provided by the program operator, Eco-Entreprises Quebec (EEQ) on its website.

packaging at the end-of-life including that related to litter clean-up. Article 9-1, (k) of the European Commission's *Waste Framework Directive* requires Member States to identify products that are the main sources of littering, notably in natural and marine environments, and take appropriate measures to prevent and reduce litter from such products; where Member States decide to implement this obligation through market restrictions, they shall ensure that such restrictions are proportionate and non-discriminatory (see A.1.0 for further information).

Ensuring Accessibility to PPP Collection for Alberta Households

An “accessible” recycling system is typically defined as one where:

- Alberta households are able to recycle the same set of materials;
- It is at least as convenient to recycle materials as it is to dispose of them as garbage; and
- In situations where curbside services are not practicable, standards are set with respect to the longest travel distances or travel times to recycling locations such as drop-off depots, and/or the density of depot sites.

An example of a performance standard related to accessibility can be seen in BC. BC's *Recycling Regulation* mandates “reasonable and free consumer access to collection facilities or collection services,”³⁹ which has led to 98% of the BC population being within a 30- and 45-minute drive of a depot for urban residents and rural residents, respectively.⁴⁰ Ontario's *Tire Regulation* offers another example of an accessibility standard; it specifies that all sites that sell tires must accept them, ensuring equal access to proper disposal facilities for all residents.⁴¹

A further option for ensuring accessibility is for producers to be required to deliver streetscape recycling. Eligible areas to be serviced could be defined based on land use designations, including residential and retail, with exclusions for ICI-only areas.

Alberta should strive for the greatest consistency and convenience for all its residents and define a standard(s). Further information on accessibility standards and language in other Canadian provinces is provided in Appendix A.3.0.

Preventing Free-riders While Considering Small Businesses

EPR passes the costs of recycling PPP to the producers of that material. Governments often recognize that small, local businesses should not be unduly burdened by administrative or financial obligations,

³⁹ http://www.bclaws.ca/Recon/document/ID/freeside/449_2004

⁴⁰ Recycle BC. (2019). Packaging and Paper Product Extended Producer Responsibility Plan. Revised June 2019. http://recyclebc.ca/wp-content/uploads/2019/07/RecycleBCStewardshipPlan_16July2019.pdf

⁴¹ <https://www.ontario.ca/laws/regulation/R18225>

and that free-riders (companies who are obligated, but don't pay their fair share) can increase costs for all others involved in the system. EPR programs often consider small businesses by setting a de minimis threshold below which producers are excluded from contributing to the cost of the system, however they may be required to report data, such as quantity of material sold into the market.

A de minimis provision can be based either on a producer's turnover or the quantity of packaging that they place on the market. In Ontario, for example, there are two de minimis thresholds, one that is weight-based and one that is based on gross revenues. Producers do not need to register with Stewardship Ontario if their gross annual Ontario sales are less than \$2M. Producers with Ontario gross sales over \$2M, but with total reported PPP quantities of less than 15 tonnes, must report their material to Stewardship Ontario, but are exempt from paying fees.

In BC, businesses with revenue less than \$1M are exempt, as are businesses that supply less than one tonne of PPP to the BC marketplace. Also exempt are businesses that are a single point of retail (i.e., businesses that only operate one retail location and that do not supply products on-line, or as part of a chain or franchise⁴²) and charitable organizations registered under the *Income Tax Act* (Canada). A summary of de minimis provisions and thresholds in Ontario, BC, Saskatchewan and Manitoba can be found in CSSA's *Guidebook for Stewards*.⁴³

Notwithstanding the above, regulation needs to ensure that all companies that supply residential PPP into Alberta are identified and that those companies contribute to paying for the cost of the system. This requires clearly identifying which producers are obligated under the program. In BC, the *Recycling Regulation* defines a producer as:

“(b)(i) a person who manufactures the product and uses in a commercial enterprise, sells, offers for sale or distributes the product in British Columbia under the manufacturer's own brand,

(ii) if subparagraph (i) does not apply, a person who is not the manufacturer of the product but is the owner or licensee of a trademark under which a product is used in a commercial enterprise, sold, offered for sale or distributed in British Columbia, whether or not the trademark is registered, or

(iii) if subparagraphs (i) and (ii) do not apply, a person who imports the product into British Columbia for use in a commercial enterprise, sale, offer for sale or distribution in British Columbia.”⁴⁴

⁴² *Ibid.*

⁴³ <https://guidebook.cssalliance.ca/part-one/1-0-introduction/1-11-what-is-a-small-business-policy/>

⁴⁴ http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/449_2004

Programs delivered against a clear definition of “producer” are better equipped to deter free-riders, as members have a better understanding of who operates in their sector.⁴⁵ The language needs to be such that companies, including non-resident online retailers, wholesale importers (as first importers) and where there is no resident producer (for instance, couriers that transport online sales into Alberta⁴⁶), are obligated to participate.

Providing Producer Compliance Oversight

The government may appoint a third-party agency to provide oversight and monitor progress against targets. The potential role of such an organization is described in Section 3.2. This oversight can also be done by a government agency in lieu of a third-party.

3.1.2 Establish and Use Mechanisms and Penalties for Addressing Non-compliance

There are several ways in which producers can be non-compliant, thus reducing the overall effectiveness of the system. These include:

- Inaccurate or under reporting of material sold in the market (by individual producers or PROs);
- Failing to register and avoiding paying their share of the system (i.e., free-riders) (by producers or through a PRO); and
- Failing to meet performance standards and targets.

Companies may not comply with the regulations if the risk of going to court or the penalty incurred is less than the benefits gained by free-riding the system. To help ensure full compliance and minimize the likelihood of individual producers trying to subvert their obligations, penalties should be established in regulation. For example, penalties should be incurred when targets are missed and they should be commensurate with the scale of the failure in order to ensure that the regulation is binding and effective, rather than symbolic. The regulatory oversight agency, discussed in Section 3.2, should be granted authority to issue administrative penalties, however investigating and ensuring non-compliance with regulation is the role of government, as is prosecuting those producers that do not comply with regulation. For example, if a PRO fails to achieve targets for one material, the regulatory oversight agency should take steps to ensure that necessary steps are taken by producers to meet targets. However, if a producer avoids joining a PRO or under-reports its PPP (i.e., acts as a free-rider), government should ensure individual producers are made to comply.

⁴⁵ BC defines producers in Appendix D of Recycle BC’s Packaging and Paper Product Extended Producer Responsibility Plan, June 2019 (https://recyclebc.ca/stewards/regulation_and_stewardship_plan/)

⁴⁶ Noted that Canada Post can only be federally regulated.

3.2 Regulatory Oversight Agency

3.2.1 Monitor and Oversee Producer Responsibility

Alberta currently has no centralized system through which data on collection and recycling can be reported. Therefore, the first priority for an EPR program in Alberta will be to establish a data management and reporting system, through which producers can submit data confidentially and where there can be transparency on the quantity of material collected, processed and recycled by material type in order to demonstrate that targets have been met.

The regulatory oversight agency will need to establish processes to verify the data provided by producers. The data management system should also ensure that producers are held accountable for their supply-chains (i.e., operators, collectors, transporters, recyclers and processors of end-of-life products/materials) and that all data provided is accurate under the standards established through the regulation, as laid out in the vision.

An example of an oversight agency that performs this type of regulatory compliance role is Ontario's Resource Productivity and Recovery Authority (RPPRA), a description of which is available in Appendix A.5.0.

3.2.2 Producer Registration

Producers (and/or the PROs fulfilling their obligations on their behalf) will be required to register with the regulatory agency and provide data to demonstrate what their obligations will be under the program (e.g., to confirm if they fall under the de minimis threshold). Producers will also be required to regularly provide information regarding what quantity and types of PPP they sell into Alberta and the quantity of PPP collected and recycled.

3.2.3 Audit Compliance

Effective EPR requires accurate reporting of the quantity of material sold into the market. The regulatory oversight agency must put in place processes to periodically audit producer data submitted annually at a sufficient frequency to deter and capture fraudulent reporting.

The regulatory oversight agency should also carry out periodic audits of the composition and quantity of PPP generated from the residential sector in both the garbage and recycling streams, to assist in determining the total quantity of residential PPP generated.

3.2.4 Educate and Inform

The regulatory oversight agency should be a resource for residents to gain information about recycling under the EPR system, including the roles and responsibilities of different actors and the performance of the system against the requirements set in the regulation. However, the main responsibility for education lies with the producers and/or the PRO(s) (see Sections 3.3.6 and 3.4.4).

3.3 Producers

3.3.1 Design System to Enable Achievement of Prescribed Outcomes

In order to meet the program objectives and outcomes set out in regulation, producers have several options they can choose from, including: investing in collection systems and technologies to meet those targets; reducing the amount of packaging they place on the market; or redesigning products and packaging to be easier to collect and recycle. Producers can also choose to implement a combination of all three actions, as long as system outcomes are met. These will be subject to audit and enforcement.

3.3.2 Financial and Operational Responsibility

The core component of EPR is the financial and operational responsibility for the management of PPP at end-of-life by the producers of PPP. Although the ‘responsibility’ aspect of EPR is occasionally interpreted as solely financial, it has become clear that operational responsibility must go hand-in-hand with financial responsibility in order for an EPR system to function as intended and deliver high performance.

In the context of EPR, operational responsibility means the authority to fully design and operate the PPP recycling system (from collection to processing to marketing of the material) in a manner that achieves the outcomes specified by the provincial government. It is up to the producers to decide how the accessibility standards, collection standards, and recycling targets will be met. While Alberta’s EPR program for PPP should give producers full operational responsibility for end-of-life management of PPP, it should provide municipalities with the option to continue to have a role in PPP collection under established service standards.

Ontario recently held mediated discussions between producers and municipalities regarding the transition of Ontario’s Blue Box to full EPR – managed and financed by producers. In these discussions, producers indicated that they will only agree to an implementation of EPR that provides them with determinacy in the operation of the PPP collection and management systems. Specifically, the mediator’s report notes that:

“Producers accept that taking on more responsibility means they will pay more to recycle their printed paper and packaging. Producers support this shift, however, because it gives them full control, from design and production all the way through to collection and recycling.

Producers are willing to take on new responsibilities and costs because this full control is part of a long-term strategy that allows them to innovate, compete, and reduce costs. They want producer responsibility applied broadly and fairly, to create a level playing-field where innovators are rewarded for their efficiencies and free-riders are penalized for not following the rules.

Making producers responsible for blue box materials can help drive changes in packaging design, use and recycling. When producers are responsible for collection, sorting, and diversion, they have the financial incentive to make their products as efficient to manage as possible.”⁴⁷

Collection

Collection of PPP should be carried out in a way that is in line with the vision (described in Section 2.1) and that adheres to service standards, as developed by producers to achieve the regulated outcomes.

Municipalities should have the first right of refusal to provide recycling collection services. If they assume this right, they have two options:

- 1) Provide the services themselves; or
- 2) Contract with a third-party commercial provider.

In both cases, the municipality needs to provide recycling collection services consistent with service standards and contract terms (which include required collection frequencies, standard list of collected materials, set out requirements, etc.) developed in consultation with producers in order to be compensated. Contract terms between municipalities and producers should be negotiated in an open, transparent and fair manner.

Under the second option, municipalities that procure garbage, organics and recycling under one contract can continue to do so, so that the financial and operational benefits of operating services alongside each other are not impacted, as could also be true for municipalities providing their own services.

If municipalities do not want to provide collection services, the producers, acting individually or through a PRO would contract with a commercial provider to provide PPP collection services in the municipality.

Post-collection Management

When producers are in control of the processing and marketing of PPP, they benefit from economies of scale to drive innovation and maximize yield of recycled materials. Producers need access to various packaging materials to make those materials available for use in their own circular economy systems and meet their recycled content goals.

In a future EPR system for PPP, producers will issue competitive tenders for post-collection services to consolidate, transfer and process materials collected in Alberta into recycled commodities. Based on information in Section 4.2.2, it is clear that considerable infrastructure for post-collection treatment already exists in municipalities across Alberta. It is possible that these might be contracted to the PRO.

⁴⁷ Ontario government. (2019) “Renewing the Blue Box: Final report on the blue box mediation process” <<https://www.ontario.ca/page/renewing-blue-box-final-report-blue-box-mediation-process>>

In these cases, the producers will bear the risk and retain the revenue from material sales on the market.

3.3.3 Compensation

As long as municipalities and commercial contractors comply with their contract, compensation will be offered by the producers (likely through the PRO(s)). The mechanism or process for determining compensation should be outlined, potentially in regulation, to the extent that it is not overly prescriptive, but provides transparency to municipalities.

3.3.4 Report Compliance

From the perspective of an obligated producer, demonstrating compliance with EPR regulations is often done through a PRO through regular reports to the regulatory oversight agency (further details below).

In BC, producers have established data reporting requirements as part of their commercial relationships with collectors and processors. In order to get paid, the collectors and processors must report their data to Recycle BC. Recycle BC also has an audit facility where it sends up to 140 random loads of PPP each month to undergo composition and contamination audits.

3.3.5 Producer Responsibility Organization (PRO)

The EPR regulation may allow for one or more PROs. PROs can be the legal route through which individual producers discharge their obligations. Alternatively, where regulations require individual producer responsibility such as is the case in Ontario under the *Resource Recovery and Circular Economy Act*, producers may still operate through a PRO but will be responsible for reporting individual compliance. Fees collected from producers are used by the PRO(s) to discharge producers' operational and financial requirements under the EPR system.

If there are multiple PROs, then they must coordinate to provide a common collection system, where the costs are split proportionately. Collection contracts will likely be made through the largest PRO or through a clearinghouse that coordinates costs and operational responsibilities.

3.3.6 Educate and Inform

Ensuring that residents are adequately informed and engaged will produce the best quality recycled product with the least amount of contamination. As the operators of the EPR system for PPP, producers will have the greatest insight into the specifics of the new system, and as such, will have a key role to play in educating the public about how it works and the extent of changes to current programs and

services. The PRO may produce educational materials to achieve this goal and/or producers may provide funding to municipalities for outreach and education to residents, as in BC.⁴⁸

3.4 Municipalities

3.4.1 First Right of Refusal

As detailed above, municipalities should be given the option to act as the collection service provider so as to ensure consistency between services, minimize service impact, and reduce the potential for stranded collection assets.

3.4.2 Comply with Service Standards

If a municipality decides to continue providing PPP collection services (either directly or through a contracted service provider), they need to do so in accordance with the service standards developed in consultation with producers in order to receive funding from producers.

3.4.3 Report Data

Municipalities that choose to be service providers must ensure that they can report on the material they collect and provide accurate data to the producers or PRO(s) (as set out in service standards), who will then report to the regulatory oversight agency. Data quality will be key in calculating the recycling rate.

3.4.4 Educate and Inform

As the first line of communication with residents, municipalities will provide an invaluable resource in the transition to and success of the EPR system for residential PPP. This will include providing information on potential changes in frequency of services, scope of materials collected, and services provided. Municipalities will receive support from the producers or PRO to educate their residents.

3.5 Residents

Residents are the first step in creating a successful recycling system. Residents are expected to correctly sort their residential PPP and prepare it for collection –either by placing it on the curbside, putting it into the appropriate collection container or bringing it to depots.

Residents should also provide feedback on the services offered to them in order to drive continuous improvement in the EPR system.

⁴⁸ Recycle BC. (2019). What is Extended Producer Responsibility? <https://www.rcbc.ca/resources/faqs/ep1>

4.0 Current State Assessment

In order to assess the impact of transitioning to a future state with EPR, it is important to understand what services Albertans are currently receiving and what the cost of those services are.

This section begins with an overview of the approaches used to collect, collate and verify primary data gathered from municipalities and secondary data obtained through research on current service provision and costs. An overview of the findings from a provincial perspective with further detail provided for large, medium and small municipalities as well as other municipality and community types and First Nations, where data was available, is then provided.

4.1 Data Collection, Verification and Modelling

In order to determine the current state of residential recycling, a data request, contained in Appendix A.6.0, was issued to almost 100 municipalities. Of these, a total of 31 provided substantial data responses. The data request asked for detailed information on how PPP is collected (curbside, depot or both), the type and quantity of PPP collected, how and where it is processed, and the costs associated with PPP collection, processing, administration and education.

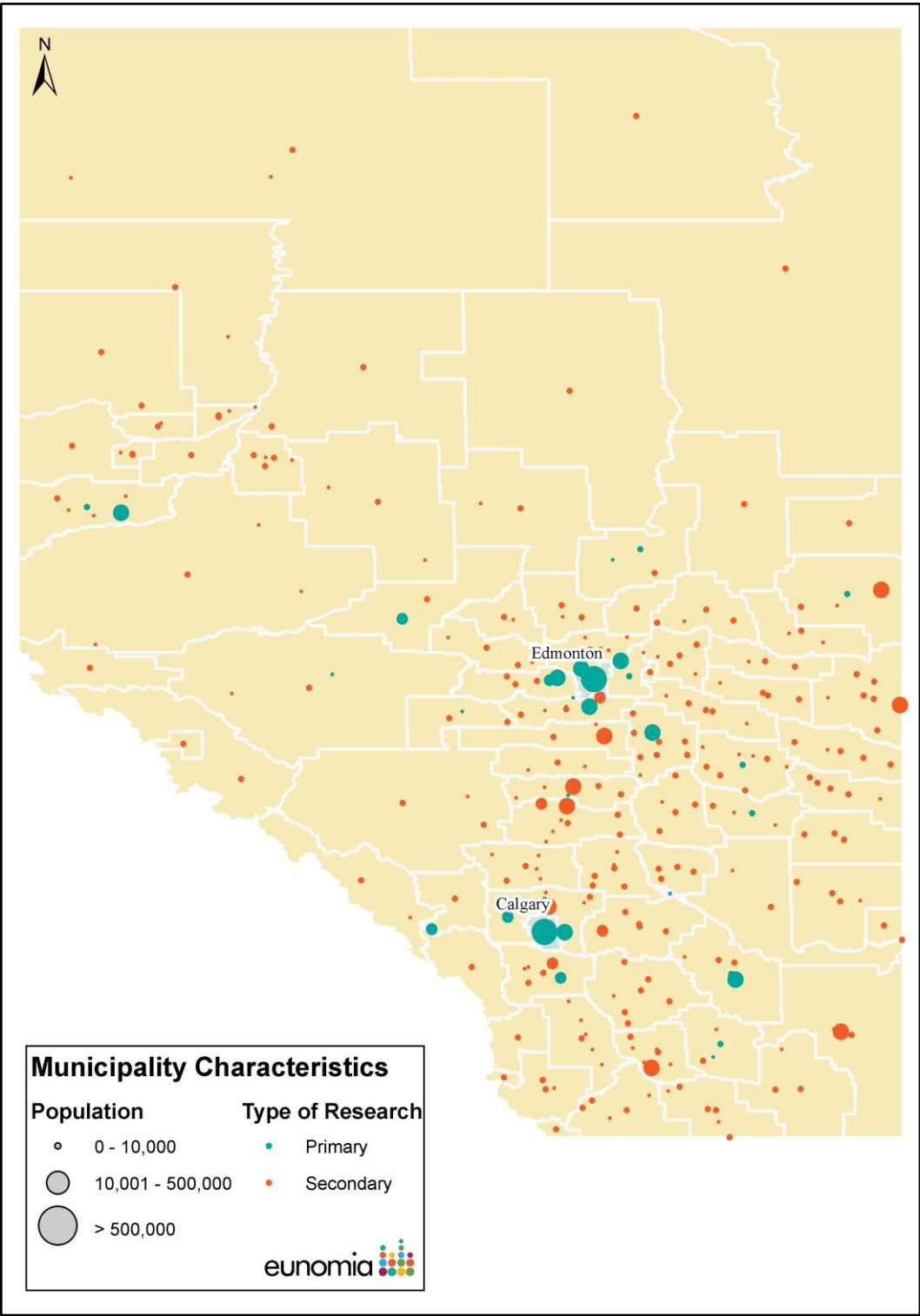
The primary data gathered from the 31 responding municipalities was supplemented with secondary data from a further 101 municipalities. Figure 4-1 shows the geographical areas for which primary and secondary data was received.

In addition to the data gathered specifically for this study, data gathered through the *Quantifying the Economic Value of Alberta's Recycling Program* study⁴⁹ was also incorporated into the service and cost models.

Data anomalies and inconsistencies were verified with municipalities in order to remove outlier data points. Appendix A.7.0 contains further details on how the available data were extrapolated and the assumptions used to provide a province-wide picture of PPP recycling services and costs.

⁴⁹ Eunomia Research & Consulting Inc and Kelleher Environmental. (2019). Quantifying the Economic Value of Alberta's Recycling Programs. https://recycle.ab.ca/wp-content/uploads/2019/07/RCA_Economic_Analysis_Report_Final.pdf

Figure 4-1: Sources of Primary and Secondary Data



Source: Eunomia

4.1.1 Determining Tonnes

Complete tonnage data was provided by large municipalities for this study, while the province -wide tonnes collected in medium, small and other municipality and community types was calculated to account for the municipalities where data was not provided. To calculate those tonnage figures, Eunomia used the service coverage proportion of each of the municipality sizes from the sample (i.e., how many households in medium municipalities from our sample had access to curbside recycling services) and then applied those coverage proportions to the number of households estimated to be located in each municipality category. Eunomia then used the tonnes collected per household from the sample for SF curbside, MF collection and depot collection, and multiplied that figure by the estimate of how many households had access to each of those services. This revealed the estimate for total number of tonnes collected in the province by each municipality category.

The tonnes recycled were calculated based on outbound tonnes leaving the MRF using levels of contamination reported by the study group. These numbers will be less if, as recommended in Section 2.0, the calculation of what is recycled includes only that material which is made into a product. As an example, changing the point of measurement to the end processor would reduce the quantity of tonnes recycled, in some cases significantly (e.g., for PET, it is estimated that changing the point of measurement would reduce the tonnes recycled by 17%)⁵⁰.

4.1.2 Determining Costs and Jobs

It is estimated that 1,362 FTE jobs are created across the whole value chain from point of collection to where the recycled material is used to manufacture a new product. This study tried to determine the number of people employed in the collection, transfer, transportation and sorting of PPP material in Alberta. One of the main challenges in doing this is how costs are allocated for people and equipment that are used to deliver both PPP and garbage services. While this can be measured through activity-based costing (ABC) studies, the data request specifically asked municipalities to provide an indication of the percentage of time and people that were used to deliver the services. In the case of depots, which are used to collect a range of materials, some of the data from the Recycling Council of Alberta study was utilized to help apportion costs.

4.1.3 Determining Landfill Savings

Costs vary by landfill site and typically range from \$75 to \$120 per tonne. The typical per tonne disposal cost data was obtained from Morrison Hershfield and municipalities for existing landfill sites across Alberta. Contamination rates were then applied to the number of tonnes collected to determine the

⁵⁰ Conversation with CITEO, France on 30/09/19

tonnes recycled figure. This figure was then used to calculate the total land fill savings to municipalities by multiplying the respective costs by the tonnes recycled.

4.1.4 Determining GHG Emission Savings

Environment and Climate Change Canada (ECCC)'s GHG Calculator for Waste Management⁵¹ was used to model the GHG equivalent savings from the recycling services. It was determined that around 197,600 tonnes of PPP material were collected for recycling in Alberta in 2018. However, noting that contamination is removed by material processors after leaving the MRF, a conservative estimate of approximately 132,800⁵² tonnes of secondary material was assumed to replace virgin material in the production of new products. This number was used to calculate resulting GHG savings, after accounting for collection contamination as well as MRF efficiencies. ECCC's GHG model assumes a national average level of landfill gas capture.⁵³ Landfill data provided by Morrison Hershfield, however, suggested that there are limited landfill gas recovery projects at many Alberta landfills. The level of landfill gas recovery in Alberta means that the GHG savings may be higher than estimated.

4.1.5 Municipality and Household Types

Across Alberta municipalities, there are many variations in how services are delivered, from curbside pick-up of garbage, organics and recycling, to neighborhood recycling and garbage bins, to depot-only access for garbage and a limited range of recyclables. In short, an Albertan's access to recycling is dependent on where they live. Approximately 80% of Albertans live in urban centers.⁵⁴ The percentage of households in each municipality type used in this study is shown in Figure 4-2.

