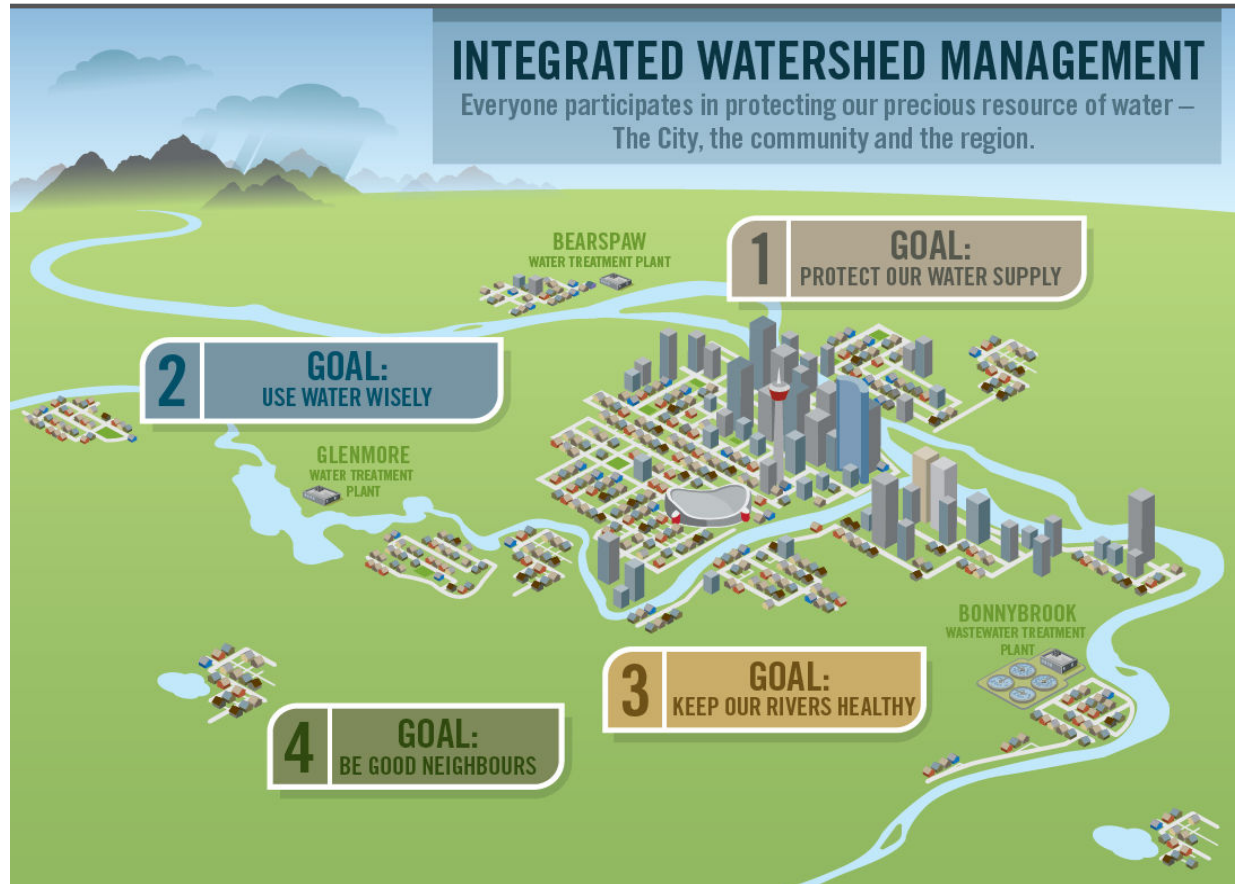


WATERSHED MANAGEMENT PLANNING 2014 PROGRESS

From the river to the tap – and back again, The City is dedicated to protecting and managing our precious water resources.



The City of Calgary takes an Integrated Watershed Management approach to protecting and conserving our water resources. This includes:

- Protecting our water supply by reducing upstream risks to our water source (Drought Management Plan, Water Supply Plan in development);
- Using water wisely through responsible and efficient use (30-in-30 Water Efficiency Plan);
- Keeping our rivers clean by reducing Calgary's impacts on the rivers (Stormwater Management Strategy and Total Loading management Plan); and
- By fulfilling the goals above, we are doing our part to be good neighbours and consider the needs of downstream users.