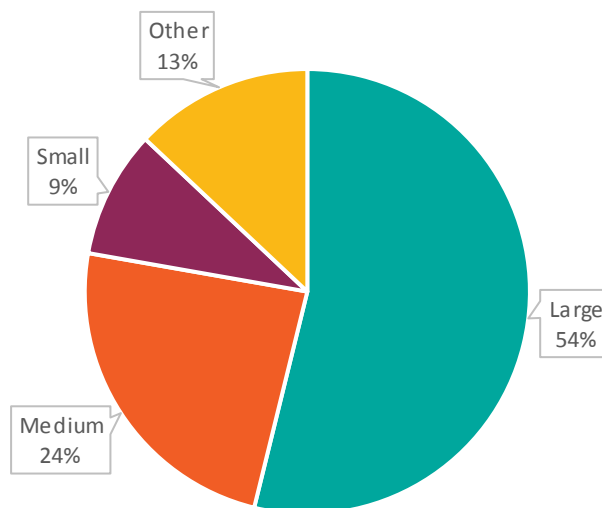
⁵¹ <https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/municipal-solid/greenhouse-gases/calculator.html>

⁵² 18% of tonnes recycled (163,200) is assumed to be removed during secondary processing based on data from the Recycling Council of Alberta report as well as discussions with CITEO. Eunomia Research & Consulting Inc and Kelleher Environmental, Quantifying the Economic Value of Alberta's Recycling Programs, June 17, 2019 (https://recycle.ab.ca/wp-content/uploads/2019/07/RCA_Economic_Analysis_Report_Final.pdf).

⁵³ 63% of landfilled waste is assumed to be disposed in landfills without gas recovery.

⁵⁴ Small, medium, and large cities defined as those listed in 2018 Alberta Municipal Affairs Population List (http://www.municipalaffairs.gov.ab.ca/documents/2018_MAPL_web.pdf)

Figure 4-2: Breakdowns of Municipalities by Type



Source: Census Profile, 2016 Census, Statistics Canada, Eunomia calculations

The figure shows that 54% of Albertans live in large municipalities; 24% live in medium municipalities; and 9% live in small municipalities. The remaining 13% of Alberta's population live in other municipality and community types.⁵⁵

Access to recycling services is also dependent on the type of household. SF and MF households receive differing levels of service in different municipality types. Furthermore, the classification of a household as SF or MF is different according to each municipality's definition, as described further in Appendix A.8.0. For the purposes of this study, MF households were determined using the census categories and include: apartment in a building that has five or more stories; apartment or flat in duplex; apartment in a building that has fewer than five stories.⁵⁶

Section 4.2 provides a province-wide picture of recycling in Alberta, with further detail provided in Sections 4.3 through 4.6 for different municipality types.

⁵⁵ For the purposes of this study, this includes: special areas, municipal districts, regional waste authorities, improvement districts, First Nations, Metis settlements.

⁵⁶ Based on 2016 Census categories, as reported by Statistics Canada.

4.2 Current State Assessment: Province

4.2.1 Collection Services and Accessibility

Collection of PPP materials in Alberta is currently handled on a municipality-by-municipality or regional basis. In order to implement a province-wide EPR system, the particulars of collection in each municipality will need to be understood in order to ensure a smooth transition.

Curbside and Depot Collection Services

Single-family vs. Multi-family – Large, Medium and Small Municipalities

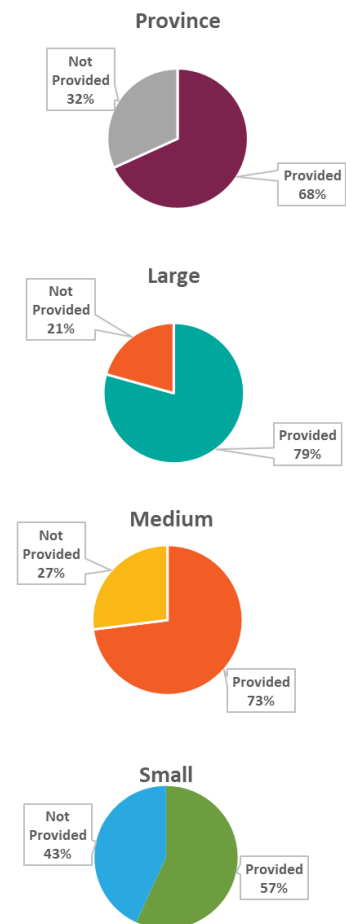
The percentage of households with access to curbside PPP services was ascertained through both primary data (reported by the municipalities themselves) and secondary data (found in reports and websites).

The available data indicated that across all households, 68% of Alberta households have a collection service provided or managed by their municipality with the remaining 32% hiring their own, private services, or relying on depot. In large municipalities, 79% of households have collection services provided or managed by their municipality. In medium municipalities it is 73%. This number drops to 57% for small municipalities.

From the data collected, it was extrapolated that a higher proportion, approximately 74%, of SF households across Alberta have recycling collection services. Of those SF households with curbside garbage collection services, approximately 7% do not have curbside recycling services.

Where MF properties are receiving PPP collection services, 43% are provided directly by the municipality, with the remainder left to hire

Figure 4-3: Percentage of Households Across Municipality Types that have Access to Collection Services Provided or Managed by Municipality



private contractors to receive this service.⁵⁷ SF curbside and MF collection services differ across municipalities. Collection frequency, materials collected, types of collection containers used, and service provider (whether in-house by the municipality or contracted to a private company) vary from one community to another. The differences in these services, as they relate to municipality type, are described in the sections below.

4.2.2 PPP Processing

After collection, PPP is processed, to varying degrees, at facilities that are owned and operated by either municipalities or commercial waste management companies. Processing of PPP in Alberta is linked to how materials are collected and, in most cases, can be split into the following categories:

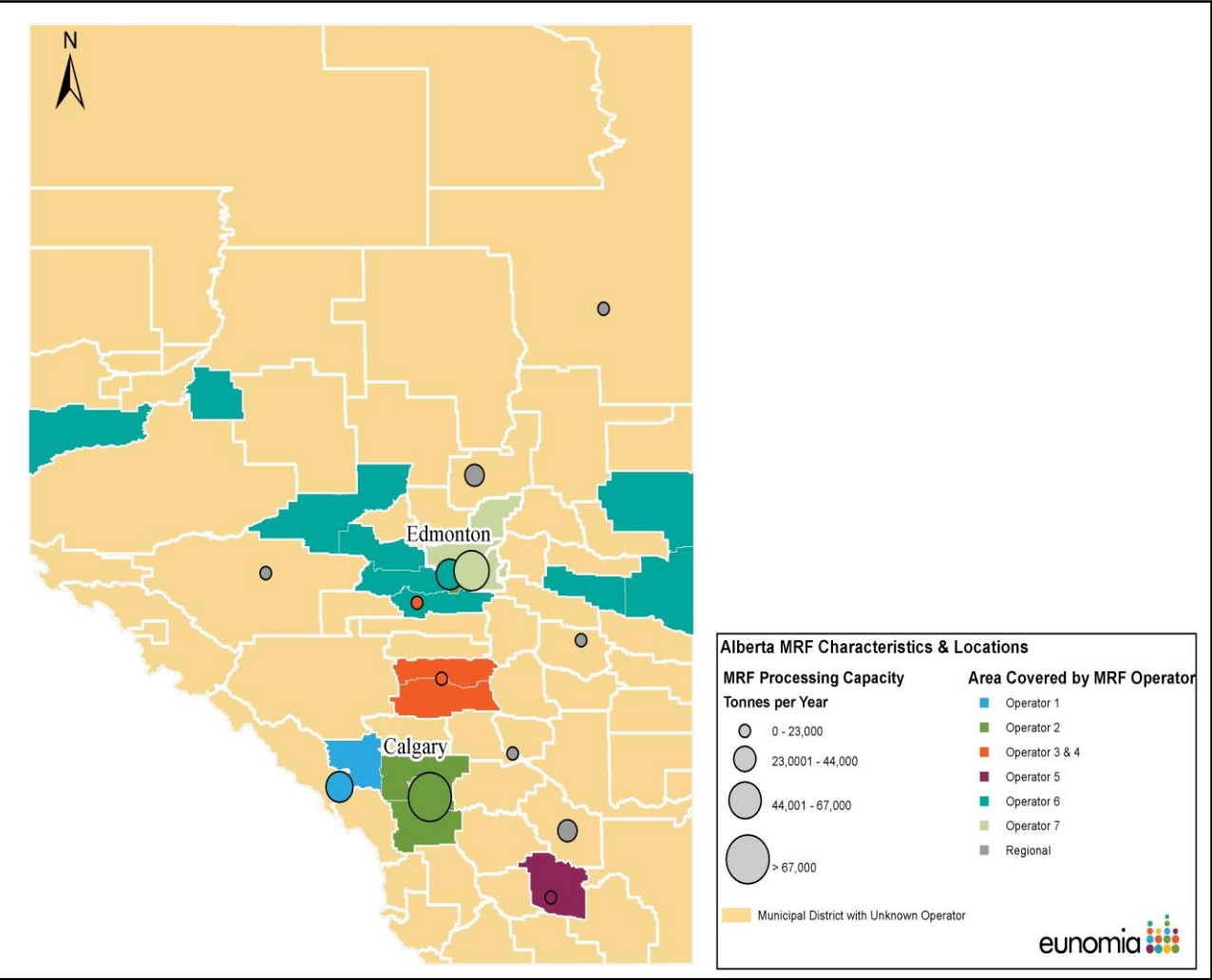
- Material recovery facilities (MRFs) that process single-stream recycling with varying levels of automation;
- MRFs that separate plastics and metal containers collected through dual - or multi- stream systems at the curbside or depot (this will have a simple processing line plus baling facilities); and
- Baling facilities, predominantly operated at depots for source segregated recyclables.

The large municipalities have single-stream MRFs that operate within their boundaries. Single-stream MRFs outside the large cities usually serve multiple municipalities. Multi-stream MRFs accept material that is already well-sorted from those municipalities with more than one recycling collection stream, so these facilities need less sorting equipment. At the baling facilities, materials are bulked and/or baled before being transported to the processor or shipped overseas.

⁵⁷ There may be MF properties that contract with the private sector for recycling collection services, but this could not be quantified so data only relates to services to MF arranged through municipalities.

illustrates the distribution of processing facilities across Alberta. A summary of the processing capacity in Alberta by facility is provided in Appendix A.9.0.

Figure 4-4: Location of Processing Facilities Across Alberta



Source: Survey responses and Eunomia research

Single-stream MRFs are predominantly owned by the private sector. Smaller facilities with simple working lines for plastics and cans and baling equipment are operated by the public sector. There has been one new single-stream MRF built in the last five years. All of the existing facilities appear to have the ability to increase throughput, should the future state require additional processing capacity.

Many more rural areas have depot-only recycling. The benefit of these facilities is that most materials are separated into multiple streams by depot users, reducing the processing requirements. Since the materials are sorted well, especially at staffed depots, baling is the predominant post-collection treatment.

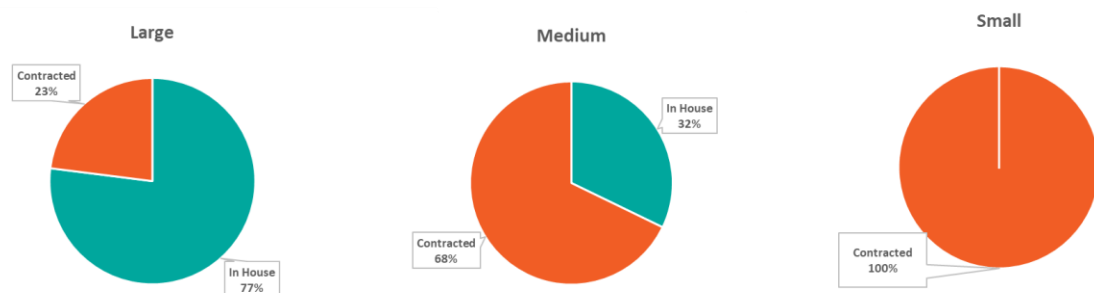
4.2.3 Contract Arrangements

Collection Contracts

An understanding of existing contracts will be important when planning the transition to the future state. Long contract lengths with MRFs may delay regional solutions that provide for cost and technological efficiencies and improvements that produce higher quality outputs for the reverse supply chain.

Figure 4-5 details the percentage of recycling collection services provided in-house by municipalities versus those provided by the private sector. This information was collected through survey responses for large, medium and small municipalities. Data was unavailable for other municipality & community types, as no respondents in that group provide collection services. Service provision outside of the two largest municipalities is predominately provided by the private sector. Appendix A.10.0 details the names of current private sector service providers identified through the primary data responses.

Figure 4-5: Breakdown of In-House and Contracted Curbside Services for SF Households in Large, Medium and Small Municipalities in 2018



Source: Eunomia primary and secondary research

PPP contracted collection services are priced in two main ways:

- Cost per household for collection plus processing costs, where the processing costs are incorporated into total costs by the contractor; or
- Cost per household for collection plus a per tonne processing fee.

The Chinese National Sword policy has placed strict quality requirements on recyclable imports since early 2018 and has made it difficult to find markets for many recyclable materials. This has resulted in the second pricing option being more prevalent. This arrangement allows private sector processors to transfer the material risk back to the municipalities, however, it creates a level of budget uncertainty.

Collection contracts for PPP services between medium- and small-sized municipalities and commercial waste collection contractors can also include collection of garbage and organics. Contracting services in this way is likely to provide financial and service efficiencies and benefits, as collection frequency can be altered and the same trucks can be used to collect two material streams. Some municipalities do not separate the costs of garbage and recycling in their budgets; greater transparency will be required in the transition to the future state.

There are many different contract structures and clauses relevant to EPR. Examples of key contract clauses from the study group are provided in Appendix A.13.0. A full review of contracts will be required during the transition to EPR, but in the short term, municipalities can consider how new contracts can be written to accommodate a future state under EPR.

Contract Length

According to survey responses, collection contract lengths are typically between three and five years.

Processing Contracts

As detailed in Section 3.0, under the future state, producers will want to design a system that can achieve regulated targets and that will drive the PPP reverse supply chain in the most cost-effective way. Material processing will be key to this effort and, as such, an understanding of existing processing infrastructure and contracting will be vital during both the transition to EPR and in its delivery.

Contract Length and Revenue Share

Of the reviewed contracts from the study group, the farthest end date for a processing facility was 2024.

Where specific contracts are in place for processing only, the municipality pays a cost for the processing of the material. However, in large municipalities there are revenue-share agreements, where the municipalities receive up to 90-100% of the revenue from the sale of the recycled material. In medium and small municipalities, revenue-sharing agreements are unusual. Processing contracts generally are based on a per tonne processing cost.

Residue Rates

Recyclable materials which are collected from households have varying contamination or residue rates, meaning some of the materials collected are not suitable for sale to end markets and contaminate the loads of paper, plastics and metals being sold to markets. These materials are removed through processing and are referred to as residue rates or contamination rates. The rate varies from under 10% for multi stream systems to 20% or higher for single stream systems.

Residue rates were reported as being higher for PPP collected from MF households. There are many challenges with implementing recycling programs in MF developments and with keeping contamination

levels down. Building configuration, location of bins, sufficiency of containers, signage and education alongside a higher turnover of residents and providing sufficient convenience are a few examples of such challenges.⁵⁸

Limited information was received from the study group on acceptable contamination levels for material entering MRFs. Where information was received, there was limited consistency. Some contracts specify maximum levels of contamination that the contractor will tolerate from the municipality with the cost of disposal for additional contamination covered by the municipality. Other contracts have no limit on contamination.

Facility Upgrades

The extent to which the processor picks up the cost of any additional upgrades to the processing facility varies by contract. For example, in cases where regional waste authorities handle the processing contract for several small municipalities, sometimes individual municipalities purchase or lease equipment (such as containers or balers) or cover some of the costs.

4.2.4 Bylaws

Bylaws are the mechanism through which services are defined. How descriptive the bylaws are is generally correlated with the scale of services provided, which in many cases corresponds to the municipality size. Compared to large municipalities, small municipalities offer a smaller range of services on average and have less prescriptive bylaws. More detail on bylaws across municipalities is found in Appendix A.8.0. The *Municipal Government Act* (MGA) provides authority to municipal Councils to decide, by resolution or bylaw, how services (including waste management services) will be provided. Service delivery, however, may be impacted by regulatory requirements of other legislation, allowing for provincial legislation that compels municipalities to alter bylaws in order to comply with a new producer-managed EPR system. The MGA was officially consolidated from other governing legislation in 1994 and is currently under review for an update.⁵⁹

4.2.5 Social, Environmental and Economic Impact of Recycling in Alberta in 2018

This section presents the social, environmental and economic impacts of the current recycling services in terms of the following metrics:

- quantity of material collected and being recycled (net of contamination);
- avoided GHG emissions associated with diverting PPP destined for disposal;

⁵⁸ <https://prc.org/app/uploads/2016/11/Multis-White-Paper-Draft-4.pdf>

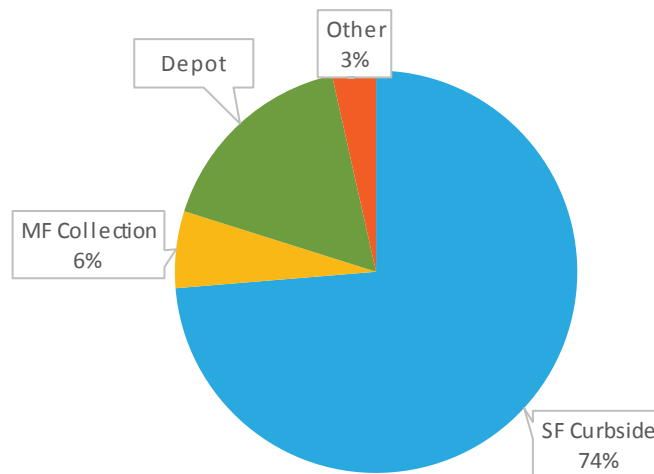
⁵⁹ Alberta provincial government (1994) *Municipal Government Act*. <<https://mgareview.alberta.ca/about/>>

- cost of PPP collection and processing services;
- saved disposal costs; and
- direct, indirect and induced jobs created.

4.2.6 Tonnage Collected and Recycled

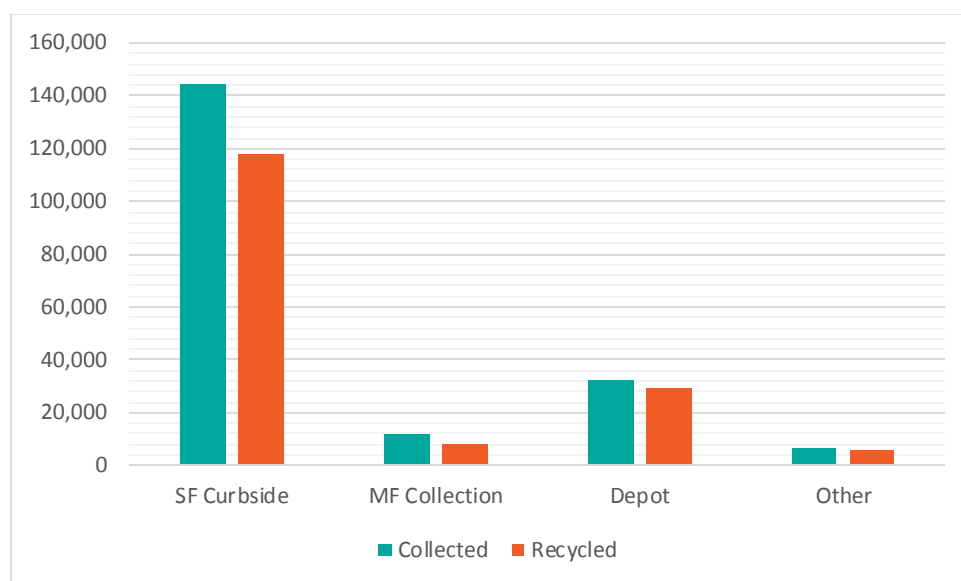
Approximately 197,600 tonnes of PPP materials are collected from residential sources for recycling each year in Alberta. Figure 4-6 presents the percentage of residential PPP estimated to be collected from different sources.

Figure 4-6: Tonnes of PPP Collected in Alberta by Source in 2018



Source: Survey Responses and Eunomia calculations

As shown in Figure 4-7, the tonnes collected per household varies significantly by source. On average, SF properties set out 160 kg/hh/year for curbside collection, versus 21 kg/hh/year for households that only have access to a depot. The higher collection rate for SF households is related to the convenience of curbside collection compared to other collection methods.

Figure 4-7: Tonnes of PPP Collected and Recycled per Household by Source in 2018⁶⁰

Source: Survey responses and Eunomia calculations

As illustrated above, SF curbside collects more than twice as much material per household than MF collection or depots. However, depots on average have the lowest levels of contamination, likely due to the separation requirements and better oversight at those depots that are staffed. Appendix A.7.0 provides more information on the amount of material collected by municipality type and method of collection.

4.2.7 Cost of Service Provision

The total cost of collecting and processing 197,600 tonnes of PPP in Alberta is estimated to be approximately \$107.0 million.⁶¹ Table 4-1 provides a breakdown of cost by municipality type. A more detailed breakdown of costs is provided in Sections 4.3.5, and Appendix A.7.0, including a comparison on a cost per tonne basis of contracted vs. in-house service provision.

Table 4-1: Total Costs of PPP Collection and Processing by Municipality Type in 2018

Municipality Type	Total (\$ million)
Large Municipalities	48.9

⁶⁰ Other includes PPP costs for eco-centres and semi-annual big bin recycling events.

⁶¹ Does not include additional tonnes or costs outside of services provided or arranged by municipalities.

Municipality Type	Total (\$ million)
Medium Municipalities	31.7
Small Municipalities	15.1
Other Municipality & Community Types	11.3
Total	107.0

Source: Survey responses and Eunomia calculations.

The current cost per tonne collected is \$543.

4.2.8 Avoided Disposal Costs

Disposal costs across Alberta range from \$75 per tonne to \$120 per tonne.⁶² Table 4-2 presents average estimated costs avoided in 2018 from PPP material that was recycled and therefore diverted from disposal. Avoided disposal costs are approximately \$17.2 million/year.

Table 4-2: Estimated Annual Avoided Disposal Costs in 2018

Municipality Type	Tonnes Diverted from Disposal	Typical Disposal Cost per Tonne (\$)	Total Cost (\$ million)
Large Municipalities	97,000	113	20.6
Medium Municipalities	40,200	75	7.1
Small Municipalities	17,200	102	3.5
Other Municipality & Community Types	8,800	102	1.8
Total	163,200	N/A	33.0

Source: Eunomia calculations.

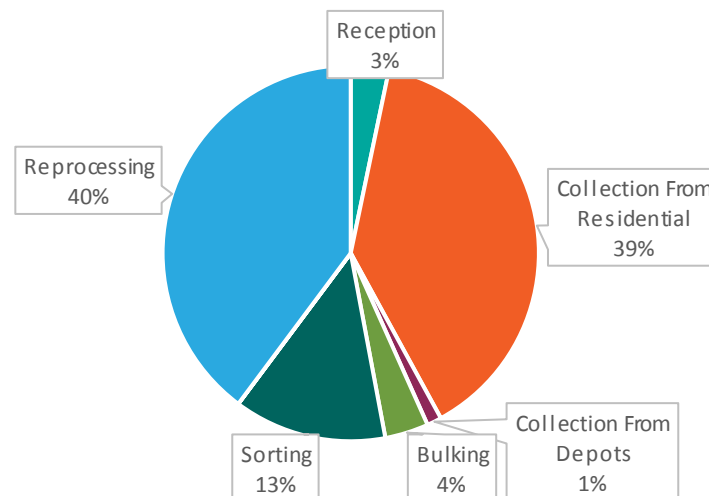
⁶² Disposal costs provided by Morrison Hershfield, Alberta office staff.

4.2.9 Jobs

The total number of FTE direct, indirect and induced jobs created by the PPP recycling sector in Alberta in 2018 was approximately 1,362. The number of direct jobs in the current state is about 775 FTE. This total was developed through responses received from the survey on employment levels at their municipalities as well as conversations with processors and others in the recycling industry.

Figure 4-9 provides a breakdown of the direct jobs associated with the recycling sector. Indirect and induced jobs are calculated based on this number and the assumptions detailed in Appendix A.7.0.

Figure 4-8: Breakdown of Direct Jobs Across Functions in Current State in 2018



Source: Eunomia data collection and calculations

4.2.10 Gross Value Added

The Gross Value Added (GVA) measures the value of goods or services added in a sector of the economy. The model created for this study uses the income approach to measuring GVA. The income approach sums up all of the income earned by individuals or businesses involved in the production of goods and services. The main components of income-based GVA are:

- compensation of employees;
- gross operating surplus (includes gross trading profit and surplus, mixed income, non-market capital consumption, rental income, less holding gains); and
- taxes (less subsidies) on production (but not on products).

Income-based GVA is a common approach to measuring the contribution of a sector to the overall GDP of a region. The GVA to Alberta's economy in 2018 from the recycling system was an estimated \$132.4 million.






4.2.11 Environmental Benefits

Appendix A.7.0 outlines the approach used to calculate the environmental benefits resulting only from diverting material from landfill. Based on the tonnage of material recycled (not collected), and therefore diverted from disposal, in Alberta, the reduced CO₂e emissions for the current state were 469,700 metric tonnes.⁶³

4.2.12 Current State Benefits Summary

A summary of the benefits resulting from Alberta's existing recycling system, as described above, is provided in Table 4-3.

Table 4-3: Summary of Benefits of Recycling System in Current State

Category	Value
 Jobs (FTE)	1,362
 GVA (\$)	132.4 million
 CO₂e Emissions Reduced (Tonnes)	469,700
 Total Tonnes Collected	197,600
 Total Tonnes Recycled	163,200

Source: Eunomia calculations

4.3 Current State Assessment: Large Municipalities

4.3.1 General

Fifty-two percent of Alberta's population resides in the province's two largest cities: Calgary and Edmonton. These two cities make up the large municipality category in this assessment. Within these municipalities, 60% of residents and 40% of residents live in SF and MF properties, respectively.

Services provided to MF households differs between large municipalities; one large municipality carries out or arranges for the collection of PPP from MF households, while the other mandates it through its

⁶³ Calculated using the US EPA WARM Model V15.

local bylaw. Due to local bylaws in Calgary, some MF households receive collection services from the private sector. However, data on service coverage or costs for MF households serviced by private haulers was not available for this study. Some assumptions were made on coverage and therefore the costs of incremental MF service. This leads to a potential slight over-estimate of the costs of the future state but is considered the best approach at this time.

4.3.2 Collection Services and Accessibility

Single-family Curbside Collection

One hundred percent of the SF properties in the large cities are provided with curbside collection of PPP. Of those, 80% of SF households have services provided in-house by the municipality with the other 20% serviced by a private sector contractor procured by the municipality.

In both large municipalities, PPP collection from SF households is single-stream with materials being collected weekly in either 240L carts or single-use bags placed directly at the curb.

Multi-family Collection

There are approximately 363,600 MF households in Alberta's two largest cities. Forty-eight percent of these have recycling collection equivalent to their garbage collection service, provided by or arranged by the municipality.⁶⁴ Material is collected in single-stream bins. Other MF properties may hire collection services from private contractors, as required by bylaws, but data on the percent of households that comply with this requirement were unavailable.

Depots

The large cities both have recycling depots in addition to curbside collection for recyclables. One municipality has recycling centres across the city that collect the same materials as the curbside collection, but in segregated material streams. The recycling centres are unstaffed and open 24/7. The other municipality has recycling centres that consist of a series of bins set in strategic locations across the city. These centres are also unstaffed and accept all recyclables in a single stream. Between the two large municipalities, there is one depot for every 19,000 households.

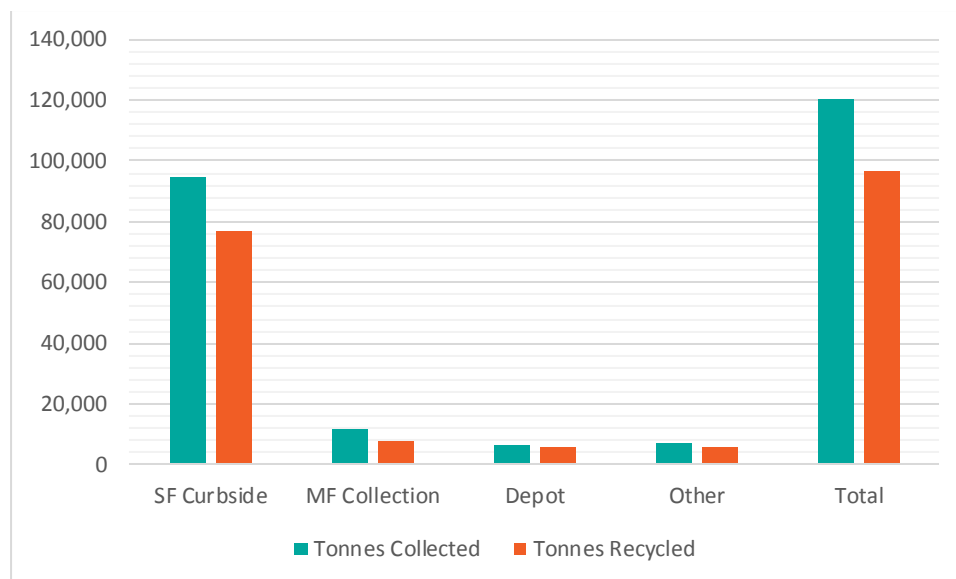
Large-scale commercial users are discouraged from disposing of recyclables at recycling centres, but since they are unstaffed, this cannot be guaranteed. The cost of operating these unstaffed recycling centres is included in our cost of service calculations, however it is likely that these depots are collecting some ICI material, which will have to be addressed in future discussions.

⁶⁴ Some MF properties may arrange and pay for their own recycling collection with private contractors; these collections were not quantified in this study.

4.3.3 Tonnes Collected and Recycled

A total of 120,300 tonnes of PPP were collected for recycling and 97,000 tonnes were recycled in 2018 in Alberta's two large cities through services provided or managed by municipalities. Seventy-nine percent of this comes from curbside collection from SF residences. The breakdown of the total tonnage is shown in Figure 4-9. The average contamination rate is approximately 19% with the highest rate being observed in MF collection (33%) and the lowest in depots (8%).

Figure 4-9: Total Tonnes of PPP Collected and Recycled in Large Alberta Municipalities in 2018



Source: Survey responses and Eunomia calculations

The total tonnes of PPP collected from SF households is greater than from MF households. Depots in the large cities collect much less PPP per household than the curbside collection programs, as seen in Table 4-5.

Table 4-4 shows that on average about 173 kg/hh/year of recyclables are collected from SF households in large Alberta municipalities. After processing, with residue losses, about 140 kg/hh/year of material is actually recycled. MF collection was less than half of the SF curbside, at 67 kg/hh/year collected and depot was an average of 7 kg/hh/year collected.

Table 4-4: Kilograms of PPP Collected and Recycled per Household in Large Alberta Municipalities in 2018

Category	Kg per Household Collected	Kg per Household Recycled
SF Curbside*	173	140
MF Collection*	67	45

Category	Kg per Household Collected	Kg per Household Recycled
Depots ^{65**}	7	6
Other ^{66**}	17	15
Average**	132	107

Source: Survey responses and Eunomia calculations. * Average where service provided **Weighted average across all households

4.3.4 Composition

In large municipalities, the data from survey responses on waste composition indicated that the largest component of the recycling stream by weight was paper, followed closely by cardboard. Together, these materials accounted for nearly 70% of the material recycled by weight. Contamination rates averaged approximately 19%. Composition details from the limited number of responses can be found in Appendix A.11.0.

4.3.5 Costs

Data received from the two large cities for both contracted and in-house PPP services (collection and processing) was used to calculate a total cost for PPP services as well as a cost per household.

Municipality Cost of Service

The total costs of providing PPP services in the large municipalities are shown in Table 4-5. This includes costs for both in-house and contracted services.

Table 4-5: Total Costs of Managing PPP in Large Municipalities in 2018

Category	Total (\$)
Collection Costs	29,305,300
Processing Costs	17,784,300

⁶⁵ A 50% discount was assumed to account for potential ICI material, predominately cardboard. No data was available to determine actual percentages of ICI vs. residential, but based on knowledge of typical tonnages per household.

⁶⁶ Includes PPP costs for eco-centres and semi-annual big bin recycling events.

Category	Total (\$)
Other Costs ⁶⁷	8,729,000
Revenue	(6,829,000)
Total Cost	48,989,600
Cost per tonne of PPP collected for recycling	407
Cost per tonne of PPP recycled	505

Source: Survey responses and Eunomia calculations

As indicated in Table 4-6, costs per MF collection at \$29/hh/year are significantly less than costs for SF curbside recycling at \$75/hh/year. This is due to the fact that for MF residences the ratio of collection points to number of households is much lower.

Table 4-6: Cost per Household per Year in Large Municipalities by Collection Method in 2018 (Includes Collection, Processing and Transportation)

Collection Method	Cost per Household (\$)
SF Curbside*	75
MF Collection*	29
Depot & Other ^{68**}	11

Source: Survey Responses and Eunomia Calculations. * Average where service provided **Weighted average across all households

⁶⁷ Includes administration, and support functions, education (where in place) and transport after collection.

⁶⁸ Includes PPP costs for eco-centres and semi-annual big bin recycling events.

4.4 Current State Assessment: Medium Municipalities

4.4.1 General

Twenty-four percent of Alberta's population resides in medium-sized municipalities, those with populations between 10,000 and 500,000. Of these residents, 86% live in SF households and 14% live in MF households.⁶⁹

Eighty-four percent of SF households in the medium municipalities are provided with curbside collection of PPP, but only 7% of MF households receive the same service (as provided by the municipality or its contractor).⁷⁰

In medium municipalities that provide curbside PPP services, collection varies from weekly or biweekly and can be via bin, cart or bag.

4.4.2 Collection Services and Accessibility

Single-family Curbside Collection

Of the medium municipalities in the study group that offered SF curbside collection, 68% contract services through the private sector, while only 32% provide services in-house.

PPP collection frequency varies among medium municipalities. Most of the study group collected both garbage and recyclables on a weekly basis, but there are notable exceptions to this trend.

One municipality collects organics on a weekly basis, but alternates weeks for garbage and recyclables. In another municipality, residents have one weekly collection, but the stream alternates between garbage, recycling and organics.

PPP material collection is most often single-stream, with only 20% of responding municipalities reporting multi- or dual-stream collection.

Multi-family Collection

For medium municipalities, there was little data specific to MF collection; only municipalities that contract the service provided total contract cost. One medium municipality specified that it provides garbage, organics and recycling collections to all residential properties, regardless of whether they are SF or MF. No additional information related to MF collection was provided by other study group

⁶⁹ Statistics Canada census data 2018.

⁷⁰ Some MF properties that are not provided services by the municipalities may choose to hire their own contractors for recycling service, but this data was unavailable.

members. For this reason, cost data is not provided for MF recycling specifically for medium municipalities.

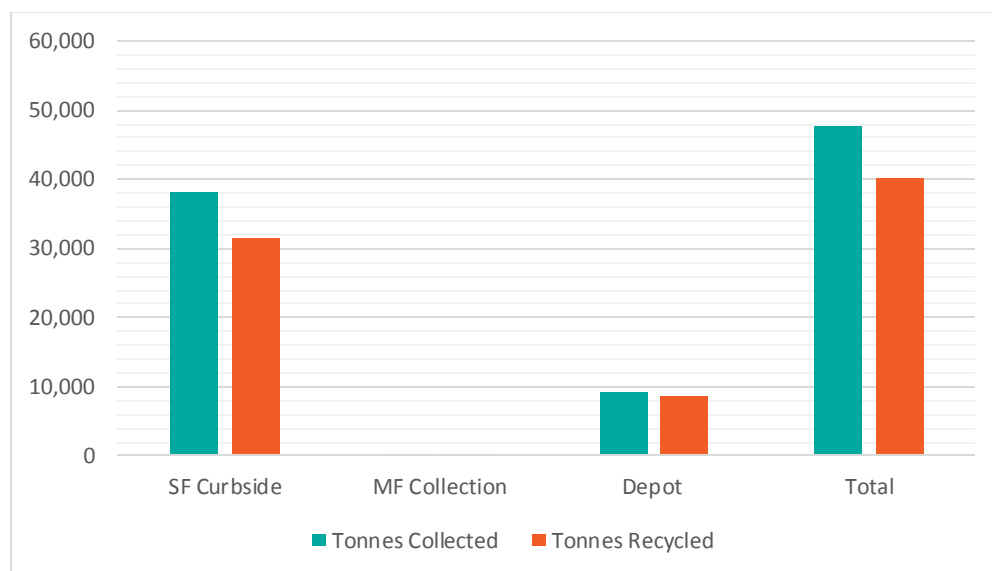
Depots

Sixteen percent of medium municipalities in the study had depot-only collection services. Depots in medium cities and towns are often used to supplement curbside programs.

4.4.3 Tonnes Collected and Recycled

A total of about 47,700 tonnes of PPP was collected for recycling and 40,300 tonnes were recycled from medium municipalities in 2018, as seen in Figure 4-10. The average contamination rate of municipalities that provided data is approximately 16%, which is lower than that of the large municipalities.

Figure 4-10: Tonnes of PPP Collected and Recycled in Medium Municipalities in 2018



Source: Survey responses and Eunomia calculations

In the medium municipalities, the kilograms of PPP collected per household is similar to that in large municipalities (see Table 4-7 below). Note that the kilograms collected and recycled per household for MF households were extrapolated from the large municipalities since there was no data provided specific to MF tonnages for medium municipalities.

Table 4-7: Kilograms of PPP Collected and Recycled per Household in Medium Municipalities in 2018

Category	Kg per Household Collected	Kg per Household Recycled
SF Curbside*	139	115

Category	Kg per Household Collected	Kg per Household Recycled
MF Collection*	67	45
Depots**	25	22
Average**	125	106

Source: Survey responses and Eunomia calculations. * Average where service provided **Weighted average across all households.

4.4.4 Composition

In medium municipalities, paper was the largest portion of the recycling stream, at 51%. Cardboard was much less than in large municipalities, at only 12%. Plastic bags and film accounted for 6% of the recycling stream, compared to only 1% in large municipalities. Composition details can be found in Appendix A.11.0.

4.4.5 Costs

Municipality Cost of Service

The total costs of providing services in the medium municipalities are approximately \$31.7 million, as shown in Table 4-8. A breakdown of costs by collection, processing and the other category is provided, along with the cost per tonne collected and cost per tonne recycled. Table 4-9 provides a breakdown of the per household cost.

Table 4-8: Total Costs of Managing PPP in Medium Municipalities in 2018

Category	Total (\$)
Collection Costs	23,993,400
Processing Costs	4,578,000
Other Costs ⁷¹	4,887,600
Revenue	(1,749,700)
Total Cost	31,709,300
Cost per tonne of PPP collected for recycling	665

⁷¹ Includes administration and transport after collection.

Cost per tonne of PPP recycled	787
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Source: Survey responses and Eunomia calculations

Table 4-9: Cost per Household per Year by Collection Method for Medium Municipalities in 2018 (Includes Collection, Processing and Transportation)

Collection Method	Cost per Household (\$)
SF Curbside*	71
MF Collection*	30
Depot & Other^{72**}	35

Source: Survey responses and Eunomia calculations. * Average where service provided **Weighted average across all households

4.5 Current State Assessment: Small Municipalities

4.5.1 General

Approximately 9% of Alberta's population is found in small municipalities. About 96% of residents in these small municipalities live in SF households, while the remaining 4% live in MF households. These municipalities have less access to PPP recycling services than either the large or medium municipalities.

There is little consistency in the services provided to small municipalities. Average contamination in small municipalities is 13%. If provided, curbside PPP collection varies from weekly to once every three weeks and can be collected using bins, carts or bags.

4.5.2 Collection Services and Accessibility

Single-family Curbside Collection

All municipalities that responded to the surveys used a private sector contractor to provide SF collection services. In most cases, recycling collection was performed alongside garbage collection and, in some cases, organics. The majority (85%) of the study municipalities used single-stream collection for all recyclables, while only about 15% used multi-stream collection.

Multi-family Collection

⁷² Includes PPP costs for eco-centres and semi-annual big bin recycling events.

As with medium municipalities, there is little data regarding which small municipalities provide both MF and SF curbside PPP collection. The percentage of MF households in small municipalities is very small, so including MF residences in collections or evaluating them on a case-by-case basis is likely. Therefore, there are no separate costs for MF collections provided for small municipalities.

Depots

There are many more small municipalities that have depot-only collections for PPP than in large or medium municipalities. Many of these municipalities do not provide curbside garbage collection, so residents use the depots to dispose of any residential waste.

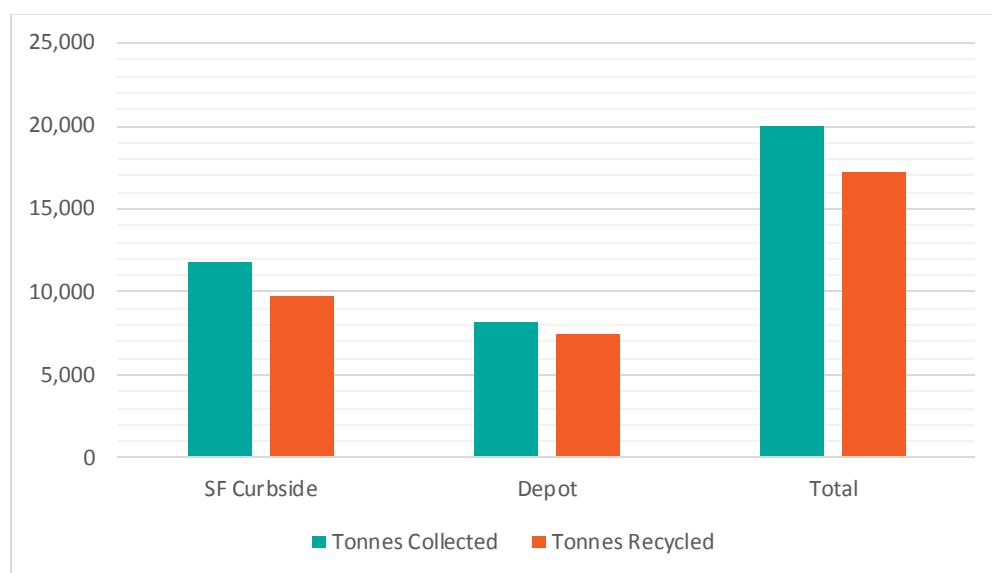
These depots come in many configurations. One municipal district has 90 bins in “mini-depots” across its jurisdiction. Another municipality has “ecostation” bins around the town in addition to one staffed recycling depot. Both of these types of locations collect PPP materials. The depots also accept hazardous items and bulky items.

The list of recyclables accepted varies at these depots, if any PPP is separated for recycling at all. One municipal district only accepts PPP separately from garbage at 11 of the 31 small neighbourhood drop-off sites. A different municipality has two depots that accept recycling, but one accepts only cardboard and the other takes additional PPP materials.

Mobile recycling sites are another collection method used in small municipalities. Residents take their PPP to containers that are located at advertised locations on set days of the week.

4.5.3 Tonnes Collected and Recycled

A total of about 19,900 tonnes of PPP was collected for recycling in small municipalities and 17,200 tonnes were recycled in 2018, as shown in Figure 4-11. Of this, SF curbside collection again captured the most tonnes for recycling. No data was provided for MF.

Figure 4-11: Total Tonnes of PPP Collected and Recycled in Small Municipalities in 2018

Sources: Survey responses and Eunomia calculations

Table 4-10 details the kilograms per household collected and recycled in small municipalities. As in the other municipality sizes, the kilograms per household collected is much greater when curbside recycling is provided.

Table 4-10: Kilograms of PPP Collected and Recycled per Household in Small Municipalities in 2018

Category	Kg per Household Collected	Kg per Household Recycled
SF Curbside*	141	117
MF Collection	N/A	N/A
Depots^{73**}	55	50
Average**	135	117

Source: Survey responses and Eunomia calculations. * Average where service provided **Weighted average across all households

⁷³ A 50% discount was assumed to account for potential ICI material, predominately cardboard. No data was available to determine actual percentages of ICI vs. residential, but based on knowledge of typical tonnages per household.

4.5.4 Composition

Like in medium municipalities, paper was by far the largest portion of the recycling stream in small municipalities. When cardboard is included, paper accounted for 63% of the recycling stream in the study group municipalities. Composition details can be found in Appendix A.11.0.

4.5.5 Costs

Municipality Cost of Service

The total costs of providing PPP services in small municipalities is \$15.1 million, as shown in Table 4-11. The cost per household is provided in Table 4-12.

Table 4-11: Total Costs of Managing PPP in Small Municipalities in 2018

Category	Total (\$)
Collection Costs	10,906,800
Processing Costs	2,852,500
Other Costs ⁷⁴	2,020,200
Revenue	(676,200)
Total Cost	15,103,300
Cost per tonne of PPP collected for recycling	757
Cost per tonne of PPP recycled	878

Source: Survey responses and Eunomia calculations.

Table 4-12: Cost per Household per Year by Collection Method in Small Municipalities in 2018 (Includes Collection, Processing and Transportation)

Collection Method	Cost per Household (\$)
SF Curbside*	84
Depot**	51

⁷⁴ Includes administration and transport after collection.

Source: Survey responses and Eunomia calculations. * Average where service provided **Weighted average across all households

Table 4-12 shows that the cost/hh for SF curbside is higher in small communities compared to medium sized and large municipalities. Some of this difference can be explained by economies of scale, distance to markets, and the lower number of properties that can be collected by each route when there are longer distances between properties.

4.6 Current State Assessment: Other Municipality and Community Types⁷⁵

4.6.1 General

About 13% of Alberta's population lives in municipalities classified in the "other municipality and community types" category. There were seven other municipalities in the study group, all of which only provide depot services for PPP collection. This trend is likely representative of the majority of these municipalities, though limited conclusions can be drawn from such a small sample size. Due to the cost constraints associated with collecting materials across large geographic areas and low population densities in most of these municipality and community types, households in the other category are unlikely to have curbside services for either garbage or recyclables and must rely on depot services to dispose of residential waste.

Two First Nations provided limited data on their garbage and PPP recycling services. Both run depots that collect paper and cardboard for recycling; they do not provide curbside recycling services. The depots mainly collect electronics and other materials that are part of the Alberta Recycling Management Authority stewardship programs. Cost and tonnage information was unavailable.

About 99% of people living in other municipality and community types in Alberta live in SF households. In the transition to EPR, the geography and density of these municipalities will determine whether curbside services are feasible in the future.

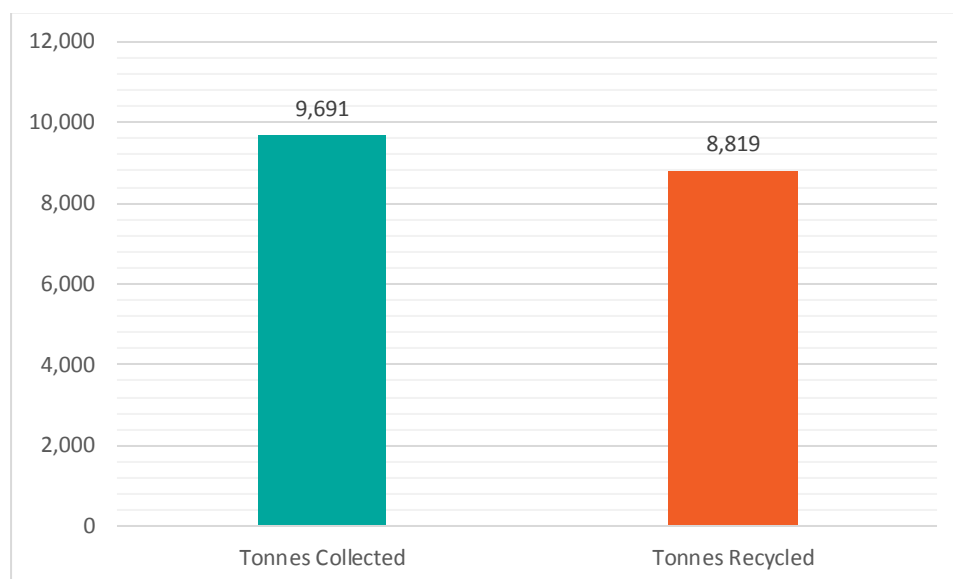
There are many different service configurations for other municipality and community types in Alberta, including:

- stationary depots, both staffed and unstaffed;
- mobile depots that visit communities on fixed days of the week at fixed times; and
- neighbourhood drop-off facilities, which are generally unstaffed.