Watershed protection in Calgary aligns with the provincial Water for Life strategy and supports regional Watershed Management Plans (Bow Basin, Elbow River and Nose Creek). Water quality protection is guided by The City's wastewater Approval to Operate, managing sediment and pollutant loadings to the Bow River.

1. GOAL: PROTECT OUR WATER SUPPLY

Reliable, secure, high quality water supplies are essential for Calgary and the region. History shows that our region is prone to prolonged, severe droughts. The Province has also closed the South Saskatchewan River Basin to new water allocations. Meanwhile, rapid growth continues to place upward pressure on water resources in the Bow River watershed. Future municipal and regional development also poses risks of degrading water quality upstream of The City's raw water intakes. To meet these challenges, The City of Calgary must proactively reduce risks to its water supplies. This must be undertaken while recognizing and balancing the needs of other land and water resource users and the environment.

The City of Calgary's Drought Management Plan provides a strategic mechanism to minimize the social, economic and environmental impacts of drought. While there is a provincial emergency response plan in place to assure people are not deprived of household water in the event of a water supply emergency, license holders must do their part to limit the need for emergency measures. Some key findings of The City's plan include:

- Privately owned and operated upstream water infrastructure could offer water security as The City does not have the assets to store sufficient water in preparation for drought. This requires a water management agreement between The City and infrastructure owners.
- Despite higher summer demand, the most critical period for municipal drought would likely be late winter through early spring. As The City's water restrictions bylaw would have minimal impact during the winter, more research on indoor water restrictions is required.
- Academic research suggests that the severity of droughts could intensify in the Calgary region. The City continues to support climate change research through the Prairie Adaptation Research Collaborative at the University of Regina correlating Tree ring data with river flows to inform improved risk assessment.
- The City continues to work with partners to develop water management strategies across the entire Bow River Basin. In light of the flooding in June 2013 there has been much emphasis on flood mitigation. However, The City continues to encourage consideration of both flood and drought conditions in provincial flood mitigation measures for new and existing infrastructure.

A **Water Supply Master Plan** is in development to characterize and evaluate a spectrum of current and future risks facing The City's water supply. This plan will consider risks to future water supply and integrate actions of the Water Efficiency Plan, The City of Calgary Drought Management Plan, water infrastructure planning and regional servicing. Actions to mitigate risks will also be identified and prioritized.

Improving our understanding of risks to source water quality has been identified as a critical priority for Water Resources. Accordingly, the first phase of the Water Supply Plan is a **Source Water Protection Plan** launched in 2014, to characterize, assess and map source water quality risks upstream of The City's water intakes on the Bow and Elbow rivers. It will also refine and prioritize mitigation actions to reduce or eliminate these risks. Together, the Source Water Protection Plan and the Water Supply Master Plan will provide Calgary with a strategic framework for a coordinated, long-term program to protect Calgary's source water.

2. GOAL: USE WATER WISELY

The City takes measures within its own operations and works with the community to ensure efficient water use. The City is on track to achieve the 30-in-30 Water Efficiency Plan goal of accommodating Calgary's population growth with the same amount of water removed from the river as in 2003 largely due to strong customer education and outreach, adoption of water efficient technology and improvements in City operations.

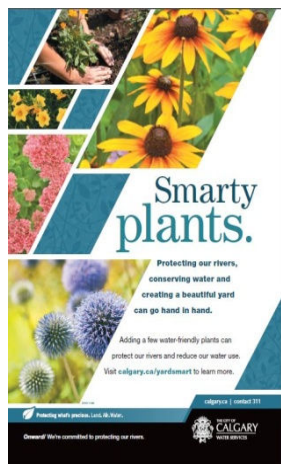
2.1 Water Efficiency in our Operations

- In 2014, 16 million litres (ML) per day of water was conserved through the City's proactive **leak detection and watermain replacement program**.
- The City's Water Resources and Parks business units have been partners with the Canadian Prairie Chapter of the Irrigation Association since its inception in 2001 to promote the efficient use of water on the urban landscape and the use of Certified Irrigation Contractors. In recent years, the Irrigation Association has developed a campaign which challenges states, provinces and municipalities across North America to proclaim '**July - Smart Irrigation Month**'. The City was proud to have the proclamation from Mayor Nenshi, adding Calgary to the growing list of municipalities who have officially proclaimed 'July - Smart Irrigation Month'.