⁷⁵ Includes: special areas, municipal districts, regional waste authorities, improvement districts, First Nations and Metis settlements.

An estimated 9,700 tonnes of PPP was collected for recycling in other municipality and community types, and 8,800 tonnes were recycled, as shown in Figure 4-12. No composition data was provided for other municipality and community types.

Figure 4-12: Tonnes Collected and Recycled in Other Municipality and Community Types in Alberta in 2018



Source: Eunomia Calculations.

4.6.2 Costs

Municipality Cost of Service

The total costs of providing PPP services in the other municipality and community types that provided data is \$11.3 million as shown in Table 4-13. Due to the far distances between households, collection costs are relatively high, leading to a higher cost per tonne collected and recycled.

Table 4-13: Total Costs of Managing PPP in Other Municipality and Community Types in 2018

Category	Total (\$)
Collection Costs	7,064,500
Processing Costs	1,385,800

Category	Total (\$)
Other Costs⁷⁶	3,764,000
Revenue	(949,400)
Total Cost	11,264,900
Cost per tonne of PPP collected for recycling	1,160
Cost per tonne of PPP recycled	1,277

Source: Eunomia Calculations.

The net cost per household in other municipality and community types is \$54 for depot-only services.

⁷⁶ Includes administration and transport after collection.

5.0 Triple Bottom Line Future State Assessment

In order to carry out the triple bottom line assessment of a future state under EPR for residential PPP in Alberta, assumptions have been made to determine the parameters of the modelling. These were touched upon in the previous section and are summarized in Appendix A.7.0. The approach to estimating future tonnages and costs has been based on a scaling up of current costs based on the following assumptions:

- 1) All SF households in large municipalities will retain curbside collection services;
- 2) All MF households in large municipalities will be guaranteed collection services through the EPR system;
- 3) All SF households in medium and small municipalities that already have a curbside garbage service will have curbside recycling service;
- 4) All MF households in medium and small municipalities with municipality-managed garbage service will receive PPP recycling collection service; and
- 5) All depots and curbside collections in large, medium, small and other municipality and community types will be able to recycle the same range of material.

Efficiencies are expected in the future EPR system as a result of uniform contracts and service standards, a standardized list of materials collected throughout the province, and standardized approach to program promotion and education. These in turn are expected to result in increased capture of recyclables and reduced levels of contamination. Collection and processing benefits resulting from greater uniformity are also expected over time.

The triple bottom line benefits detailed in this section are indicative of what could be realized when the services have fully transitioned to the future state and may take a number of years to materialize.

Further discussion on the architecture of the future system will be required to either develop a model from the bottom up to identify the triple bottom line in more detail, or to determine the efficiency assumptions to be applied.

The costs presented in this section are likely to be at the upper limit of what should be expected, as no assumptions have been made as to likely savings from economies of scale. In order to determine potential future service efficiencies, an assessment of current service efficiency needs to be completed; this was outside the scope of this study.

5.1 Benefits

5.1.1 Collection Services and Accessibility

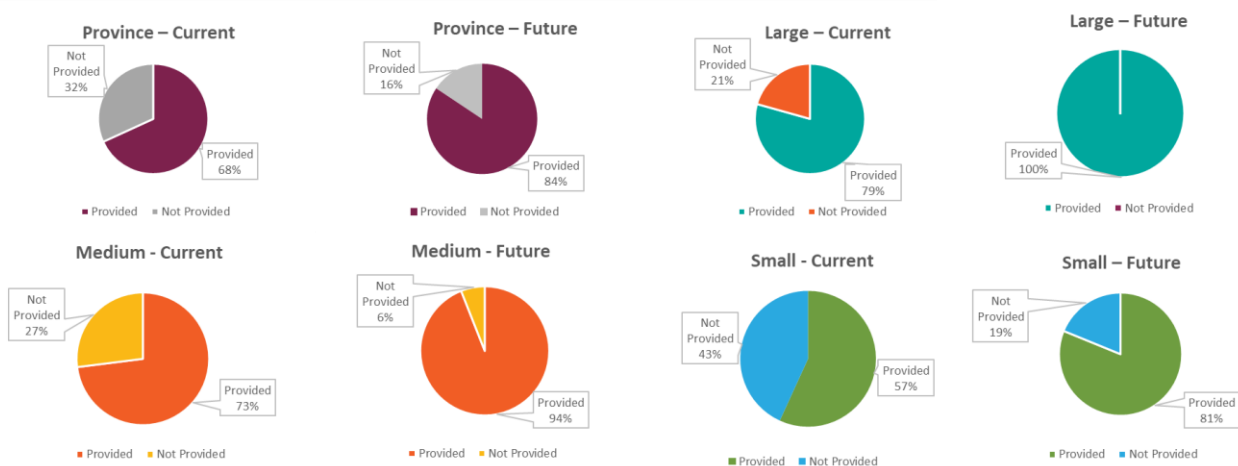
As described in the vision, once EPR is fully implemented, all MF households should receive equivalent services to SF households. This means that if SF households receive curbside collection services, then MF

households will receive a similar level of service. This will lead to an additional 18% of households guaranteed coverage by the EPR PPP collection system.

The future state increases the number of SF and MF having a curbside or equivalent collection from 66% to 84% of households. One hundred percent of households in large municipalities, 90% of households in medium municipalities, and 90% of households in small municipalities will have a curbside or equivalent service under the future state. Other municipality and community types will continue to use depot services, though these may be expanded.

Figure 5-1 provides an illustration of the coverage of SF curbside and MF collection households in the current state that are provided service by the municipality directly or through their contractor. The corresponding future state diagrams illustrate the percentage of households that will be covered under EPR.

Figure 5-1: SF and MF Households with Curbside/Collection Service Coverage Provided or Managed by Municipalities in the Current State vs. Future State



Source: Eunomia calculations

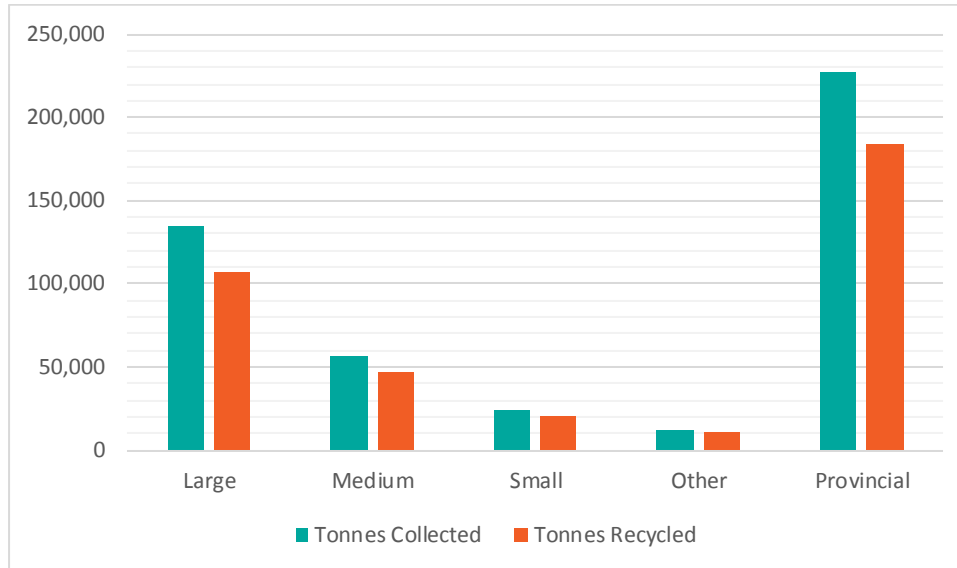
5.1.2 Tonnes Collected and Recycled

In the future state scenario, it is estimated that there would be an additional 29,300 tonnes of PPP collected for recycling,⁷⁷ of which approximately 20,900 tonnes (equivalent to the weight of about

⁷⁷ Due to local bylaws in Calgary, some MF households receive collection services from the private sector. However, data on service coverage or costs for MF households serviced by private haulers was not available for this study. Some of this additional tonnage may currently be getting recycled through privately contracted waste services.

52,000 elk!) would be recycled, and would bring the total tonnes of PPP recycled up to 184,100 tonnes. Figure 5-2 shows the tonnes collected and recycled across the various municipality types.

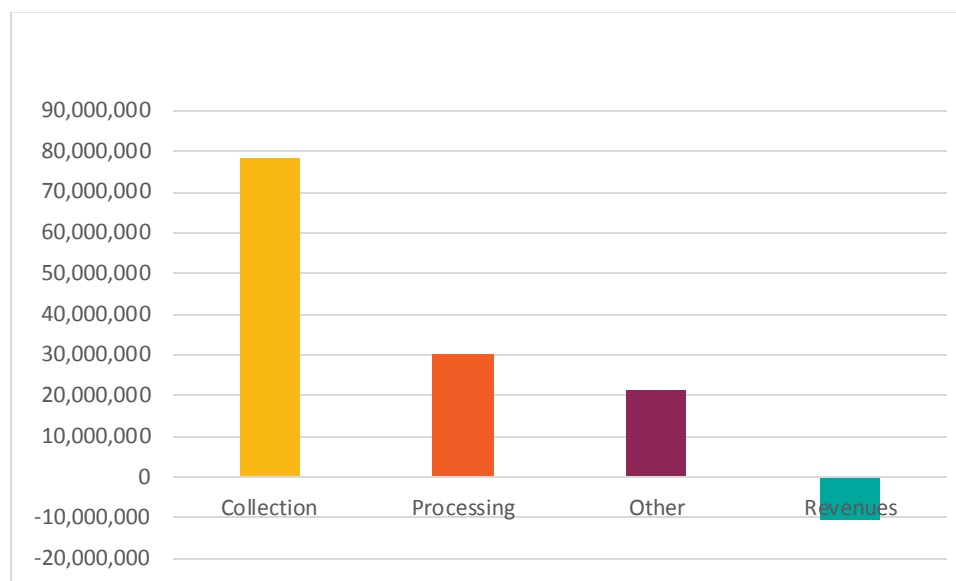
Figure 5-2: Annual Projected Tonnes Collected and Recycled in the Future State by Municipality Type and Province-wide



Source: Eunomia calculations

5.1.3 Costs of Service Provision

The estimated costs for recycling approximately 184,100 tonnes of residential PPP in Alberta in the future state is estimated at \$119.3 million. The breakdown of these costs, by categories is provided in Figure 5-3. The costs per tonne in the current and future states is provided in Table 5-1.

Figure 5-3: Future State Projected Annual Costs of PPP Collection and Recycling⁷⁸

Source: Eunomia calculations

Table 5-1: Cost Per Tonne of PPP Collected in Current and Future State⁷⁹

Municipality Type	Current Cost per Tonne (\$)	Future Cost per Tonne (\$)
Large Municipalities	407	393
Medium Municipalities	665	632
Small Municipalities	757	777
Other Municipality & Community Types	1,160	1,042
Provincial Average	543	526

Source: Eunomia Calculations.

⁷⁸ Projected costs are calculated according to current market conditions and do not include system efficiencies through more centralized provision of services. Calculating these potential efficiencies would require an assessment of current system efficiency, which was outside the scope of this study.

⁷⁹ Projected costs are calculated according to current market conditions and do not include system efficiencies through more centralized provision of services. Calculating these potential efficiencies would require an assessment of current system efficiency, which was outside the scope of this study.

For an increase of 12% in tonnage recycled, the system costs increase by approximately 9%. The recycled tonnages increase to a greater extent than the costs because a large percentage of the households added to the system are MF, which have a considerably lower costs of collection than SF households (though generally fewer kg/hh are collected and with higher contamination rates).

As seen in the table above, the cost per tonne collected is expected to fall in most municipality types, from \$407 to \$393 in large municipalities, \$665 to \$632 in medium municipalities and from \$1,160 to \$1,042 in other municipality and community types. In small municipalities, the price rises from \$757 to \$777, as more SF households are added to the system. Overall, the province-wide average costs for PPP collected falls from \$543 per tonne to \$526 per tonne.

5.1.4 Avoided Disposal Costs

Increasing the quantities recycled means that 20,900 fewer tonnes of residential material need to be collected and disposed of as garbage. Assuming a cost of \$100/tonne for garbage collection and \$74-\$120/tonne for disposal,⁸⁰ a potential additional \$4.7 million in garbage and disposal related costs could be avoided. This calculation is based on the disposal fees set out in Table 4-3.

5.1.5 Jobs

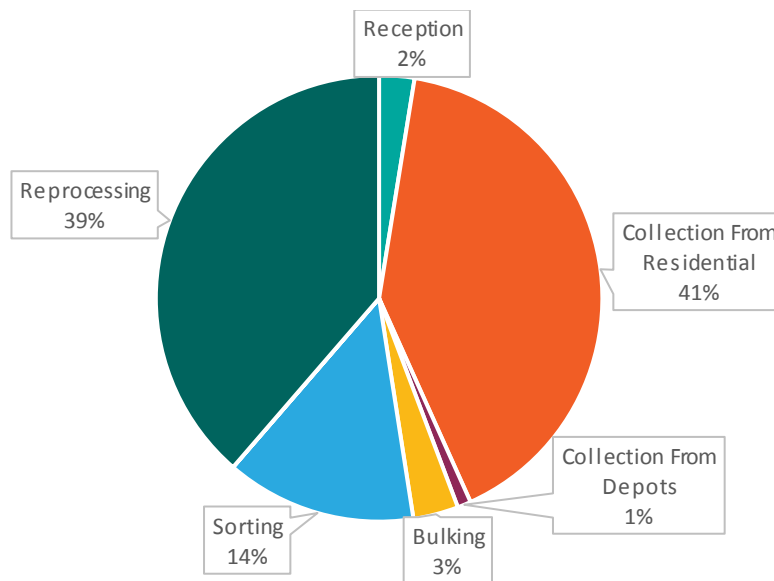
Collecting an additional estimated 29,300 tonnes of PPP in the future state could, subject to system efficiencies, result in an estimated increase of 219 FTE⁸¹ employees in direct, indirect and induced FTE jobs in Alberta, bringing the total number of jobs created by the recycling system to approximately 1,581 FTE, including 894 FTE direct jobs.⁸² The breakdown of the projected future direct FTE jobs is provided in Figure 5-4.

⁸⁰ Data on garbage collection costs was provided by Kelleher Environmental. Data on disposal costs was provided by Morrison Hershfield.

⁸¹ Proportionate to increase in tonnes recycled; does not incorporate potential reductions in tonnages associated with garbage collection. An assessment of efficiencies in garbage collection would be required to calculate this potential reduction.

⁸² Based on the collection and processing of tonnages of PPP in the future state.

Figure 5-4: Projected FTE Direct Jobs Created in the Future State



Source: Eunomia calculations

5.1.6 Gross Value Added

The model created for this study used the income approach to measuring GVA, which is the value of goods or services added to the economy from recycling in Alberta. The income approach sums up all of the income earned by individuals or businesses involved in the production of goods and services. For the future state, GVA includes the additional income earned by individuals or businesses involved in recycling. The estimated contribution to Alberta's economy in the future state is an estimated \$148.4 million in GVA.

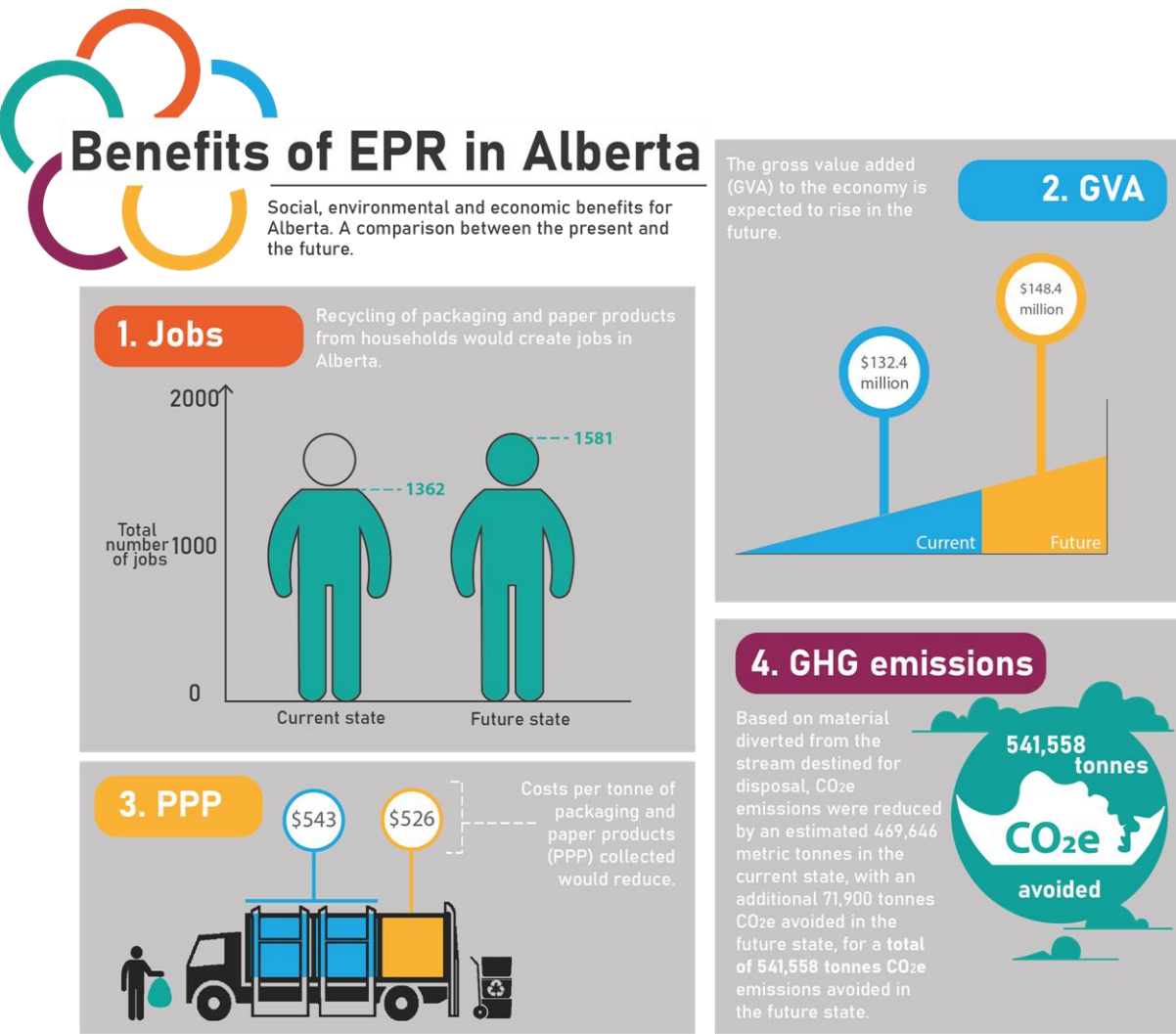
5.1.7 Environmental Benefits

The total quantity of material diverted will result in approximately 541,600 tonnes of CO₂e emissions avoided in the future state based on the additional tonnage recycled. This is the equivalent to the annual emissions of over 120,300 passenger vehicles. Appendix A.7.0 provides details of the conservative approach to this calculation. These are the calculated GHG emission savings associated with diverting 184,100 tonnes of waste from landfill and into recycling, based on specific composition of PPP in Alberta. In addition, the study does not calculate the reduced impact of litter, in terms of avoided clean-up costs on land and in the aquatic environment and improved public amenity delivered through a cleaner environment.

5.1.8 Future State Benefits Summary






As described above, the transition to EPR will produce many benefits for Albertans; these are summarized in Figure 5-5. Table 5-2 provides an overview of the change in costs and benefits from the current to the future state.

Figure 5-5: Benefits of Future State Under EPR Summary



Source: Eunomia calculations

Table 5-2: Change in Annual Costs and Benefits from Current State to Future State⁸³

Category	Current	Future	Change (%)
 Cost per Tonne Collected	\$543	\$526	-3.0
 Jobs (FTE)	1,362	1,581	+16.1
 GVA	\$132.4 million	\$148.4 million	+12.1
 CO₂e Emissions Reduced (Tonnes)	469,700	541,600	+15.3
 Total Tonnes Recycled	163,200	184,100	+12.8

Source: Eunomia calculations

Through the implementation of the EPR program in accordance with the vision developed, the cost per tonne of material recycled will be reduced and the costs for this service will move from the municipalities to the producers. This will not only create a more efficient PPP residential recycling system, but municipalities will be able to allocate their resources to other services and Albertans will benefit from program management honed across other Canadian provinces with EPR by producers that operate across the country.

5.2 Overarching Challenges with EPR

The main challenge in transitioning to a future EPR system is that there is already a PPP recycling system in place, managed by municipalities and paid for by taxpayers (through property taxes, utility fees and/or private fees). The PPP collection and processing system is operated by both municipalities and private sector companies under contract to municipalities, as well as private companies hired directly, in

⁸³ Projected costs are calculated according to current market conditions and do not include system efficiencies through more centralized provision of services. Calculating these potential efficiencies would require an assessment of current system efficiency, which was outside the scope of this study.

the case of some MF households. This section identifies the challenges that will be faced during the transition from the current state to the future EPR system, subject to some conditions being met.

5.2.1 Current Infrastructure

The existing infrastructure for PPP recycling consists of a combination of trucks, bins and other containers for collection; consolidation points with simple equipment such as balers and bins; transfer stations for aggregating recyclables before transportation to larger facilities; and MRFs of varying sizes, ages and complexity. As producers develop a province-wide collection system, efficiencies may lead to consolidation of some of these facilities and equipment. Transition processes should ensure that current contracts are honored and existing assets are utilized or compensated. Transition processes should also ensure that the financial impact of existing contracts and infrastructure is minimized for all stakeholders. Some of these considerations will be naturally mitigated, as existing contracts have expired and have been replaced with new contracts that have shorter terms or include clauses that fully recognize the risk of transition. Also, because of the long lead time, buildings and equipment have been amortized to be fully paid off by the time the transition occurs. In other words, some of the issues can be resolved by implementing change in a gradual manner.

5.2.2 Existing Contracts

Existing contracts often present challenges when transitioning from current PPP programs to EPR. However, this project has identified that of all current contracts for PPP collection and processing reviewed for this study, the one with the longest remaining term expires in 2024 (only four years from today). Compared to some other provinces that have implemented EPR, Alberta's contract timelines are shorter, which reduces the challenges associated with transitioning. Most Alberta contracts are set for terms of three to five years; this is in contrast to Ontario, for example, where contract durations are typically 10 years or more.

5.2.3 One or More PROs

A PRO is generally set up to collect fees from producers and manage the PPP recycling system using these revenues. In Europe, many EPR schemes have a single PRO, whereas in other jurisdictions, EPR schemes are operated by a few different groups operating in the same industry sector. In BC, for instance, the electronics EPR programs are operated by a number of different organizations (e.g. EPRA for some electronics; CESA for small household electronics; OPEIC for outdoor electronic equipment, etc.). The PPP EPR system in BC is operated by one PRO – Recycle BC. Ontario's shared EPR program is administered by Stewardship Ontario, which has been directed by the Ontario Minister of Environment, Conservation and Parks (MECP) to "wind up" the program in preparation for new regulations. There are differing opinions on whether having a single PRO is best and more efficient, or whether allowing for competition – where producers can choose to form different PROs – is a better approach. Regardless of approach, the key is to have well written regulations, high targets and strong enforcement. It is not known at this time how the Alberta marketplace will evolve.

5.2.4 Impacts on Alberta Residents

The move to EPR will have some impacts on Alberta residents. On the positive side, access to collection services will be improved, collection standards will likely be harmonized province-wide, and there is likely to be a standard list of materials collected throughout the province. On the negative side, there may be some initial confusion among residents if certain materials that were collected curbside are moved to depot collection, as was the case in some BC municipalities for film plastics and glass. A period of education for residents may also be required if collection frequency and set out rules change, however, based on experience from BC, this is not significant.

5.2.5 Further Points to Consider

Further points to consider during the future planning process include:

- Roles and responsibilities: The distribution of roles and responsibilities among stakeholders (provincial government, regulatory oversight agency, PROs, producers, the waste management industry, municipalities, consumers) must be clearly defined in regulation in order to avoid overlap or loopholes.
- Transparent and consistent data: Regulators should establish the appropriate level of public information needed from producers/PROs from the onset to ensure that reporting is consistent and complete and that the public has appropriate insight into the effectiveness of the EPR system and its benefits.
- Free-riding: As discussed in Section 3.0, all producers in Alberta who meet the de minimis threshold must comply with their obligations under EPR, including those that may be located outside of Alberta such as internet retailers. Free-riding (which refers to companies benefiting from the system but not paying their fair share of the costs of collecting and recycling their products) may happen if producers do not pay the appropriate EPR fees to the PRO or are non-compliant with data requests. The regulations should stipulate the obligations of all affected producers and allow for oversight and adequate penalties to deter free-riding.
- Inclusion of new products in EPR system: The definition of PPP should be clear in the regulation and should be flexible enough to allow for new products and packaging types that may enter the Alberta market over time, but that do not exist at the time of drafting.
- Waste leakage: Products that are not captured in the EPR system are said to be leaked. Products can leak through the system through other legal or illegal channels, such as informal recyclers, illegal or legal export of waste. Proper data collection and monitoring will be required to combat waste leakage.
- Disposal bans have been shown to be an effective complement to EPR policies. Recent European data indicates that countries with landfill restrictions on recyclable and recoverable materials,

on average, achieve higher recycling rates of post-consumer plastics.⁸⁴ The CCME, in Phase 1 of its Canada-Wide Action Plan on Zero Plastic Waste, has committed to developing best management practices for disposal bans of end-of-life plastics by December 2019.

5.3 Stakeholder Impact Assessments

Through the transition to EPR, the roles and responsibilities of many stakeholders will change. This will come with associated risks, opportunities and challenges. The overarching benefits have been presented in Section 5.1 and the challenges in Section 5.2. This section provides an initial assessment of these impacts on key stakeholders along with possible mitigating measures to ensure the smoothest possible transition to EPR.

Municipalities and First Nation Communities

Risks

- Some municipalities may feel they are not paid sufficiently if they continue to be involved in collection, depending on contract wording
- Some materials may get dropped from collection or moved to drop-off/takeback, reducing control over how services are delivered
- Remote communities' access to recycling services may be limited depending on what service standard is set
- Some First Nation communities are at risk of consultation fatigue, as many have limited staff capacity to address the consultation requests that they receive from industry and government and also face recycling challenges

Opportunities

- No longer subject to the risks associated with processing and marketing materials
- Improved service provision in other municipality and community types – greater level of service consistency for all Albertans regardless of whether living in urban or rural areas
- Opportunity to optimize collection systems to reduce contamination and increase recycling yield
- Less procurement and contract management required if responsibility for processing transfers to PRO
- First Nations communities and Metis settlements able to access services that they otherwise cannot provide. There may be interest from the federal and provincial governments to support capacity building opportunities in these communities.

⁸⁴ [*Plastics – The Facts 2018: An Analysis of European Plastics Production, Demand and Waste Data*](#), by Plastics Europe, 2018, p. 35.

Challenges

- Perceived lack of control over service provisions
- Governing structure of Indigenous communities is very different comparing to municipalities. Metis settlement is a provincial responsibility, but First Nations communities are federal responsibility and both will need engagement in transitioning to EPR

Possible Mitigating Measures

- The transition to full EPR for PPP includes the requirement that there will be no reduction in service
- Municipalities will have the option of opting in or out of providing collection services
- Collection service standards will ensure recyclables collection is no less frequent than garbage collection (Recycle BC's model collection contracts can be a proven starting point)
- Convenient drop-off locations will be in place where curbside collection is not economically viable
- Ensuring producers are responsible for material marketing removes that risk from local municipalities
- Work with Alberta Environment & Parks, Alberta Indigenous Relations, Indigenous Services Canada, First Nations Technical Services Advisory Group and stakeholder organizations to determine strategy for First Nations communities moving forward

Waste Management Industry (Collection Contractors and Processors)*Risks*

- As collection may become more consolidated, some will likely lose out on business with potential employment impacts
- May be reduced opportunities, as market may have fewer players over time

Opportunities

- Opportunity to standardize collection across the province
- Less contract administration if working with one PRO
- More material to process and potentially less contamination

Challenges

- Negotiation/renegotiation of contracts
- Ensuring collection service standards are well specified to deliver quality materials
- Ensuring processing standards and infrastructure is suitably specified and efficiently procured / run

Possible Mitigating Measures

- There will likely be some consolidation of collection and processing services but also an increase in total tonnes managed; local material consolidation is still needed as part of an expanded recycling system
- As the program will be implemented over time (and perhaps phased-in), contract re-negotiation should be minimized
- Producers will set collection and processing standards and foster healthy competition through their procurement of waste management services

Non-Governmental Organizations (NGOs)

Risks

- Potential for some NGOs who provide services to lose the ability to do so

Opportunities

- More diversion – opportunity to focus on reduction
- Availability of high-quality data for organizations such as Recycling Council of Alberta
- Potential to partner with PROs on marketing and communication

Challenges

- Determining role of NGOs

Possible Mitigating Measures

- NGOs can play a continued role in promoting system-wide waste reduction and reuse and educating residents
- Citizen and NGO advocacy roles are strengthened by availability of program performance data

Individual Producers

Risks

- Lack of markets for recovered materials; quality of collected and processed materials which they may need to sell
- Budgeting for uncertain markets and uncertain future contract costs
- Getting fees right
- Meeting targets in regulations
- Total system cost could be higher than BC, for example, because of greater distance to markets

Opportunities

- An efficient reverse supply-chain for the collection of materials from millions of Albertans and its management for use in a circular economy
- Driving static efficiency (cost reduction) and dynamic efficiency (innovation) in collection and processing

- Reuse of materials in manufacturing, driving a circular economy, reducing GHG emissions

Challenges

- Ensuring proper regulatory oversight to prevent free-riding and non-compliance⁸⁵

Possible Mitigating Measures

- Producers manage different PPP programs in five other provinces; lessons learned/best practices from these programs can be adapted to Alberta
- Adding another producer-led PPP program in Canada presents opportunities for time and cost saving harmonization by producers
- Material-specific targets help ensure continuous improvement for Alberta's recycling programs
- Increasing the use of recycled content is a step towards packaging and product design that is more environmentally-friendly

Producer Responsibility Organization(s) (PRO(s))

Risks

- Poor performance in meeting targets

Opportunities

- Coordination of producers to create the most efficient system possible

Challenges

- Setting regulations to ensure that PROs have sufficient flexibility to design system, but ensuring that enforcement and political power belong to the government and oversight agencies

Possible Mitigating Measures

- Regulated penalties or enforcement mechanisms to incentivize achievement of targets

Provincial Regulators (Government and Regulatory Oversight Agency)

Risks

- Writing a sufficiently clear regulation that is flexible to adapt to future material composition changes and markets
- Having sufficient enforcement to minimize free-riders

⁸⁵ Where an organization that should be part of a program and contributing to its costs avoids detection to avoid payment, which places excessive costs on companies that are complying with the regulation.

- Ensuring appropriate reporting to collect sufficient data to evaluate system performance and whether targets are being met
- PROs may lobby against changes in laws and delay campaign for longer transition periods

Opportunities

- EPR could further the province's commitment to protecting our environment to encourage and attract investment in our province
- Use of regulatory design that minimizes red-tape while ensuring effective regulatory oversight and attendant high environmental performance
- Set challenging material-specific targets

Challenges

- Setting up systems to register producers and collect sufficient information to verify material-specific targets

Possible Mitigating Measures

- Governments need to set clear policy objectives and establish a regulation that sets performance standards to deliver desired environmental outcomes
- Government or a designated organization monitors progress and conducts enforcement
- Municipalities are given the right-of-first-refusal to act as collection interface with residents
- Producers lead on the design and implementation of the program in response to the regulation
- Regulation should limit political influence of PROs and state that they exist by virtue of the regulation

Consumers

Risks

- Need to ensure that they get reasonable collection service
- Clarity of instructions on what is recycled – some materials may no longer be collected curbside (some may move to depot only)

Opportunities

- Standardized set of materials collected, reducing consumer and service provider confusion and allowing for optimization of collection and management systems

Challenges

- Educating consumers about what the change means and why it is happening

Possible Mitigating Measures

- Aggressive and sustained promotion and education by PRO to residents and service providers
- Regulators set challenging material-specific targets for producers to meet

6.0 Summary, Conclusions and Considerations for Next Steps

6.1 Current PPP Recycling System

Key findings on the current state of residential PPP recycling in Alberta are listed below:

- About 74% of SF households in Alberta are estimated to have access to curbside services for recycling. An estimated 43% of MF households in the province have recycling collection services provided or managed by the municipality;
- An estimated 197,600 tonnes of PPP were collected for recycling in 2018 and about 163,200 tonnes were recycled. The recycled number is lower than the collected number as the collected tonnes include non-target materials which are removed in sorting processes prior to the recycling operation;
- The total cost of residential recyclables collection and processing net of revenue is estimated at \$107.0 million/year. About half of this cost is related to residential recycling in the two largest cities with the remainder expended to provide recycling services to medium, small and other municipality and community types;
- It is estimated that 1,362 FTE direct, indirect and induced jobs were created by recycling of PPP from households in Alberta in 2018. The GVA to Alberta's economy in 2018 from the recycling system was an estimated \$132.4 million; and
- CO₂e emissions were reduced by an estimated 469,700 metric tonnes based on the current state.

6.2 Impacts of Future PPP System with EPR

EPR for residential PPP in Alberta would result in the transfer of recycling costs to the producers of PPP. Key changes from the current system include:

- The operational and financial responsibility for managing PPP in Alberta would be transferred from municipalities to producers;
- An estimated additional 29,300 tonnes of PPP would be collected for recycling, with an additional estimated 20,900 tonnes recycled, increasing the total tonnes recycled from 163,200 tonnes/year to 184,100 tonnes/year;
- A further 219 FTE jobs created (for a total of about 1,581 FTE jobs) as a result of recycling with an additional estimated GVA of \$16.0 million to Alberta's economy for a future total of \$148.4 million;
- An additional 71,900 estimated tonnes of CO₂e emissions would be avoided for a total of 541,600 tonnes CO₂e through the recycling of 184,100 tonnes of materials. This is the equivalent to the annual emissions of over 120,300 passenger vehicles; and

- Services would be provided to 18% more households for an estimated 11% increase in system costs from \$107.0 million to \$119.3 million per year, but costs per tonne of PPP collected would fall from \$543 in the current state to \$526 in the future.

6.3 Next Steps

This report has described the current residential PPP recycling system in Alberta, outlined a vision for a future EPR system for PPP and estimated its potential impacts on key stakeholders and the environment. It also described a number of transition issues that need to be considered in the move to a future state EPR recycling system for residential PPP.

In Canada, BC's EPR PPP program has had promising results that other provinces are building upon. Ontario is in the midst of working out various transition issues involved in shifting from its current shared responsibility model, which has been in place since the late 1980s, to a full EPR model. The government has set a 6-year timeline for the transition, and considerable work has already been carried out in the last five to ten years to work out the details. Both the Saskatchewan and Manitoba governments are now considering moving to the BC model from the existing shared-responsibility models that exist in each province. While Alberta is considering an EPR PPP program, it is important to consider the experience of BC while concurrently considering Alberta's local municipal structure, recycling system and local circumstances.

To successfully transition Alberta's existing residential recycling to an EPR model, Alberta municipalities should engage representatives in other jurisdictions to learn from the experiences of those provinces and apply lessons learned and best practices to Alberta to create the most efficient and effective EPR system for residential PPP possible. Implementing a successful EPR program also requires ongoing, transparent, and informed discussions with the provincial government, producers, business associations and small businesses. Alberta municipalities can lead these discussions, invite different stakeholders to the table, inform Alberta companies what EPR policy means for their business, and help champion the transition to an EPR framework.

APPENDICES

A.1.0 Visioning Workshop Attendees and Minutes

Attendees:

- Consultant Team:
 - Eunomia: Sarah Edwards (Calgary), Dominic Hogg (phone), Sydnee Grushack (phone), John Carhart (phone)
 - Kelleher Environmental: Maria Kelleher (phone)
 - Love Environment: Geoff Love (Calgary)
 - S-Cubed Environmental: Tammy Schwass (Calgary)
- Project Team:
 - City of Calgary: Jason London (Calgary)
 - AUMA: Che-Wei Chung (Edmonton)
 - CSSA: Gemma Zechinni (phone)
 - City of St. Albert: Olivia Kwok (Edmonton)
 - Recycling Council of Alberta: Christina Seidel (Calgary)
 - City of Edmonton: Ryan Kos (Edmonton)
 - Town of Whitecourt: Dale Rankel (Edmonton)
 - Rural Municipalities of Alberta: Alex Mochid (Edmonton)
- Governance Committee:
 - City of St. Albert: Cathy Heron (phone)
 - City of Edmonton: Cameron Grayson (Edmonton)
 - City of Calgary: Peter Demong (Calgary)
 - AUMA: Nicole Martel for Dan Rude (Edmonton)
- Additional Stakeholders:
 - Recycling Council of Alberta: Jodi Tomchyshyn London (Calgary)
 - City of Calgary: David Duckworth (Calgary), Rick Valdarchi (Calgary), Blair Cunningham (Calgary), Kate Trajan (Calgary)

Introduction to EPR by Sarah Edwards

Presentation by Geoff Love

Discussion points:

- Harmonization across Alberta, Western Canada, enable potential for all provinces to come together
- Make sure residents know what recyclable materials are
- Consumers should be able to recycle the same materials, regardless of where they live
- All Alberta communities should have access, including rural areas
 - Accessibility standards are important

ISC: Unrestricted

- No decline in recycling, no decline in service
- As many materials diverted as possible, including difficult plastics
- ICI inclusion
- Coordination between today's system and future PPP – integration
- Multifamily inclusion
- Consistency in the province
- Outcome-based producer flexibility
- Communications – transparency to Albertans – costs, recycling, recover and disposal rates
- Accountability to Albertans through the Minister of Environment and Parks
- Industry forming in Alberta – local processing
- First right of refusal for municipalities (to continue providing collection service under contract)
- Using terms as clearly as possible, i.e. 100% financial and operational responsibility for producers
- Smart and fair transition from now to 20+ years
- Be clear what information you want to gather – what, how, what gets recycled
- Ability to compel data from different areas of the supply chain
- Full 4R transparency on what is disposed
- Cost effective and efficient
- End-of-life responsibility – not shipped to disposal sites overseas
- Concrete plan for ICI (industrial, commercial and institutional) inclusion
- System key components
 - Move conversations upstream
 - Cross-border
 - Design
 - Don't lose things that work well in current system
 - Government sets outcomes, not tactics
 - Municipal engagement is key
 - Set priorities
 - Clarity on first right of refusal, fairness of negotiation
 - BC incentive rate term
 - Parking Lot
 - Individual producer orgs vs. collective orgs.
 - Consequences of outcomes

A.2.0 PPP Material Under EPR Measurement Process Details

In order to calculate the

In March 2019, the European Commission, through the Waste Framework Directive, revised the methodology used by EU Member States to calculate the quantity of material that is recycled and to report on progress against new targets. Under the new methodology, the amount of material recycled is to be calculated as described below:

“the weight of the municipal waste recycled shall be calculated as the weight of waste which, having undergone all necessary checking, sorting and other preliminary operations to remove waste materials that are not targeted by the subsequent reprocessing and to ensure high-quality recycling, enters the recycling operation whereby waste materials are actually reprocessed into products, materials or substances. The weight of the municipal waste recycled shall be measured when the waste enters the final recycling process (Article 11 (2)).”⁸⁶

The Commission defines the final recycling process as:

“the recycling process which begins when no further mechanical sorting operation is needed and waste materials enter a production process and are effectively reprocessed into products, materials or substances (Article 17a).”⁸⁷

The calculation rules for the attainment of the EU’s packaging and packaging waste targets for 2025 and 2030 established in Article 6a(1) and (2) of Directive 94/62/EC are that only waste that enters a recycling operation or waste that has achieved end of waste status should be used for the calculation of the recycling target and, as a general rule, the measurement of waste should be at the input to the recycling operation. In order to ensure uniform application of the calculation rules and comparability of data, the calculation points for the main packaging materials and recycling operations should be specified.

There are several reasons why ‘supplied’ and ‘generated’ quantities could be different, for example through the addition of material from free-riders (obligated producers who don’t pay their fees and their tonnes are not reported as sold into the market) or exempt business (smaller businesses who are below the de minimis threshold), or from material brought in from outside the province, for instance through Internet shopping, or magazines that are sent from the US through the mail. Using either one as the denominator in the recycling calculation has several implications from a producer’s perspective,

⁸⁶ Eurostat. Glossary: Recycling of waste. https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Recycling_of_waste

⁸⁷ Ibid.

especially as related to free-riders and producers exempt under the de minimis provision. The generated amount does not work as a denominator under an IPR (individual producer responsibility) framework, as each company is individually responsible for meeting recycling targets for the materials they sell into the market.

Where material generated is used as the denominator (in some collective responsibility programs), the calculated recycling rate is lower. If the supplied-into-market figure is used, the calculated recycling rate is higher (as the denominator is lower but the amount recycled – the numerator – stays the same).

A.3.0 Definition of Packaging and Paper Products and Accessibility Standards in Other Jurisdictions

Table A-1 details the definition of packaging and paper products under different producer obligated EPR programs.

A-1: Definitions for the Purposes of Producer Obligations

Jurisdiction	Legislation, Regulation Producer Responsibility		Packaging Definition	Paper Products
British Columbia	Legislation	Environmental Management Act ⁸⁸ Chapter 53 Recycle BC	Primary packaging, i.e., packaging that contains the product at the point of sale to the residential consumer;	Paper of any description including flyers, brochures, booklets, catalogues, telephone directories, newspapers, magazines, paper fibre and
	Regulation	BC Recycling Regulation ⁹⁰		

⁸⁸ http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/03053_00

⁹⁰ http://www.bclaws.ca/Recon/document/ID/freeside/449_2004

Jurisdiction	Legislation, Regulation Producer Responsibility		Packaging Definition	Paper Products
	Producer Responsibility/ Stewardship Organization	Recycle BC	Grouped packaging or secondary packaging that goes to the household;	paper used for copying, writing or any other general use. Paper does not include paper products that by virtue of their

Jurisdiction	Legislation, Regulation	Producer Responsibility	Packaging Definition	Paper Products
	Cost Coverage	100% of the cost of collecting and processing obligated material	<p>Transportation, distribution or tertiary packaging that goes to the household;</p> <p>Service packaging designed and intended to be filled at the point of sale and “disposable” items sold, filled or designed and intended to be filled at the point of sale;</p> <p>Packaging components and ancillary elements integrated into packaging, including ancillary elements directly hung or attached to a product and which perform a packaging function unless they are an integral part of the product and all elements are intended to be consumed or disposed of together</p> <p>Full Definition provided in the July 2018 Recycling BC Program Plan here</p>	<p>anticipated use could become unsafe or unsanitary to recycle or any type of bound books such as text books, reference books or literary books.⁸⁹</p> <p>Full Definition provided in the July 2018 Recycling BC Program Plan here</p>

⁸⁹ Please note that the BC Recycle Regulation as it reads, exempts all bound books. We believe the government’s intention was only to exempt bound literary, textbooks and reference books and that it intends to make that clarification in upcoming amendments to the Regulation. With that clarification the Recycling Regulation will

Jurisdiction	Legislation, Regulation Producer Responsibility		Packaging Definition	Paper Products
Saskatchewan	Legislation	The Environmental Management & Protection Act ⁹¹	Primary packaging, i.e., packaging that contains the product at the point of sale to the residential consumer; Grouped packaging or secondary packaging that goes to the household; Transportation, distribution or tertiary packaging that goes to the household;	Paper of any description including flyers, brochures, booklets, catalogues, telephone directories, newspapers, magazines, paper fibre and paper used for copying, writing or any other general use. Excluded are paper products that, by virtue of their anticipated use, could become unsafe or unsanitary to recycle
	Regulation	The Household Packaging & Paper Stewardship Regulation ⁹²		
	Producer Responsibility/ Stewardship Organization	Multi-Material Stewardship Western		

effectively obligate other kinds of bound books such as comic books, colouring books, and bound notebooks (e.g., journals, games and puzzle books and more) – all of which currently find their way into Recycle BC’s blue bins, but for which their producers do not pay fees to recycle them. We suggest that Alberta ensure this clarification is made in the drafting of its regulation.

⁹¹ <http://www.qp.gov.sk.ca/documents/english/Chapters/2010/E10-22.pdf>

⁹² <http://www.qp.gov.sk.ca/documents/English/Regulations/Regulations/E10-21R5.pdf>

Jurisdiction		Legislation, Regulation Producer Responsibility	Packaging Definition	Paper Products
	Cost Coverage	75% of the cost of collecting and processing obligated material	<p>Service packaging designed and intended to be filled at the point of sale and “disposable” items sold, filled or designed and intended to be filled at the point of sale;</p> <p>Packaging components and ancillary elements integrated into packaging, including ancillary elements directly hung or attached to a product and which perform a packaging function unless they are an integral part of the product and all elements are intended to be consumed or disposed of together.</p> <p>This definition has been condensed. For the full definition of included packaging materials please refer to the MMSW Program Plan.</p>	<p>or any type of bound book not mentioned in clause.</p> <p>Paper comprises any type of cellulosic fibre source including but not limited to wood, wheat, rice, cotton, bananas, eucalyptus, bamboo, hemp, and sugar cane (bagasse) fibre sources.</p> <p>This definition has been condensed. For the full definition of included paper please see the MMSW Program Plan.</p>

Jurisdiction	Legislation, Regulation Producer Responsibility		Packaging Definition	Paper Products
Manitoba	Legislation	The Waste Reduction & Prevention Act ⁹³	Designated materials for the MMSM program include: “Packaging”, which means materials that are used for the containment, protection, handling, delivery or presentation of goods supplied to consumers, and includes, but is not limited to, service packaging and all packaging components and ancillary elements integrated into the Packaging. “Service packaging” means packaging which may or may not bear a brand that is supplied at the point of sale by the retail, food-service or other service providers to facilitate the delivery of goods, and includes all bags, boxes, and other	Designated printed paper for the MMSM program includes: newspapers, including those paid through subscription, provided through free distribution and those purchased through retail channels; daily, weekly, monthly and quarterly glossy magazines including those paid through subscription, provided through free distribution and those purchased through retail channels; directories, including those paid through subscription, provided through free distribution and
	Regulation	Packaging & Printed Paper Stewardship Regulation		
	Producer Responsibility/ Stewardship Organization	Multi-Material Stewardship Manitoba		

⁹³ <http://web2.gov.mb.ca/laws/statutes/ccsm/w040e.php>

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	Cost Coverage	80% of the cost of collecting and processing obligated material	<p>items for the containment of goods at point of sale.</p> <p>“Supplied”, means sold, leased, donated, disposed of, used, transferred the possession of or title of, or otherwise made available to a consumer in Manitoba or distributed for use by a consumer in Manitoba.</p> <p>“Consumer”, means an individual (other than a Person in the Industrial, Commercial, or Institutional (IC&I) sector) to whom Designated Blue Box Waste is Supplied.</p> <p>For more information on designated packaging for the MMSM program, please refer to the MMSM Rules or the MMSM Program Plan.</p>	<p>those purchased through retail channels;</p> <p>lottery tickets and lottery information;</p> <p>warranty information, assembly instructions, product use instructions and health information, product registration cards and promotional information that is found inside purchased products;</p> <p>envelopes, statements and information inserts from banks, credit companies, utilities, service providers, etc.;</p> <p>information, forms and promotional materials distributed by municipal, regional, provincial and federal governments;</p> <p>promotional calendars, posters that are distributed to consumers free of charge;</p> <p>unsolicited promotional information, coupons, handbills and flyers; and</p> <p>transportation and transit</p>
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Jurisdiction	Legislation, Regulation Producer Responsibility		Packaging Definition	Paper Products
				<p>Printed paper does not include bound reference books, bound literary books, or bound textbooks.</p> <p>Please see the MMSM Rules or Program Plan for more information on designated printed paper.</p>
Ontario	Legislation	Resource Recovery and Circular Economy Act ⁹⁴	“Packaging”, refers to materials that are used for the containment, protection, handling, delivery or presentation of goods supplied to consumers, and includes, but is not limited to, service packaging and all packaging components and ancillary	“Printed Paper” means any material that is not Packaging, but is printed with text or graphics as a medium for communicating information, Supplied to Consumers, and includes, but is not limited to:
	Regulation	The Blue Box Waste Regulation ⁹⁵ Stewardship Ontario Regulation ⁹⁶		

⁹⁴ <https://www.ontario.ca/laws/statute/16r12>

⁹⁵ <https://www.ontario.ca/laws/regulation/020273>

⁹⁶ <https://www.ontario.ca/laws/regulation/160388>

Jurisdiction	Legislation, Regulation Producer Responsibility		Packaging Definition	Paper Products
	Producer Responsibility/ Stewardship Organization	Stewardship Ontario	elements integrated into the Packaging. “Service Packaging”, refers to packaging which may or may not	<ul style="list-style-type: none"> newspapers, including those paid through subscription, provided through free distribution and those

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	Cost Coverage	50% of the cost of collecting and processing obligated material (in transition to 100%)	<p>bear a brand that is supplied at the point of sale by the retail, food-service or other service providers to facilitate the delivery of goods, and includes all bags, boxes, and other items for the containment of goods at point of sale.</p> <p>“Supplied”, means sold, leased, donated, disposed of, used, transferred the possession of or title of, or otherwise made available to a consumer in Ontario or distributed for use by a consumer in Ontario. Supply and supplies have similar meanings.</p> <p>“Consumer”, means an individual (other than a person in the Industrial, Commercial, or Institutional (IC&I) sector) to whom Designated Blue Box Waste is supplied. Please refer to the Stewardship Ontario Program Plan or the Rules for more information on designated materials for the Stewardship Ontario program.</p>	<p>purchased through retail channels;</p> <ul style="list-style-type: none"> • daily, weekly, monthly and quarterly glossy magazines, comic books, puzzle books including those paid through subscription, provided through free distribution and those purchased through retail channels; • directories, including those paid through subscription, provided through free distribution and those purchased through retail channels; • lottery tickets and lottery information; • warranty information, assembly instructions, product use instructions and health information, product registration cards and promotional information that is found inside purchased products; • envelopes, statements and information inserts from banks,
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Jurisdiction		Legislation, Regulation Producer Responsibility	Packaging Definition	Paper Products
				<p>credit companies, utilities, service providers, etc.;</p> <ul style="list-style-type: none"> • information, forms and promotional materials distributed by municipal, regional, provincial and federal governments; • promotional calendars, posters that are distributed to consumers free of charge; • unsolicited promotional information, coupons, handbills and flyers; and • transportation and transit schedules <p>Printed Paper does not include bound reference books, bound literary books, or bound textbooks.</p> <p>Please refer to the Stewardship Ontario Program Plan or the Rules for more information on designated materials for the Stewardship Ontario program.</p>

Jurisdiction	Legislation, Regulation Producer Responsibility		Packaging Definition	Paper Products
Quebec	Legislation	Environment Quality Act Originally passed in 2002 and was revised in 2011		
	Regulation	Respecting Compensation for Municipal Services Provided to Recover and Reclaim Residual Materials	Containers and packaging - Made of flexible or rigid material such as paper, cardboard, plastic, glass or metal Designed to contain, protect or wrap products	Printed matter, paper and other cellulosic fibres, whether or not they are used a medium for text or images, except books and newspapers. The newspapers class is represented by RecycleMédias. ⁹⁸
	Producer Responsibility/ Stewardship Organization	Eco-Entreprises Quebec	Intended for single use or a short service life Short-life containers and packaging sold as products and printed matter sold as products. ⁹⁷	

⁹⁷ <https://www.eeq.ca/en/for-companies/fee-structure/materials-guide/>

⁹⁸ Ibid.