2.2 Promoting Positive Behaviour Change in our Community

- Recognizing the continued opportunity to see significant water savings in the hotel/motel industry, in 2014 The City supported replacement rebates of 343 toilets. Likewise, the 2014 Multifamily toilet rebate program replaced 643 toilets, while toilets rebated through the residential program in 2014 accounted for over 6065 toilet replacements in Calgary homes. Combined, the **toilet replacement programs** helped to reduce demand by an estimated 183ML in 2014.

- The **YardSmart** program engages and inspires citizens to adopt responsible water management practices in their yards. Throughout spring and summer, Water Resources spoke to approximately 5,000 people about YardSmart gardening. This year, over 1,740 rain barrels were sold at sales in ten communities, while in various other communities, almost 3,000 YardSmart door hangers were distributed with Water Educators engaging in 150 citizen conversations along the way. Eighty citizens attended basic YardSmart gardening workshops, offered in partnership with



the Calgary Horticultural Society, 13 of which advanced their skills by helping construct a YardSmart demonstration garden.

- More than 30,400 Calgarians visited calgary.ca/yardsmart over the spring and summer, more than tripling the visits to some pages. Specialized **Youth Education Programs** demonstrate The City's commitment to responsible management of our water resources and foster a conservation ethic amongst young Calgarians. This year, 1,110 students, grades 4-12, participated in educational tours of the Water and Wastewater treatment plants and discovered how The City of Calgary treats drinking water and wastewater. The City engaged an additional 4,000 youth during various events including the Mayor's Environment Expo, Beakerhead, local science fairs, and youth conferences. Our partnerships with other youth-focused environmental organizations in Calgary enabled our water education messaging to reach an additional 19,800 youth in the city.



- Three **public art** hydrant drinking fountains were rotated throughout the city to create public gathering spaces and draw attention to the invisible underground water delivery system that ensures fresh drinking water flows into homes, places of business and play each day. They were located in high-traffic areas during large scale summer events such as Canada Day and Stampede, as well as left for daily public interaction at busy summer locations such as Eau Claire Plaza and Stephen Ave. The fountains generated media buzz, and appeared in social media, creating positive citizen engagement and interaction for The City. The Water Resources team also provided support to other Utilities & Environmental Protection Department public art projects including River Passage Park, and the Parkdale Plaza instalments.



- The **Leak program** encourages Calgarians to check toilet leaks every 6 months, and repair them as part of regular home maintenance. Over 40,000 leak detection strips were distributed to Calgarians in 2014 and "Fix a Leak" messaging reached approximately 79,000 people through social media. Water Resources personally interacted with over 5,500 Calgarians at the Home and Garden Show promoting the Leak program further. The multi-unit program uptake increased this year with four property



management companies participating, resulting in 5,137 individual properties directly receiving tools and resources. Our partnership with RONA enabled 109 Calgarians to participate in 6 skill building leak repair workshops offered through the store. Similar workshops were offered internally for City staff.