Jurisdiction	Legislation, Regulation Producer Responsibility	Packaging Definition	Paper Products
	Cost Coverage	Originally the amount that the programs had to provide was about 50% of the costs (this was negotiated on a yearly basis). The revisions in 2011 specified the yearly payment rate, that increased to 100% by 2013.	
Europe	Legislation	EUROPEAN PARLIAMENT AND COUNCIL DIRECTIVE 94/62/EC of 20 December 1994 on packaging and packaging waste	N/A
	Regulation	Country specific	
	Producer Responsibility/ Stewardship Organization	County specific	
		<p>‘packaging’ shall mean all products made of any materials of any nature to be used for the containment, protection, handling, delivery and presentation of goods, from raw materials to processed goods, from the producer to the user or the consumer. ‘Non-returnable’ items used for the same purposes shall also be considered to constitute packaging.</p> <p>‘Packaging’ consists only of: (a) sales packaging or primary packaging, i.e. packaging conceived</p>	

	Cost Coverage	<p>so as to constitute a sales unit to the final user or consumer at the point of purchase;</p> <p>(b) grouped packaging or secondary packaging, i.e. packaging conceived so as to constitute at the point of purchase a grouping of a certain number of sales units whether the latter is sold as such to the final user or consumer or whether it serves only as a means to replenish the shelves at the point of sale; it can be removed from the product without affecting its characteristics;</p> <p>(c) transport packaging or tertiary packaging, i.e. packaging conceived so as to facilitate handling and transport of a number of sales units or grouped packaging in order to prevent physical handling and transport damage. Transport packaging does not include road, rail, ship and air containers.</p> <p>The definition of 'packaging' shall be further based on the criteria set out below. The items listed in Annex I are illustrative examples of the application of these criteria.</p>	
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			<p>(i) Items shall be considered to be packaging if they fulfill the abovementioned definition without prejudice to other functions which the packaging might also perform, unless the item is an integral part of a product and it is necessary to contain, support or preserve that product throughout its lifetime and all elements are intended to be used, consumed or disposed of together.</p> <p>(ii) Items designed and intended to be filled at the point of sale and 'disposable' items sold, filled or designed and intended to be filled at the point of sale shall be considered to be packaging provided they fulfill a packaging function.</p> <p>(iii) Packaging components and ancillary elements integrated into packaging shall be considered to be part of the packaging into which they are integrated. Ancillary elements hung directly on, or attached to, a product and which perform a packaging function shall be considered to be packaging unless they are an integral part of this product and all elements are</p>	
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Jurisdiction	Legislation, Regulation Producer Responsibility	Packaging Definition	Paper Products
		<p>intended to be consumed or disposed of together.</p> <p>The Commission shall, as appropriate, examine and, where necessary, review the illustrative examples for the definition of packaging given in Annex I.</p>	

Source: Canadian Stewardship Services Alliance Guidebook and European Parliament and Council Directive 94/62/EC

Table A-2 provides a summary of the accessibility standards and performance of Canadian EPR provinces.

Table A-2: Accessibility Details from other Canadian Provinces with EPR

Province	Accessibility Standards in Regulation	% of Households with Access to EPR Program through Curbside or Depot Service
British Columbia	Accessibility measured by drive-time to depot metric: population located within a 30-minute (urban) or 45-minute (rural) drive-time to a depot	98.3% ⁹⁹
Saskatchewan	A Depot Only Household is deemed to have access to a depot if the household is within a 45-minute drive of the depot. ¹⁰⁰	82.2% ¹⁰¹

⁹⁹ Recycle BC. 2018 Annual Report. <http://recyclebc.ca/wp-content/uploads/2019/06/Recycle-BC-2018-Annual-Report-1.pdf>

¹⁰⁰ Multi-Material Stewardship Western. Waste Packaging and Paper Stewardship Plan. Revised September 26 and December 12, 2013. Revised September 24, 2015. https://www.mmsk.ca/wp-content/uploads/WPP-Stewardship-Plan_revised_September-12-2015.pdf

¹⁰¹ Multi-Material Stewardship Western. 2018 Annual Report. <https://www.mmsk.ca/wp-content/uploads/MMSW-2018-Annual-Report.pdf>

Province	Accessibility Standards in Regulation	% of Households with Access to EPR Program through Curbside or Depot Service
Manitoba	No performance monitoring requirements in regulation ¹⁰²	91.5% ¹⁰³
Ontario	In progress	N/A
Quebec	Drop-off centres required to meet at least one of several criteria based on population and distance from retail outlets. ¹⁰⁴	N/A

¹⁰² Packaging and Printed Paper Stewardship Regulation (2008). https://web2.gov.mb.ca/laws/regs/current/_pdf-regs.php?reg=195/2008

¹⁰³ Multi-Material Stewardship Manitoba. 2018 Annual Report. http://stewardshipmanitoba.org/wp-content/uploads/2018/06/200947-MMSM-Annual-Report_Composite_reduced.pdf

¹⁰⁴ <http://legisquebec.gouv.qc.ca/en/ShowDoc/cr/Q-2,%20r.%2040.1>

A.4.0 Packaging Materials Assumed to be in Scope

The materials to be included in the Alberta EPR program are based on CSSA's national material list. Table A-3 below lists all the materials as designated by Ontario, Manitoba, Saskatchewan and British Columbia and indicates whether they are covered by Alberta's Beverage Container Recycling Program, if they will be included under the EPR system or neither (a note has also been made for materials included in Alberta Recycling's stewardship programs). Further definitions of materials can be found in CSSA's guidebook at: http://guidebook.cssalliance.ca/wp-content/uploads/2019/03/CSSA-Guidebook_Updated-March-2019.pdf. Packaging-like products¹⁰⁵ may also be considered, as discussed in Section 3.1.1.

A-3: Definitions for the Purposes of Producer Obligations

Material	Included in Beverage Container Program	Include in PPP EPR System
Paper Products		
Newspaper		✓
Other Newsprint		✓
Magazines		✓
Catalogues		✓
Directories		✓
Paper for General Use		✓
Purchased Posters, Calendars, Greeting Cards and Envelopes, comic books, colouring books and bound notebooks¹⁰⁶		✓

¹⁰⁵ I.e. products resembling packaging but sold as a product, such as aluminum pie plates

¹⁰⁶ Please note that the BC Recycle Regulation as it reads, exempts all bound books. We believe the government's intention was only to exempt bound literary, textbooks and reference books and that it intends to make that clarification in upcoming amendments to the Regulation. With that clarification the Recycling Regulation will effectively obligate other kinds of bound books such as comic books, colouring books, and bound notebooks (e.g., journals, games and puzzle books and more) – all of which currently find their way into Recycle BC's blue bins, but

Material	Included in Beverage Container Program	Include in PPP EPR System
Other Printed Materials		✓
Paper Packaging		
Gable Top Containers – Beverage – Milk and Milk Substitutes	✓	
Gable Top Containers – Beverage – Wine and Spirits	✓	
Gable Top Containers – Non-Alcoholic	✓	
Gable Top Containers – Non-Beverage		✓
Aseptic Containers – Beverage – Milk and Milk Substitutes	✓	
Aseptic Containers – Beverage – Wine and Spirits	✓	
Aseptic Containers – Beverage – Non-Alcoholic	✓	
Aseptic Containers – Non-Beverage		✓
Paper Laminates		✓
Kraft Paper Bags (Point of Sale)		✓
Kraft Paper – Non-Laminated		✓
Corrugated Cardboard		✓
Boxboard and Other Paper Packaging		✓
Plastic Packaging		
PET Bottles and Jars < 5 Litres – Beverage – Milk and Milk Substitutes	✓	
PET Bottles and Jars <5 Litres – Beverage – Wine and Spirits	✓	

for which their producers do not pay fees to recycle them. We suggest that Alberta ensure this clarification is made in the drafting of its regulation.

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Material	Included in Beverage Container Program	Include in PPP EPR System
PET Bottles and Jars < 5 Litres – Beverage – Non-Alcoholic	✓	
PET Bottles and Jars ≥ 5 Litres – Wine and Spirits	✓	
PET Bottles and Jars ≥ 5 Litres – Non-Alcoholic	✓	
PET Bottles and Jars < 5 Litres – Non-Beverage		✓
PET Bottles and Jars ≥ 5 Litres – Non-Beverage		✓
HDPE Bottles, Jars and Jugs < 5 Litres – Beverage – Milk and Milk Substitutes	✓	
HDPE Bottles, Jars and Jugs < 5 Litres – Beverage – Wine and Spirits	✓	
HDPE Bottles, Jars and Jugs < 5 Litres – Beverage – Non-Alcoholic	✓	
HDPE Bottles, Jars and Jugs ≥ 5 Litres – Beverage – Wine and Spirits	✓	
HDPE Bottles, Jars and Jugs ≥ 5 Litres – Beverage – Non-Alcoholic	✓	
HDPE Bottles, Jars and Jugs < 5 Litres – Non-Beverage		✓
HDPE Bottles, Jars and Jugs ≥ 5 Litres – Non-Beverage		✓
Plastic Laminates – Beverage – Milk and Milk Substitutes	✓	
Plastic Laminates – Beverage – Wine and Spirits	✓	
Plastic Laminates – Beverage – Non-Alcoholic	✓	
Plastic Laminates – Non-Beverage		✓
PET Thermoform Containers < 5 Litres – Non-Beverage		✓

Material	Included in Beverage Container Program	Include in PPP EPR System
PLA, PHA, PHB – Beverage – Milk and Milk Substitutes	✓	
PLA, PHA, PHB – Beverage – Wine and Spirits	✓	
PLA, PHA, PHB – Beverage – Non-Alcoholic	✓	
PLA, PHA, PHB – Non-Beverage		✓
PLA, PHA, PHB – Plastic Film		TBD
PLA, PHA, PHB – Carry-Out Bags		TBD
LDPE or HDPE Film		TBD
LDPE or HDPE Film – Carry-Out Bags		TBD
Expanded Polystyrene – Food Packaging		TBD
Expanded Polystyrene – Other		TBD
Non-Expanded Polystyrene – Beverage Bottles – Milk and Milk Substitutes	✓	
Non-Expanded Polystyrene – Beverage Bottles – Wine and Spirits	✓	
Non-Expanded Polystyrene – Beverage Bottles – Non-Alcoholic	✓	
Non-Expanded Polystyrene - Other		TBD
Other Plastic Packaging (not listed above) < 5 Litres – Beverage – Milk and Milk Substitutes	✓	
Other Plastic Packaging (not listed above) < 5 Litres – Beverage – Wine and Spirits	✓	
Other Plastic Packaging (not listed above) < 5 Litres – Beverage – Non-Alcoholic	✓	
Other Plastic Packaging (not listed above) ≥ 5 Litres – Wine and Spirits	✓	
Other Plastic Packaging (not listed above) ≥ 5 Litres – Beverage – Non-Alcoholic	✓	
Other Plastic Packaging (not listed above) < 5 Litres – Non-Beverage		✓

Material	Included in Beverage Container Program	Include in PPP EPR System
Other Plastic Packaging (not listed above) ≥ 5 Litres – Non-Beverage		✓
Natural and Synthetic Textiles		Not Included
Steel Packaging		
Steel Aerosol Paint Containers		Included in Alberta Recycling Paint Stewardship Program
Steel Paint Cans		Included in Alberta Recycling Paint Stewardship Program
Other Steel Containers and Packaging – Beverage – Milk and Milk Substitutes	✓	
Other Steel Containers – Beverage – Wine and Spirits	✓	
Other Steel Containers – Beverage – Non-Alcoholic	✓	
Other Steel Containers – Non-Beverage		✓
Aluminum Packaging		
Aluminum Aerosol Paint Containers		Included in Alberta Recycling Paint Stewardship Program
Aluminum Food Containers – Non-Beverage		✓
Aluminum – Beverage Containers – Milk and Milk Substitutes	✓	
Aluminum – Beverage Containers – Wine and Spirits	✓	
Aluminum – Beverage Containers – Non-Alcoholic	✓	
Other Aluminum Packaging		✓
Glass Packaging		
Clear Glass – Beverage – Milk and Milk Substitutes	✓	

Material	Included in Beverage Container Program	Include in PPP EPR System
Clear Glass – Beverage – Wine and Spirits	✓	
Clear Glass – Beverage – Non-Alcoholic	✓	
Clear Glass – Non-Beverage		✓
Coloured Glass – Beverage – Milk and Milk Substitutes	✓	
Coloured Glass – Beverage – Wine and Spirits	✓	
Coloured Glass – Beverage – Non-Alcoholic	✓	
Coloured Glass – Non-Beverage		✓

A.5.0 Example of Agency Involved in EPR

Resource Productivity and Recovery Authority (RPRA)

The RPRA was created in November 2016 by the Government of Ontario to support the transition to a circular economy and a waste-free Ontario. The Authority receives its powers from the *Resource Recovery and Circular Economy Act, 2016* (RRCEA) and the *Waste Diversion Transition Act, 2016* (WDTA).

Under the WDTA, RPRA oversees three waste diversion programs: Blue Box, Municipal Hazardous or Special Waste (MHSW), and Waste Electrical and Electronic Equipment (WEEE) – and their eventual wind up.

Under the RRCEA, RPRA enforces individual producer responsibility (IPR) requirements for managing waste associated with products and packaging.

RPRA responsibilities include:

- Overseeing existing waste diversion programs until they are wound up;
- Approving wind-up plans developed by industry funding organizations and overseeing their implementation;
- Developing and operating a registry for producers responsible for materials under the RRCEA to register with the Authority and report on waste recovery;
- Managing, analyzing and reporting on the information in the registry;
- Carrying out compliance and enforcement activities; and
- Advocating for the circular economy to spur innovation and protect the environment.

Under the *Waste Diversion Act*, Waste Diversion Ontario monitored progress on EPR programs but enforcement was carried out by Ministry of Environment, Conservation and Parks staff. Stewards paid some fees towards the enforcement staff costs, but minimal enforcement was carried out by MECP staff. Generally, the stewardship organizations such as Stewardship Ontario ensured maximum compliance with regulatory requirements with respect to fee payments. Where free riders were found, fines were levied.

A.6.0 Data Request

General Service Information

Collection and Depot

Collection Channels														Collection Container	
Municipality	Delivery of Collection Service	Provides curbside recycling service	Service configuration	Service level (frequency)	Provides single-family	Number of single-family households in municipality	Number of single-family households serviced	Provides curbside to multi-family	Number of multi-family households in municipality	Number of multi-family households serviced	Is PPP service linked to residual/organics	Depot recycling services provided?	On-street container collection?	Blue Box	Size of Blue Box
Insert name	(e.g. private, municipal)	Y/N	(e.g. single stream)		Y/N			Y/N			(e.g. share resources) alternate week collections etc.	(e.g. is this additional to curbside or a substitute for it)			

Transfer

Municipality	Is material transferred after collection before being processed	If Yes please provide location	If Yes please provide name of operator
Insert name	Y/N		

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Please provide details of where your curbside material is taken to for processing

Municipality	MRF Name	MRF Operator	MRF Location	Operational Start Date	Processing Capacity	MRF Contracts Term	MRF Termination	MRF Union Considerations	Stream	Level of Automation	Capital Cost	Net Cost	Data Links
Insert name						(e.g. contract length starts and end date)			single, dual				

Other

Have Relevant by Laws?	Link if Yes	Has Composition Data
		Please provide copy

Future State

Under EPR would your municipality

Want to continue to deliver services	Y/N
Be obligated under bylaws to deliver	Y/N
Want to continue to contract for services	Y/N

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Materials Collected

Paper	Cardboard	Plastic bags/plastic wrap	Plastics (Symbol 1)	Plastics (Symbol 2)	Plastics (Symbol 3)	Plastics (Symbol 4)	Plastics (Symbol 5)	Plastics (Symbol 6)	Plastics (Symbol 7)	Tin cans	Tin foil	Glass containers	Lids and caps	Aluminum	Tetra pack	Cartons
(Y/N)	(Y/N)	(Y/N)	(Y/N)	(Y/N)	(Y/N)	(Y/N)	(Y/N)	(Y/N)	(Y/N)	(Y/N)	(Y/N)	(Y/N)	(Y/N)	(Y/N)	(Y/N)	(Y/N)

Tonnage Collected

	Single Stream	Dual-Stream	Multi-Stream	Residual
Tonnage				
Year Data Reported				

PPP Curbside Contractor

Please complete the following, if services are provided by a contractor

Municipality	Insert name
Service provider	
Services covered under contract	(e.g. PPP, Residual, Organics)
Total contract price	
Contract price for PPP services	(Preferably per household including any difference in cost for single vs multi-family collections)
Contract start date	
Contract end date	

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Please can you provide a copy of your contract for us to better understand the relevant clauses that would need to be considered as part of transition to EPR	If you are unable to provide please ensure data below is completed
Does the contract have price escalation clause	(Y/N and % increase)
Does contract price include material processing	(Y/N, if no please complete relevant post collection tab - contractor or municipal)
Does contract include provision for education	(e.g. annual recycling leaflet or website if yes please provide details including specific cost if not included in total price)
Is contractor the first point of contact for residents they serve for inquiries	(e.g. does contractor they have customer support center) what is the cost for this function if not included in contract price above
Termination rights	(For contractor and municipality)
Transfer rights	Please provide details of clauses that allow for the contract to be transfer to another entity.
Workforce clauses	Are there any clauses relevant to workforce unions, pay agreements, minimum wage etc.
Does contractor provide containers	If yes what is the contract cost associated with this
If no, what is the capital or amortized cost of containers to the municipality	Please state if residents purchase their own containers
Is there revenue share for collected PPP materials	Please provide contract clause related to any revenue share

PPP Depot Contractor

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Annual contractor operating price	
% of contract price associated with providing PPP services	Please make an educated assessment potentially based on tonnage or relative time spent managing PPP versus other materials that maybe processed through the recycling centre
Amortized cost of PPP collection containers	(if not covered under contract but provided by municipality)
Is there revenue share for collected PPP materials	Please provide contract clause related to any revenue share
Contract start date	
Contract end date	
Please can you provide a copy of your contract for us to better understand the relevant clauses that would need to be considered as part of transition to EPR	If you are unable to provide please ensure data below is completed
Does the contract have price escalation clause	(Y/N and % increase)
Termination rights	(For contractor and municipality)
Transfer rights	Please provide details of clauses that allow for the contract to be transfer to another entity.
Workforce clauses	Are there any clauses relevant to workforce unions, pay agreements, minimum wage etc.

Contract Material Transfer and Processing Costs

Material Processing

Municipality	Insert name
MRF treatment cost/tonne	\$ -
Contract start date	
Contract end date	
Please can you provide a copy of your contract for us to better understand the relevant clauses that would need to be considered as part of transition to EPR	If you are unable to provide please ensure data below is completed
Permissible contracted contamination rate (%)	Please include details of relevant clauses related to any costs that have to be included by municipality if contamination levels exceed contracted value
Does the contract have a price escalation clause	(Y/N include details including calculation for increase or annual percentage)
Does contract include provision for education	(e.g. annual recycling leaflet or website if yes please provide details including specific cost if not included in total price)
Termination rights	(For contractor and municipality)
Transfer rights	Please provide details of clauses that allow for the contract to be transfer to another entity.
Workforce clauses	Are there any clauses relevant to workforce unions, pay agreements, minimum wage etc.