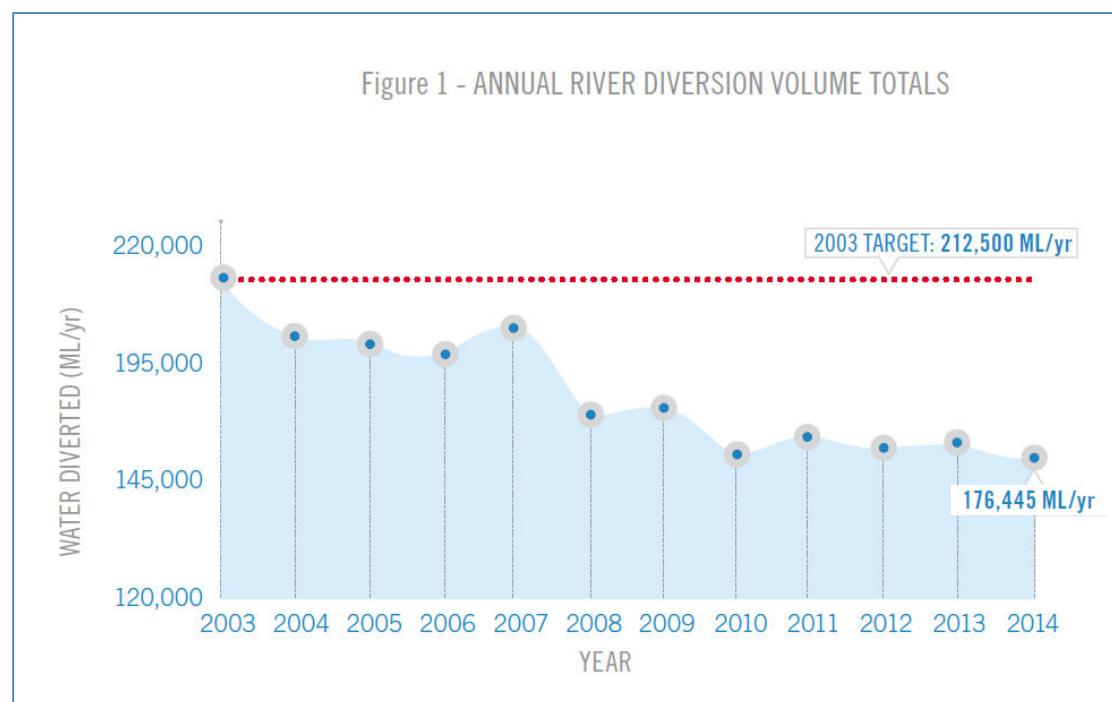
2.3 Water Efficiency Performance

The City's Water Efficiency Plan has identified annual water withdrawal as its goal, and uses key performance measures to monitor performance. The following outlines the measures used to monitor and demonstrate success toward watershed management.

Annual River Water Diversion (Figure 1)

The City is on track to achieve the 30-in-30 Water Efficiency Plan goal of accommodating Calgary's population growth with the same amount of water removed from the river as in 2003.

Goal	Target	2014
River water withdrawal	Accommodate population growth with the same amount of water we removed from the river in 2003 (212,500 ML/yr)	176,445 million litres(ML)/year



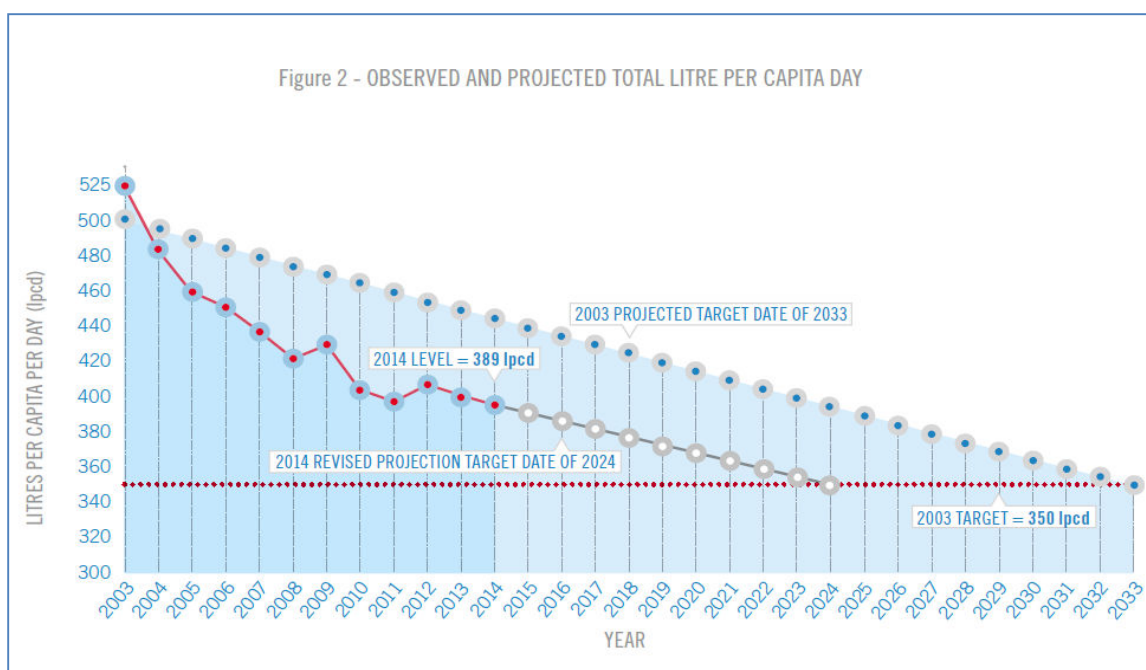
In addition to the Annual River Water Diversion goal, the following indicators are monitored to track progress.

Goal	Target	2014
Universal metering	100 per cent by end of 2014	97 per cent
Per Capita Demand	350 litres per capita per day (lpcd) by 2033	389 lpcd
Single family residential demand	210 lpcd by 2020	220 lpcd
Peak day demand	950 ML	719 ML
Non-revenue water	3.1 - 3.9	4.03

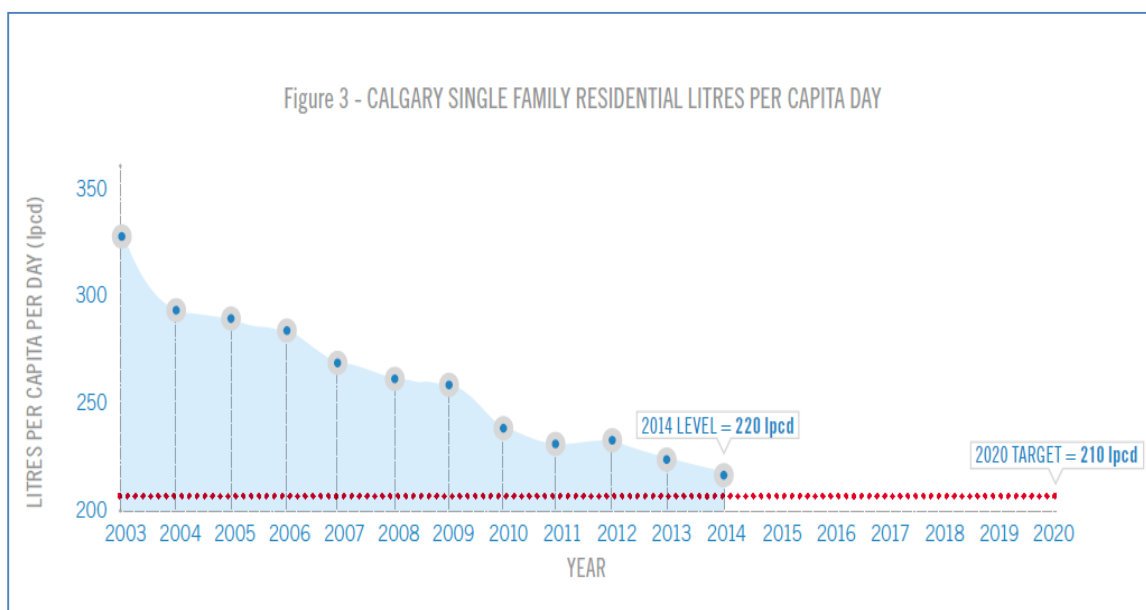
- The **universal metering program** successfully converted 1,647 residential flat-rate accounts to water meters in 2014, bringing residential metering to 97 per cent. This has helped to meet the corresponding water efficiency objective by reducing demand by 208 ML per year. While the goal of the metering program was for all single family customer accounts to be metered by 2014 December 31, the program has achieved the water efficiency objective as planned and is considered complete from the perspective of the Water Efficiency Plan.

The City will continue to encourage the remaining residential flat-rate customers (approximately 9,700) to convert to meters via direct communication, at the ENMAX call center and through other operational opportunities. Some of the accounts cannot be easily converted due to structural challenges and The City will continue to work with these customers on a case by case basis.

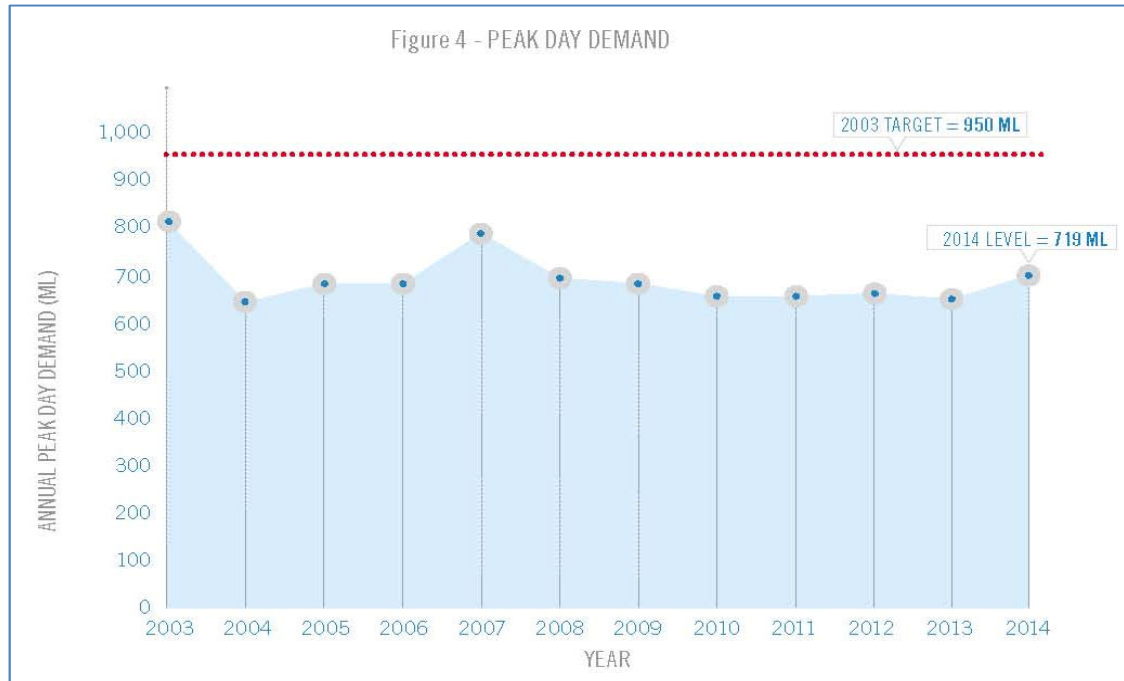
- Per capita demand** (Figure 2) is the average amount of water used in the city per person. It is calculated by dividing the total city-wide demand (including residential, commercial and municipal use) by the population and is measured in litres per capita per day (lpcd). In 2014 this overall water use was 389 lpcd, and current projections indicate that the target will be met well ahead of 2033.