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Does the facility revert back to the municipality at the end of the contract term	Please detail relevant clauses e.g. is there an assumed operating life at point of handover
Is there revenue share for collected PPP materials	Please provide contract clause related to any revenue share

Transfer Station

Municipality	Insert name
Transfer Station Location	
Transfer Station Operator	
Transfer cost/tonne	\$ -
Does the contract cover both transfer and processing of PPP	
Contract start date	
Contract end date	
Please can you provide a copy of your contract for us to better understand the relevant clauses that would need to be considered as part of transition to EPR	If you are unable to provide please ensure data below is completed
Permissible contracted contamination rate (%)	Please include details of relevant clauses related to any costs that have to be included by municipality if contamination levels exceed contracted value
Does the contract have a price escalation clause	(Y/N include details including calculation for increase or annual percentage)
Termination rights	(For contractor and municipality)

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Contract transfer rights	Please provide details of clauses that allow for the contract to be transfer to another entity by whether party
Workforce clauses	Are there any clauses relevant to workforce unions, pay agreements, minimum wage etc.
Does the facility revert back to the municipality at the end of the contract term	Please detail relevant clauses e.g. is there an assumed operating life at point of handover

Tonnage Collected

	Single Stream	Dual-Stream	Multi-Stream	Residual
Tonnage				
Year Data Reported				

Municipality Provided Curbside Services - Single Family

Municipality	
Year	
Please provide organization chart for the PPP services	Y/N

Please provide full year costs and revenues

Costs

Vehicles

Please include details of all vehicles or part of that are used in the provision of PPP services including supervisor vehicles

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	Vehicle 1 (insert the type of vehicle)	Vehicle 2 (insert the type of vehicle)	Vehicle 3 (insert the type of vehicle)
Number	If vehicles are shared e.g. with garbage please provide details of the % of the vehicles time that is spent on providing PPP services		
Purchase date or average age			
Capital costs	or book value of asset		
Amortized cost			
Rental cost			
Maintenance Costs/Fleet management			
Fuel			

Labor

	Managers	Foreman/Supervisor	Drivers	Operatives/Helpers	Other
Number					
% of time spent on PPP services					
Salary	\$ -	\$ -	\$ -	\$ -	\$ -
Overhead	\$ -	\$ -	\$ -	\$ -	\$ -
Training Costs	\$ -	\$ -	\$ -	\$ -	\$ -
Other personnel costs	\$ -	\$ -	\$ -	\$ -	\$ -

ISC: Unrestricted

Buildings

Rental and rates	
Building maintenance	
Utilities	
Telephones	
Security	
Other	

Other Costs

Radio airtime costs	
License and permit costs	
Insurance costs	
Other	

Revenue Streams

Material revenue	Total and by material if relevant
Municipal rates	
Sale of containers to residents	

ISC: Unrestricted

Grants	
Other please specify	

Recycling Depot/Centre

Costs

Municipality	
Year	
Please provide organization chart for services	Y/N
Number of recycling depots/centres	Number that the costs below relate to

Vehicles and Equipment

Please include details of all vehicles or part of that are used in the provision of PPP services including supervisor vehicles

	Vehicle/Equipment 1 (insert the type of vehicle)	Vehicle/Equipment 2 (insert the type of vehicle)	Vehicle/Equipment 3 (insert the type of vehicle)
Number	If vehicles are shared e.g. with garbage please provide details of the % of the vehicles time that is spend on providing PP services		
Purchase date or average age			
Capital costs	or book value of asset		

ISC: Unrestricted

Amortized cost			
Rental cost			
Maintenance Costs/Fleet management	servicing etc.		
Fuel			

Labor

	Manager	Foreman/Supervisor	Drivers	Operatives/Helpers	Other
Number					
% of time spent on PPP services					
Salary					
Overhead					
Training Costs					
Other personnel costs					

Buildings

Rental and rates	
Building maintenance	
Utilities	
Telephones	
Security	

ISC: Unrestricted

Other	
-------	--

Other Costs

Radio airtime costs	
License and permit costs	
Insurance costs	
Suppliers	
Other	

Municipality Provided Curbside Services - Multi Family

Municipality	
Year	
Please provide organization chart for the PPP services	Y/N

Please provide full year costs and revenues

Costs

Vehicles

Please include details of all vehicles or part of that are used in the provision of PPP services including supervisor vehicle s

Vehicle 1 (insert the type of vehicle)	Vehicle 2 (insert the type of vehicle)	Vehicle 3 (insert the type of vehicle)
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ISC: Unrestricted

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Number	If vehicles are shared e.g. with garbage please provide details of the % of the vehicles time that is spend on providing PPP services		
Purchase date or average age			
Capital costs	or book value of asset		
Amortized cost			
Rental cost			
Maintenance Costs/Fleet management			
Fuel			

Labor

	Managers	Foreman/Supervisor	Drivers	Operatives/Helpers	Other
Number					
% of time spent on PPP services					
Salary	\$ -	\$ -	\$ -	\$ -	\$ -
Overhead	\$ -	\$ -	\$ -	\$ -	\$ -
Training Costs	\$ -	\$ -	\$ -	\$ -	\$ -
Other personnel costs	\$ -	\$ -	\$ -	\$ -	\$ -

Buildings

Rental and rates	
------------------	--

ISC: Unrestricted

Building maintenance	
Utilities	
Telephones	
Security	
Other	

Other Costs

Radio airtime costs	
License and permit costs	
Insurance costs	
Other	

Revenue Streams

Material revenue	Total and by material if relevant
Municipal rates	
Sale of containers to residents	
Grants	
Other please specify	

Material Handling/Processing

Costs

Municipality	
--------------	--

ISC: Unrestricted

Year	
Facility type	e.g. transfer station, MRF
Number of facilities for which cost below refer to	
Please provide organization chart for services	Y/N
please provide full Asset list for vehicles and equipment	Y/N

Vehicles

Please include details of all vehicles or part of that are used in the provision of PPP services including supervisor vehicles

	Vehicle/Equipment 1 (insert the type of vehicle)	Vehicle/Equipment 2 (insert the type of vehicle)	Vehicle/Equipment 3 (insert the type of vehicle)	Total
Number	If vehicles are shared e.g. with garbage please provide details of the % of the vehicles time that is spend on providing PP services			
Purchase date or average age				
Capital costs	or book value of asset			

ISC: Unrestricted

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Amortized cost				
Rental cost				
Maintenance Costs/Fleet management	inc servicing etc.			
Fuel				
Other				

Equipment

Please include details of all pieces of equipment - if asset list is provided please just complete cost information where not included on asset list

	Equipment 1 (insert the type of vehicle)	Equipment 2 (insert the type of vehicle)	Equipment 3 (insert the type of vehicle)	Equipment 4 (insert the type of vehicle)	Equipment 5 (insert the type of vehicle)	Equipment 6 (insert the type of vehicle)	Equipment 3 (insert the type of vehicle)
Number							
Purchase date or average age							
Capital costs	or book value of asset						
Amortized cost							
Rental cost							
Maintenance cost	inc servicing etc.						
Other							

Labor

ISC: Unrestricted

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	Manager	Foreman/Supervisor	Drivers	Plant Operator	Sorter	Other
Number						
% of time spent on PPP services						
Salary						
Overhead						
Training Costs						
Other personnel costs						

Buildings

Capital cost	If relevant
Rental and rates	
Building maintenance	
Utilities	
Telephones	
Security	
Sprinkler	
Other	

Other Costs

ISC: Unrestricted

Radio airtime costs	
License and permit costs	
Insurance costs	
Suppliers	
Residual disposal costs	

Revenue Streams

Material revenue	Total and by material if relevant
Gate fee/tipping fees	
Sale of containers to residents	
Grants	
Other please specify	

Service Administration and Support

Municipality	Insert name
Budget year	

Labor

Cost in accounts

ISC: Unrestricted

Service Area	HR	Services administration	Customer Services	Education	Sorter	Other
Total Cost for PPP Services						

Or actual resource costs

	Insert position e.g. HR administrator					
% of time spent on PPP services						
Salary						
Overhead						
Training Costs						
Other personnel costs						

Buildings

As related to support functions above

Capital cost	If relevant
Rental and rates	
Building maintenance	
Utilities	
Telephones	

ISC: Unrestricted

Security	
Other	

Other Costs

Communications and education budget	e.g. for leaflets, website etc.
Other	

A.7.0 Introduction to Method

A.7.1 Data Gathering

The first step in modelling the effects of introducing an EPR residential PPP recycling system in Alberta was to understand the PPP recycling system as it stands today. This current-state analysis required Eunomia to collect comprehensive survey data from municipalities on:

- type of materials collected through residential PPP curbside and depot services;
- quantity of material collected and recycled from different PPP services to SF and MF households, as well as through depots;
- the cost of both depot and curbside services provided in-house or through a contractor;
- revenue from material sales.

Eunomia was required to collect residential PPP service data from both of Alberta's two large municipalities, a minimum of eight medium municipalities, ten small municipalities and two First Nations. To meet this requirement the survey request included in Appendix A.6.0 was issued to over 100 municipalities identified during the planning stage. In addition to the primary data received from 31 survey responses, secondary research (a review of reports and websites) was collected from an additional 101 municipalities within the province of Alberta. This secondary research provided additional data on which municipalities had curbside services.

A.7.2 Modelling Current State

A bottom-up cost benefit model was developed from the data received through the survey. The model was developed so that cost and tonnage outputs from the model could be viewed from the perspective of small, medium and large municipalities, other municipality and community types, as well as the province as a whole.

Data entered into the model went through a quality review process so that outlier data that could disproportionately skew final outputs could be verified with the responding municipality or else excluded from the calculations.

Because survey responses did not cover all municipalities, the data provided from the responding 31 municipalities was extrapolated to cover the whole province. Data was received from cities in the large municipality category, so no extrapolation was required. However, for small and medium sized municipalities as well as other municipality and community types, a process was undertaken to scale the data received as detailed below.

A.7.2.1 Data Extrapolation for Current State

Tonnes Collected and Recycled

To estimate the tonnage of material collected from those municipalities for which data was not received Eunomia first calculated the average kg per household per year (kg/hh/year) for medium and small municipalities and other municipality and community types. Average kg/hh/year values were calculated for SF, MF and depot collections. There were two average depot collection rates: one for municipalities that only provided PPP collection services through depots and one for municipalities where curbside services were also provided. This distinction was made to avoid over-estimating the total tonnage during the extrapolation process.

Eunomia then determined through a web-based search which small and medium sized municipalities provided curbside PPP collection services to SF households as well as collection services to MF households versus those which only provided depot services. This process determined that 76% of households living in medium sized municipalities and 57% of households in small municipalities were provided with curbside services and only 7% of MF households in medium sized municipalities had access to a similar level of service.

The average kg/hh/year collection rates for curbside SF service, MF collection and depot service (with or without curbside also being provided in the community) were then applied to the number of properties that were identified as having the service provided or managed by municipalities. Data for those households that hire their own services from private contractors was not available.

The average level of contamination (residue rate) for SF, MF and depot collection in small and medium municipalities was applied to the collected tonnage to estimate the tonnes recycled. Contamination is taken into account when estimating the GHG benefits from avoided landfill.

Seven responses were received from other municipality and community types. All of these municipalities provided depot services only. It was therefore assumed that the 13% of the population that live in other municipality and community types only receive depot services. The depot only average kg/hh/year for small municipalities was applied to these households.

One concern with depot tonnage for this study (which is focused on residential PPP only) is that it includes PPP generated from the ICI sector. Most depots could not clearly identify what percentage of PPP tonnage was from the residential sector or the ICI sector. In these cases, we reduced the reported tonnages by 50% to mitigate the possibility of over-reporting the residential PPP. No data was available to determine actual percentages of ICI vs. residential, so this was based on knowledge of typical tonnages per household.

Cost

Cost data provided by the 29 small, medium and other municipality and community types was extrapolated to estimate an overall cost for services provided to these areas as well as to estimate a total Alberta cost.

Cost data was received for services provided in-house as well as for services provided by contractors. Collection, transportation, and processing costs, as well as other costs associated with recycling programs (i.e., administration and education and promotion) could be identified from in-house data which was very granular. It was also possible to identify separate costs for labor, buildings, vehicles and equipment and administrative support. An average cost per household was calculated for the following types of services, and these averages were applied to the properties that received them:

- Medium municipalities:
 - Average SF curbside with depot
 - Average MF service with depot
 - Average depot only
- Small municipality
 - Average SF curbside with depot
 - Average depot only

The average cost per household was calculated from costs provided from both in-house and contracted out services.

The number of SF and MF households in small and medium municipalities was taken from 2016 Statistics Canada census data. For all other areas where data was not provided, the total population in these areas was divided by 2.7 (the average number of people per household) to estimate household counts. The percentage split between SF and MF households taken from the primary and secondary data was then applied to the total number of households to estimate the number of SF and MF households in these areas.

Allocating costs for resources or assets that are only used a proportion of the time for PPP collection or processing activities is a challenge. The data survey clearly asked respondents to estimate the amount of time a person or asset was used for the provision of residential PPP services or activities. Despite Eunomia's efforts to make this clear with survey respondents through an introductory phone call, there were several instances where the costs per tonne processed through depots appeared excessively high. In such cases, outlier data were either clarified and corrected with the respondent or were not used.

Jobs

Data obtained from the survey was used to update the jobs model developed as part of the *Quantifying the Economic Value of Alberta's Recycling Program* study carried out on behalf of the Recycling Council of Alberta earlier in 2019. The jobs model calculates the number of jobs per 1,000 tonnes of material recycled by activity including:

- Curbside collection, processing and administration
- Depot operation, bulking, transportation and administration

To calculate the number of full-time equivalent (FTE) jobs provided by the PPP collection system, Eunomia took the calculated tonnes of PPP collected through curbside and depot services and divided the total by the jobs per 1,000 tonnes for the corresponding service.

The municipal survey asked respondents to make a best guess at what proportion of staff time (for those not fully dedicated to PPP recycling) was allocated to residential PPP recycling services vs. other duties. Many respondents had difficulty allocating the time, particularly for administration and legal services. Where the allocation in responses seemed disproportionately high it was not used for the analysis.

A.7.2.2 Large Municipalities Overview

Tonnes

A summary of the tonnes collected by large municipalities, as well as their contamination (residue) rates, can be found in Table A-4 below. Our level of confidence in the tonnage results for large municipalities is high because detailed data was provided by both cities (Edmonton and Calgary) that make up the large municipality category, therefore no extrapolation was needed.

A-4: Tonnage Calculations and Contamination Assumptions for Large Municipalities (2018)

Assumption	Total Tonnes Collected	Kg Collected per Household	Contamination Rate
SF Curbside	94,805	173	19%
MF Collection	11,800	67	33%
Depot	6,800	7	8%
Other Services	6,900	17	12%

**Source: Eunomia calculations, assuming 50% depot discount for ICI sector*

Costs

Service budget breakdowns provided by both the large municipalities for the provision of each in-house service was used to determine the percentage of the total collection costs spent on:

- Labour, which included both operational staff, supervisors and management costs associated with residential PPP services only;
- Building leases or annual capital depreciation plus maintenance and utilities;
- Vehicles and equipment used in whole or part for the provision of PPP services; and
- Administration, which includes items such as insurance, supplies, security, etc.

A summary of these proportions can be found in Table A-5 below.

A-5: Costs Related to Different Functions in Large Municipalities (%)

Cost	% of Single-Family Collection Budget	% of Multi-Family Collection Budget	% of Depot Collection Budget
Labour	22%	32%	63%
Building	6%	<1%	6%
Vehicle & Equipment	64%	68%	11%
Administrative	1%	1%	20%
Other (mostly debt)	6%	0%	0%

Source: Eunomia calculations

The collection costs make up 63% of the total residential PPP recycling system costs, as shown in Table A-6.

A-6: Cost Breakdown by Activity in Medium Sized Municipalities (2018) (%)

Activity	% of Total System Budget
Collection (SF, MF, depot)	63%
Transportation	1%
Processing	21%
Support Services and Communication and Education	14%
Total Gross Costs	100%

Source: Eunomia calculations

There were cost differences between the two municipalities. The average cost by collection service type (SF, MF, depot) was calculated by dividing the total costs for that service in each municipality by the number of households serviced. Eunomia found that the average net cost per household in large municipalities of the service was \$53.78.

The gross costs per household for each serviced were calculated from the data responses. In order to avoid distorting the overall average, a weighted average approach was used to calculate the average gross cost per household values presented in Table A-7.

A-7: Gross Per Household Cost of PPP Collection in Large Municipalities (2018)

Service Type	Estimated Cost per Household Served (\$)
--------------	--

SF Curbside	50.75
MF Collection	9.42
Depot	6.46

Source: Eunomia calculations

Note that these costs are the costs for households that only receive the specific collection service. For example, SF collection costs per household are an average of the costs for SF collection divided by the number of SF households served. Therefore, adding the service costs together will not yield the total per household cost within a municipality.

The study analysis determined that SF curbside services in large municipalities cost on average \$50.75 per household (gross collection costs), while the average per household cost for MF service is \$9.42 (gross collection costs).

Table A-8 breaks down the total costs per household for all services by activity aside from collection, which is provided in Table A-7 above. Commentary is also provided on the level of confidence we have in the cost estimates.

A-8: Per Household Costs of PPP Management in Large Municipalities (2018)

Activity	Degree of Confidence	Estimated Cost per Household Served (\$)
Processing (Including labor, capital, and admin costs)	High	13.67
Transportation	High	0.86
Support Services and Communication and Education	Medium	8.89
Revenues	High	7.50

Source: Eunomia calculations

There were some support service and communication costs that seemed idiosyncratic and hard to include in an average picture.

A.7.2.3 Medium Municipalities Overview

Tonnes

To calculate the per household average tonnes collected by service type Eunomia applied the same methodology as described in section A.5.2.1 and A.5.2.2. Eunomia used a weighted average approach from the data received to identify a cost/household average. Responses from municipalities that covered a greater number of households had more weight in the average calculation. This prevented skewing costs from municipalities that covered fewer households. This weighted average was then applied to the estimated number of households served in medium municipalities throughout Alberta. The estimated kg/hh/year collected from the survey responses is presented in Table A-9 below.

A-9: Tonnage Calculations and Contamination Assumptions for Medium Municipalities (2018) (kg/hh/year)

Assumption	Total Tonnes Collected	Kg Collected per Household	Contamination Rates
SF Curbside	38,032	139	17%
MF Collection	275	67	33%
Depot	9,381	25	9%

Source: Eunomia calculations

Some challenges to calculating the estimates above were that the data reported had to be analyzed to identify outliers and municipalities contacted to verify the reported values. Some municipalities, for example, reported unusually high contamination rates. Eunomia received confirmed recycling rates ranged from 77 to 190 kg/hh/year which is a very wide range.

Additionally, it was difficult to achieve representative samples and heterogeneous depot collection systems made synthesis challenging at times. Some municipalities had mini-MRFs while others were only collection depots.

The kg/hh/year values were then multiplied by the number of households known to have each of the services in order to calculate the total tonnages collected in medium sized municipalities.

The data received covered 158,269 households, representing 68% of the population in Alberta that lives in medium municipalities. Eunomia followed the same approach for calculating the per household costs of the PPP recycling system in medium municipalities as it did for large municipalities.

Costs

Taking the weighted average in this instance had a more profound effect on the per household numbers than on the large municipalities. In this case, costs varied by municipality by a greater degree than in large municipalities. Some smaller medium municipalities, for instance, would have high collection costs, but only serve a small number of households. To ensure these costs did not skew the final average costs, we took the weighted average of collection costs by giving the municipalities that served more households a higher weight.

The weighted average of the costs provided by municipalities allowed for the smoothing out of outlier data. This produced a representative average cost per household by service as detailed in Table A-12. The data for MF households was provided by one response only. The percentage split of costs by activity is provided in Table A-10 and Table A-11 below. Responded medium municipalities did not provide debt obligations.

A-10: Costs Related to Different Functions in Medium Municipalities (2018) (%)

Cost	% of Single-Family Collection Budget	% of Depot Collection Budget
Labour	32%	37%
Building	4%	5%
Vehicle & Equipment	53%	47%
Administrative	11%	11%

Source: Eunomia calculations

A-11: Cost Breakdown by Activity in Medium Municipalities (2018) (%)

Process	% of Total System Budget
Collection (SF, MF, depot)	70%
Transportation	4%
Processing	16%
Support Services and Communication and Education	10%
Total Gross Costs	100%

Source: Eunomia calculations

Eunomia found that the net per household cost of service in households with all services provided was \$86.85.

A-12: Gross Per Household Cost of PPP Collection in Medium Municipalities (2018)

Service Type	Degree of Confidence	Estimated Cost per Household Served (\$)
SF Curbside	Medium	49.00
MF Collection	Medium	17.03

Depot	Medium	27.45
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Source: Eunomia calculations

Some challenges to calculating the estimates above were controlling for outliers and having only one data point for MF collection costs.

The per household cost for each major component of the recycling service aside from collection is presented in Table A-13.

A-13: Per Household Costs of PPP Management in Medium Municipalities (2018)

Activity	Degree of Confidence	Estimated Cost per Household Served (\$)
Processing	Medium	14.88
Transportation	High	3.59
Support Services and Communication and Education	High	9.22
Revenues	Medium – Low	4.60

Source: Eunomia calculations

Some challenges to calculating the estimates above were that types and extents of post collection services described in data responses varied greatly. For example, some municipalities responded with post collection costs that were difficult to separate completely from other stages in the process, such as depot collections because some depots function as transfer stations as well. These are difficult to compare to one another, as there are there instances of depots, transfer stations, and mini-MRFs.

Additionally, it was difficult to achieve consistent, representative revenue figures for these municipalities due to market fluctuations and incomplete data on behalf of the municipalities and MRF operators.¹⁰⁷

A.7.2.4 Small Municipalities Overview

Ten survey responses which covered 20,428 households (representing just 7% of the population) living in small municipalities were received as part of the project research. All of the curbside services in small municipalities are provided by contractors.

¹⁰⁷ Conversations with GFL representative 08/12/19

Tonnes

The estimated kg/hh/year collected was developed from survey responses using a weighted average approach described previously. Results are presented in Table A-14 below.

A-14: Tonnage Calculations and Contamination Assumptions for Small Municipalities (2018)

Assumption	Total Tonnes Collected	Kg Collected per Household	Contamination Rate
SF Curbside	11,773	141	17%
MF Service	N/A	N/A	33%
Depot	8,174	55	9%

Source: Eunomia calculations

Some challenges when calculating the estimates above were small sample sizes as well as outliers that had to be confirmed with municipalities or removed.

Furthermore, high depot yields were often reported, which had to be confirmed with municipalities. Commercial tonnages were likely included in many of the reported tonnages given by municipalities. Therefore, depot tonnages reported were reduced by 50% to account for likely ICI contributions. No data was available to determine actual percentages of ICI vs. residential, so this was based on knowledge of typical tonnages per household.

No reliable contamination rates were provided from small municipalities, medium contamination rates were therefore used.

Total household numbers in small municipalities, as well as the coverage rates, were combined to calculate the total PPP tonnes collected in small municipalities.

Costs

Eunomia found that the average per household cost in small municipalities with SF curbside and depot services was \$102.46. A summary of the costs of collection only (i.e., no processing, revenues, support services or post-collection transportation) is presented in Table A-15 below.

A-15: Gross Collection Costs in Small Municipalities in 2018

Service Type	Degree of Confidence	Estimated Costs per Household Served (\$)
SF Curbside	Medium - Low	68.40

MF Collection	N/A	N/A
Depot	Medium - Low	35.12

Source: Eunomia Calculations

Some challenges to calculating the estimates above were inconsistencies of service scope across municipalities and small sample size.

Furthermore, heterogeneous depot collection systems were hard to compare to each other and revenue figures were highly variable.

Because only total contract costs were provided for PPP services a breakdown by activity cannot be provided.

The per household costs for all stages of the recycling service are presented in Table A-16 below.

A-16: Average per Household Costs of PPP Recycling System in Small Municipalities in 2018

Cost	Degree of Confidence	Estimated Cost per Household Served (\$)
Processing	Low	18.57
Transportation	Low	4.48
Support Services and Communication and Education	Medium	9.22
Revenues	Medium – Low	4.02

Source: Eunomia calculations

Some challenges to estimating the estimates above were limited data availability, no transportation costs were given from the sample, a per household costs increase of 25% from medium municipalities to small municipalities was therefore assumed to achieve a per household number. Additionally, it was difficult to find consistent, representative revenue figures for these municipalities due to market fluctuations and incomplete data given by the municipalities.

The total population living in small municipalities was divided by 2.7 to calculate the number of households. The average cost/household was applied to the estimated number of households believed to receive each of the service to calculate total costs.

It was estimated that 57% of SF households in small municipalities had curbside service, while no MF households received service.

The average per household costs for SF and depot service were applied to total households to calculate the total cost of PPP recycling in small municipalities, which is estimated at approximately \$25 million.

A.7.3 Summary of Tonnes Per Household

Table A-17 details the tonnes per household collected across collection methods and municipality types.

A-17: Summary of Average Tonnes Collected per Household in Alberta, by Municipality Type and Collection Method in 2018

Municipality Type	Collection Method				Average (kg/hh/year)
	SF Curbside (kg/hh/year)	MF Collection (kg/hh/year)	Depot (kg/hh/year)	Other (kg/hh/year)	
Large Municipalities	173	67	7	17	132
Medium Municipalities	139	67	25	N/A	125
Small Municipalities	141	N/A	55	N/A	117
Other Municipality and Community Types	N/A	N/A	47	N/A	47
Average	160	67	21	17	120

Source: Eunomia calculations

A.7.3.1 Avoided Garbage Collection and Disposal Costs

Each tonne of PPP collected and recycled avoids the need to collect and manage the PPP material as garbage.

Eunomia calculated that the current garbage collection and disposal savings in Alberta is equal to \$28 million. This number was calculated by assuming a landfill rate of \$120/tonne for large municipalities, \$75/tonne for medium municipalities, and \$102/tonne for small and other municipality and community types. The rates were taken from responding municipalities. Garbage collection costs of \$100 per tonne were assumed. Garbage collection costs were obtained from conversations with representatives from Morrison Hershfield.

The same methodology was used to calculate the future avoided garbage collection costs.

Morrison Hershfield maintains a database of local Alberta per tonne tipping fees for municipal waste. The average cost per tonne for each municipality size was multiplied by the tonnes recycled (tonnes collected minus the MRF and depot contamination rates) to estimate the avoided landfill costs in 2018.

A.7.3.2 Avoided GHG Emissions

The avoided GHG emissions were calculated using Environment and Climate Change Canada (ECCC)'s GHG Calculator.¹⁰⁸ Under the current state, an estimated 197,600 tonnes of residential PPP were collected, with 163,200 tonnes recycled. A conservative 132,000 tonnes were used for the GHG Calculator to account for MRF residue and other material losses, based on material composition of PPP in Alberta. For the GHG emissions saved, national average assumptions on landfill gas recovery in the ECCC model was used. There is apparently limited landfill gas recovery in Alberta.

A.7.4 Future State Assumptions

A.7.4.1 Future State Design

Table A-18 below details the design assumptions for the future state.

A-18: Future State Design Assumptions

Category	Future State Modelling Assumptions
Accessibility Standard	Any household that has curbside services for garbage is also provided with curbside service for recycling, including multi-family at the same collection frequency as garbage collection Municipalities with depot-only services (for garbage and recyclables) will have same materials collected as curbside services.
Designated Materials	All paper product and packaging (PPP) materials generated by obligated households

¹⁰⁸ Environment Canada, Determination of the Impact of Waste Management Activities on Greenhouse Gas Emissions: 2005 Update Final Report <https://www.rcbc.ca/files/u3/ICF-final-report.pdf>

Category	Future State Modelling Assumptions
Materials Collected	Consistent across curbside and depot services and consist of paper product and packaging (PPP) materials necessary to meet targets.
Convenience	The existing network of depots is sufficient and there is no need for additional depots. Unstaffed depots will continue to be unstaffed, but a formula will be developed for ensuring tonnage from the ICI sector is excluded from payments for example based on agreed caps by material taken from staffed depots.
Tonnage	<p>Additional tonnage expected through an EPR system for residential PPP has been calculated as follows:</p> <p>Additional properties being provided with curbside services, predominately MF properties in Calgary plus some SF in those areas that receive curbside garbage but not PPP.</p> <p>Uplift (increased tonnage recycled) resulting from consistent range of materials collected at both the curbside and through depots taken from an assessment of the waste composition studies received:</p> <p>Percentage material increase at curbside: 9% for small municipalities and 7% for medium and large</p> <p>Percentage material uplift: 16% for depots in small municipalities.</p> <p>No additional material capture assumed as a result of setting targets as targets not determined.</p>
Collection Frequency and Methodology	<p>Assumed no change in current collection frequencies or methodology. The majority of municipalities for which data was obtained provide curbside PPP recycling weekly.</p> <p>Consideration: Curbside recycling should be provided at least at the same frequency as curbside garbage. PRO should have flexibility to introduce alternative collection frequency/methodology if targets not met.</p>
Containerization	<p>Municipalities continue to choose appropriate containers if they are providing or contracting recycling services. If producers are the contracting party, they will choose the containers supplied.</p> <p>Consideration: Potential in long term to move to automated collection as program develops.</p> <p>If target is not being met, PRO should have flexibility to introduce alternative collection methodology.</p>

Category	Future State Modelling Assumptions
Capital Costs	No additional capital cost has been assumed for new processing infrastructure; processing costs based on a per tonne average from existing costs for large, medium and small municipalities

A.7.4.2 Future State Assumptions for Large Municipalities

How the assumptions listed in Table A- 21 are observed in the future state in large municipalities are summarized below:

- SF Curbside:
 - Access: No increase in access as 100% of SF already have access
 - Tonnes and material consistency: No increase in SF tonnes as range of materials is consistent with other municipalities
 - Cost: No change in SF costs to the system. Although contracting and potential regional processing efficiencies could be realized through EPR over time, these savings are difficult to quantify and as such no assumptions have been applied.
- MF Collection:
 - Access: Increased by 180,000 households to cover Calgary MF properties currently without service provided or managed by the municipality, resulting in 100% of MF having access to services in the future state.
 - Tonnes and material consistency: Additional 14,800 tonnes from MF service and 8.5% increase in tonnes per household based on a consistent range of service. This resulted in a future average of 73kg/hh/year applied across all MF.
 - Cost: \$3.95 million for adding MF households in large municipalities to system based on cost per household from the one large municipality that provides the service:
 - \$9.42 for collection;
 - \$0.76 for additional tonnage processing costs of already covered municipalities due to increased tonnage;
 - \$11 for processing costs of new households;
 - \$1.85 for support services;
 - Less \$0.21 of revenue
- Depot:
 - Access: No change in number of depots
 - Tonnes: No change in depot tonnes
 - Costs: No change in costs

The assumptions have the following effect on large municipalities from the current to future state:

- Access: An additional 188,055 households covered
- Tonnes: An increase of 14,000 tonnes collected
- Cost: An increase of \$4,108,863 to the system

A.7.4.3 Future State Assumptions for Medium Municipalities

- SF Curbside:
 - Access: Expand service so that all SF households that have curbside garbage PPP. Additional 29,100 households determined through primary and secondary data. Additional properties as well as the yield increase explained below increased tonnage by 6,394 tonnes.
 - Tonnes and material consistency: A yield increase of 8.5% to all properties for consistent service and collection of materials that brought the tonnes collected per household to .153 which was then multiplied to households already covered. The yield increase was determined by seeing how many materials were covered in our sample, and then applying the additional material collection tonnage if all PPP materials were covered.
 - Cost: An increase in cost of \$2.5 million in medium municipality SF coverage. Cost of adding 29,100 SF households to the service each with a cost per household of:
 - \$49 for collection
 - \$15 for processing
 - \$9.22 for administration
 - Less \$0.13 of revenue
 - A \$1/hh increase in processing & collection costs for households already covered due to tonnage yield increase of 8.5% from all materials collected
- MF Collection:
 - Access: Increase of 50,845 multi-family households to service
 - Expansion based on 100% coverage of households with garbage collection, determined through primary and secondary research based on % of households with garbage who are not covered for recycling
 - Tonnes and material consistency: Additional 3,600 tonnes from existing MF service tonnage yield increase and addition of new MF households to service. Increased tonnage uplift of 8.5% due to expanded coverage of materials to existing recycling services multiplied by already covered MF households
 - Cost: A \$1.6 million additional cost to the collection system for providing collection service to an additional 50,900 MF properties each with a per household cost of:
 - \$17 for collection
 - \$7 for processing costs of new households
 - \$9 for support services
 - \$0.13 for revenues
 - \$0.05 increase in processing costs for households already covered for yield increase collection and processing
 - A \$61,644 decrease in transportation costs from fewer tonnages collected at depots and depot expansions to mini-MRFs
- Depot:
 - Access: No change in number of depots, however expansion of current depot services assumed

- Tonnes and material consistency: A 3,060 tonne decrease in depot tonnes collected due to the expansion of curbside service which drops the kg/hh collected at depots as households substitute away from depots.
- Cost: A decrease of \$304,543 in depot processing costs due to drops in the tonnage collected at depots

The assumptions result in the following:

- Access: An additional 79,945 households covered
- Tonnes: An increase of 8,921 tonnes collected
- Cost: An increase of \$4,048,000 to the system

A.7.4.4 Future State Assumptions for Small Municipalities

- SF Curbside:
 - Access: 35,885 household increase in single family coverage. Expand service to everyone who has garbage curbside collection and will therefore have recycling curbside.
 - Tonnes and material consistency; A 6,500 tonne increase in SF tonnage collected as the collection rate increases by 8.5% to 153 kg/hh/year
 - Cost: An increase in cost of \$3.3 million in small municipality SF recycling for adding 29,100 SF households to recycling service, each with a per household cost of:
 - \$68 for collection
 - \$15 for processing
 - A decrease of \$2.13 for depot transportation costs, as costs were lowered due to expansion of depots into transfer stations/mini MRFs
 - Support service costs of \$9
 - Less \$3.40 of revenue
 - Additional \$7.02/hh for additional processing & collection costs for households already covered due to tonnage yield increase of 8.5%
- MF Collection:
 - Access: Increase of 380 multi-family households to service. Expansion based on assumed 100% coverage of households with garbage collection, determined through primary and secondary research based on % of households with garbage curbside service who are not covered by curbside recycling.
 - Tonnes and material consistency: Additional 30 tonnes from new households added to service
 - Cost: A \$10,556 additional cost to the MF collection system due to the cost of providing collection service to an additional 380 MF properties, each with a cost per household of:
 - \$17 for collection
 - \$7 for new processing costs
 - \$2.13 decrease in transportation costs for expansion of depots to transfer stations/mini MRFs for all households old and new

- \$9 for support services
 - Less \$3.40 of revenue
- Depot:
 - Access: No changes in number of depots assumed, but expansion of depot services assumed
 - Tonnes and material consistency: A 2,800 tonne change in depot tonnes collected due to expansion of curbside service drops the amount collected from 55kg/hh/year to 36kg/hh/year.
 - Cost: A decrease of \$405,290 in depot processing costs due to drops in tonnage collected at depots. \$2.13/hh decrease in transportation costs for expansion of depots to transfer stations/mini MRFs for all households old and new

The impact of these assumptions has the following effect on small municipalities from the current to future state:

- Access: An additional 36,261 households covered
- Tonnes: An increase of 3,624 tonnes collected
- Cost: An increased cost of \$3.25 million to the system

A-19: Future State Assumptions for Households in Other Municipality and Community Types

- Depot:
 - Access: No changes in number of depots assumed, but expansion of depot services assumed
 - Tonnes: An increase of 1,940 tonnes collected from consistency of service at depots
 - Costs: An increase in costs at depots by \$1.34/hh, transportation costs increase by \$113/tonne for each additional tonne for transportation, \$1.28/hh for administrative costs, revenues of \$0.26/hh

The impact of these assumptions on other municipality and community types from the current to future state is estimated at:

- Access: No change in number of depots assumed, but an increase in services provided at depots assumed
- Tonnes: An increase of 1,940 tonnes collected
- Cost: An increase of \$858,427 to the system

A.7.5 Options for Future Efficiencies

Table A-20 below highlights where there is the potential for service and costs efficiencies in the future state:

A-20: Other Factors

Potential System Change	Rationale
Standardized contracts for collection	Standardized contracts provide for a uniform approach to collection service; with the limited data available assumptions were not made on the potential impacts that standardized contracts would provide.
Collection contract transparency	The transparency afforded by a single PRO could help reduce the variation in contract costs, however, the contracted costs received from the limited data responses showed a large variance between responses. It was not possible to identify what cost efficiencies could be realized.
Cross municipality border service efficiencies	This is partly linked to assumptions 1 and 2 above. Benefits are generally derived from cross-border delivery of services; however, no assumptions have been made in this report. Resources are being already shared by the private sector in delivering their services (e.g., collection schedules that collect in one municipality on Monday and Tuesday, and a neighboring municipality on Wednesday and Thursday).
Frequency of collection	29 of the 31 responses received have weekly recycling collections already. There is a potential to move to bi-weekly collections, but this would need to be carried out in conjunction with the municipality to assess the impact on garbage as well as green bin services.

A.8.0 Bylaws Details

The bylaws of individual municipalities vary immensely. It is likely that there may need to be broad adjustments to the bylaws of many municipalities to accommodate for the provincial transition to an EPR system for residential PPP. Additional details on disparities in bylaws across municipalities in Alberta are discussed below.

The definition of SF and specifically MF varies by municipality as demonstrated in Box 6-1.¹⁰⁹ These examples highlight the need for standardized definitions to be established when an EPR system is put in place.

In British Columbia, the Packaging and Paper Product Extended Producer Responsibility Plan defines MF properties as:

“Residential complexes with 5 or more units where all households deposit their recycling at a centralized location in shared containers.”¹¹⁰

¹⁰⁹ Sourced from the bylaws of various municipalities across Alberta.

¹¹⁰ Recycle BC. “Packaging and Paper Product Extended Producer Responsibility Plan.”
<https://recyclebc.ca/wp-content/uploads/2018/07/Packaging-and-Paper-Product-Extended-Producer-Responsibility-Plan-July2018.pdf>

Box 6-1: Definition of Multi-family in Two Alberta Cities

MF Definition 1:

“(i) a class of building containing more than one dwelling unit, except for row housing where each dwelling unit is on a separate tax parcel; or

(ii) a class of property containing more than one building with dwelling units on a single tax parcel.”

MF Definition 2:

“residential recycling services and residential diversion of food and yard waste material will be provided by the City to only those residential dwellings that are not located in a multi-residential complex and: are a:

(i) single detached dwelling;

(ii) duplex;

(iii) triplex;

(iv) fourplex;

(v) multiplex;

(vi) rowhouse;

(vii) townhouse; and

(b) receive weekly residential black cart collection services.”

MF Definition 3: “Multiple Dwelling Development” means a “residential condominium development or any development containing 3 or more Dwelling units on a single legal parcel of land.”

The definition of MF properties in Alberta should be standardized to reflect the demographics of the province.

Large Municipalities

All large municipalities have bylaws regulating waste management services. Municipalities are required to provide waste services to residents or to contract with a private agency to do so. In order to enable producers to manage the recycling system under EPR, provincial policy will need to ensure producers have unfettered discretion to operate collection and post-collection management systems.

Additionally, large municipalities offer curbside services along with depots that accept additional materials to those accepted in the blue box. In a producer-operated system, standardization of materials accepted will occur as a standard material list established pursuant to provincial policy.

The waste management bylaws of large municipalities are very detailed and include definitions of MF units and details on service provisions to such households. These will be replaced by definitions in provincial policy.

Non-residential premises must arrange with private contractors for the removal and treatment of waste and recycling.

Medium Municipalities

All medium municipalities have bylaws regulating waste management services. In most cases, the municipality is required to provide waste services to residents or to contract with a private agency to do so.

Often, a Chief Administrative Officer (CAO) is designated as the responsible party for fulfilling the obligations outlined in the bylaw. This single person is authorized to enter into contracts for waste collection services with commercial contractors for the collection and disposal of waste, if necessary.

The extent to which packaging recycling is specified varies; some define all packaging types and their method of disposal, others define the responsibilities of the municipality and the residents, and some do not distinguish recycling from other solid waste management.

Small Municipalities

Compared to larger municipalities, small municipalities tend to specify less in their bylaws. Like the medium municipalities, the small municipalities often name the administrator responsible for making arrangements for waste management on behalf of the town or village. This individual is often authorized to determine the types of waste accepted as well as manage contracts with any commercial agency for collection or processing.

One municipality states that the authorized agent may:

“specify the types of waste, recyclable or compostable material accepted at the Town’s designated disposal site or community recycling depot, make and execute agreements on behalf of the [small municipality] for the collection of waste, recyclable or compostable material and disposal services.”

Though there is responsibility for waste management designated in the bylaws of most of the small municipalities, provincial policy will override local bylaws in this regard.

A.9.0 PPP Processing Facilities

Summary of Identified Alberta Processing Facilities

Facility No.	Facility Type	Owner	Operator	Operational Start Date	Current Processing Tonnage (MT p/a)	Max Processing Capacity (MT p/a)	Capital Cost (\$M)	Level of Automation	Source of Material	Remaining Asset Life
1	Dual-stream	Public	Public	2014	1,800	Approx. 15,000 (10MT/hr)	3.8	Low: Plastics and metal sorting line, plus baler	SF	2033

Facility No.	Facility Type	Owner	Operator	Operational Start Date	Current Processing Tonnage (MT p/a)	Max Processing Capacity (MT p/a)	Capital Cost (\$M)	Level of Automation	Source of Material	Remaining Asset Life
2	Single-stream	Private	Private	2009	56,000 single-stream (one shift, 8.5hrs per day, 5 days per week), plus 25,000 source-separated material (cardboard) from ICI sector	Approx. 85,000 (one shift) or 155,000 (two shifts)	N/A	High: 70%	SF plus some ICI as source segregated	N/A
3	Single-stream	Private	Private	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
4	Single-stream	Private	Private	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	N/A

Facility No.	Facility Type	Owner	Operator	Operational Start Date	Current Processing Tonnage (MT p/a)	Max Processing Capacity (MT p/a)	Capital Cost (\$M)	Level of Automation	Source of Material	Remaining Asset Life
5	Single-stream	Public	Private	2019	8,840 (one shift, 8.5hrs per day, 5 per days)	17,680	Not Available	Medium	SF, MF, Depots, ICI	Not Available
6	Single-stream	Private	Private	2013	30,000 single-stream (one shift, 8.5hrs per day, 5 per days) plus 4,800 other	Approx. 79,000	35.5	High	85% SF, 10% MF, 5% ICI	6 – 8 years
7	Single-stream	Public	Private	1999	58,000	58,000	12	Medium	SF	N/A
8	Single-stream	Public	Private	2018	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

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Attachment 2

Facility No.	Facility Type	Owner	Operator	Operational Start Date	Current Processing Tonnage (MT p/a)	Max Processing Capacity (MT p/a)	Capital Cost (\$M)	Level of Automation	Source of Material	Remaining Asset Life
9	Dual-stream	Public	Public	2011	1,600	Not Available	3.2	Low: Plastics and metal sorting line, plus baler	SF	Not Available
10	Multi-stream	Public	Public	2015	890	N/A	0.3	Very Low: Baler only	SF (20%) and ICI (80%)	Not Available
11	Multi-stream	Private	Private	N/A	N/A	N/A	0.8	Very Low: Baler only	Not Available	Not Available
12	Multi-stream	Public	Public	2017	N/A	N/A	0.1 (excluding building)	Baler only	N/A	N/A

Source: Eunomia primary data from municipality data request

A.10.0 Current Private Sector Service Providers

A selection of waste management organizations, cited by study group participants, is provided in Table A-21.

A-21: Alberta Commercial Waste Management Organizations

Waste Management Organizations			
GFL Environmental, Inc.	Blueplanet	Green for Life	SASH
Can Pak Environmental, Inc.	Empringham	Dr. Recycle	Prairie Disposal
Collective Waste	Aquaterra	Waste Connections	Evergreen Ecological
Environmental 360 Solutions			

A.11.0 Waste Composition Data

Table A-22 provides an average waste composition breakdown of the recycling stream across municipality types and through every collection method, based on data provided by a subset of the study group. Waste composition data was only available in a limited number of municipalities, so should be used with caution if applying more broadly. Average composition is weighted based on the tonnes collected in each municipality type.

A-22: Composition of Recycling Stream Across Study Municipalities

	Large	Medium	Small	Average
Paper	37%	51%	51%	44%
Cardboard	33%	12%	12%	22%
Plastic Bags/Plastic Wrap	1%	6%	6%	3%
Plastics (rigid)	3%	3%	3%	3%
Tin Cans	2%	2%	2%	2%
Glass Containers	3%	4%	3%	3%
Aluminum	1%	0%	0%	0%
Stewardship	5%	5%	5%	5%
Other Metal	1%	1%	1%	1%
Other	19%	17%	17%	17%

Source: Survey responses and Eunomia calculations.

A.12.0 Other Jurisdiction Targets

The proposed recovery targets in the latest Recycle BC Packaging and Paper Product Extended Producer Responsibility Plan are set out in Table A-23.

A-23: British Columbia Proposed Recovery Target¹¹¹

Material Category	2017 Recovery Rate (%)	Target Recovery Rate (%)	Year to Achieve Target
Paper	87	90	2020
Plastic	41	50	2025
Rigid Plastic	50	55	2022
		60	2025
Flexible Plastic	20	22	2022
		25	2025
Metal	66	67	2020
Glass	72	75	2020

Source: Packaging and Paper Product Extended Producer Responsibility Plan revised June 2019

Table A-24 summarizes the current packaging mandatory recycling targets as set out in the European Union's Packaging and Packaging Waste Directive.

A-24: Packaging Targets in Europe

Material Category	Mandatory Recycling Rate (%)	Year to Achieve Target
All Packaging	65	2025

¹¹¹ The plan also includes overall recovery targets of 75% (2018); 75% (2019), 77% (2020), 77% (2021), and 78% (2022).

Material Category	Mandatory Recycling Rate (%)	Year to Achieve Target
Paper and Cardboard	70	2030
	75	2025
Plastic	85	2030
	50	2025
Ferrous Metals	55	2030
	70	2025
Aluminum	80	2030
	50	2025
Glass	60	2030
	70	2025
Wood	75	2030
	25	2025
	30	2030

Source: Packaging and Packaging Waste Directive (94/62/EC), Article 6¹¹²

¹¹² <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1567873308871&uri=CELEX:01994L0062-20180704>

A.13.0 Collection Contract Clause Examples

Contract Example 1: Collection Contract

- Assignment: Neither party shall assign its interest in this Agreement, or any part hereof, in any manner whatsoever without having first received written consent from the other party. This consent shall not be unreasonably withheld.

Contract Example 2: Curbside and Depot

- Assignment: Contractor cannot assign the contract; contract is silent on municipality assignment.
- Termination for Convenience: The County can terminate the contract at any time but must pay the contractor:
 - In the event of a termination notice being given pursuant to this section, the Contractor shall be entitled to be paid, to the extent that costs have been reasonably and properly incurred for purposes of performing the Contract and to the extent that the Contractor has not already been so paid or reimbursed by the County.

Contract Example 3: Curbside

- Assignment: Neither party shall assign its interest in this Agreement, or any part hereof, in any manner whatsoever without having first received written consent from the other party, which consent shall not be unreasonably withheld.
- Termination: Ability for the municipality to terminate the contract for any reason giving 180 days' notice. The contractor's right to payment shall be limited to payment for the services performed and not previously paid for.

Most Recent Producer Funding Obligations in Canadian EPR Jurisdictions

Province	Program type	Producer Obligation	Producer Funding ¹
Alberta	Individual municipalities	0%	\$0 ²
British Columbia	Full EPR	100% (costs, risks, liabilities)	\$88,700,000 ³
Saskatchewan	Partial EPR	Up to 75% (agreed to costs, liabilities)	\$6,000,000 ⁴
Manitoba	Partial EPR	Up to 80% (agreed to costs, liabilities)	\$20,500,000 ⁵
Ontario	Partial EPR	Up to 50% (agreed to costs, liabilities)	\$126,400,000 ⁶
Quebec	Partial EPR	Up to 100% (agreed to costs, liabilities)	\$145,100,000 ⁷
TOTAL:			\$386.7 million

¹ Rounded to the nearest 100,000.

² EPR Canada EPR Summary Report September 2017

³ RecycleBC 2018 Annual Report

⁴ Multi-Material Stewardship Western 2018 Annual Report

⁵ Multi-Material Stewardship Manitoba 2018 Annual Report

⁶ Resource Productivity & Resource Authority News Release – 2019 Blue Box Funding Obligation

⁷ Eco Enterprises Quebec 2018 Annual Report



Alberta Collaborative Extended Producer Responsibility Study

UCS2020-0887

ISC: Unrestricted

Standing Policy Committee on Utilities and Corporate Services

2020 September 16





Previous Council Direction

On 2019 February 4, Council approved Notice of Motion C2019-0129 and directed Administration to cooperate with other Alberta municipalities, AUMA, producers and recyclers of packaging and paper products, and the Province of Alberta to develop a baseline that can inform the design of a provincial EPR program by researching:

- I. The benefits, challenges, and risks of an EPR program in Alberta for these groups and their constituents; and
- II. The current recycling systems and supply chains across the province, and potential impacts of an EPR program in Alberta.

Calgary



Partners

In funding and the project...



Canadian Stewardship
Services Alliance



In the project...



RCA RECYCLING COUNCIL
OF ALBERTA





Why does Alberta need EPR?

- Alberta municipalities spent approximately \$107 million in 2018 to manage paper and packaging products
 - With an EPR framework in place in Alberta, that cost would be partially or wholly shifted to producers and shared among consumers across Canada.
- For The City of Calgary, the implementation of EPR in Alberta would mean that residents of Calgary would see Blue Cart fees reduced or eliminated, potentially reducing costs for every single-family household in Calgary by up to \$100 each year



Environmental and Economic Benefits of EPR

- Additional 20,900 tonnes recycled in Alberta annually
- Additional 71,900 tonnes in avoided CO₂ emissions annually
- Approximately 220 jobs would be created
- Those who can actually create change are empowered with the incentive to create environmentally friendly packaging and efficient recycling systems

The equivalent of
15,000 cars off the
road each year





Recommendation

That the SPC on Utilities and Corporate Services recommends that Council reaffirm its support for Extended Producer Responsibility and direct Administration to continue advocating for EPR in collaboration with other Alberta municipalities, industry and affected stakeholders.