- Of the overall water use, **single family residential demand** (Figure 3) was estimated to be 220 lpcd in 2014, which is trending positively towards the 2020 Sustainability target of 210 lpcd.



- Peak day demand** (Figure 4) is the one day in the year in which Calgary requires the most drinking water. It typically falls during irrigation or outdoor water use season (May – September.) The target is to keep the peak day demand below 950 ML (current plant production capacity). In 2014, peak day demand was 719 ML, on July 29. This was higher than in recent years and resulted from a period of hot, dry summer weather conditions.



- **Non-revenue water** is reported as an Infrastructure Leakage Index benchmarked between 3.1 and 3.9. The Infrastructure Leakage Index was calculated in 2013 at 4.03. Potential sources of non-revenue water include unbilled authorized consumption such as fire fighting and operation flushing; and leakage from the water supply system. Efforts have been made to:
 - investigate system leakage areas
 - evaluate pressure zones
 - review production and distribution meters to improve accuracy.

The City will continue to investigate sources of, and potential solutions to reduce, non-revenue water.

3. **GOAL: KEEP OUR RIVERS HEALTHY**

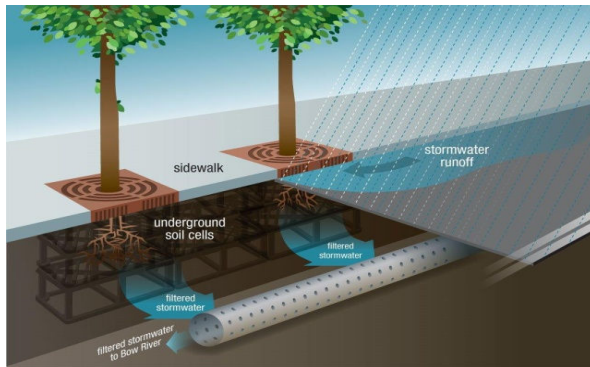
The City's Stormwater Management Strategy and Total Loading Management Plan guide The City's actions to maintain river health and meet regulatory commitments. The Strategy and Total Loading Management Plan aim to protect the health of our watersheds by reducing the rates and volumes of stormwater runoff, controlling sediment loads, and development of sustainable stormwater management solutions. The City's Drainage Financial Plan 2015-2018 includes additional capital investments in the community drainage improvements (CDI) program, riparian areas, flood protection and control, and stormwater quality improvements.

3.1 Major Stormwater Retrofit Projects

- In 2014, the design of two stormwater management facilities including Bowmont East and Laycock Park stormwater quality retrofit ponds was complete and construction is expected to commence in 2015. Oil grit separators have been accommodated in the design of the Laycock Park storm pond to improve stormwater quality.

3.2 Innovative Stormwater Management

- In 2014, The City began the construction of **the Manchester Centre soil cell**, which is a small scale source control practice to treat stormwater before it enters waterways. Stormwater monitoring, soil moisture and tree health assessments of the 23 trees will demonstrate and evaluate the effectiveness of these types of installation.



- As part of the multi-year **Community Rain Garden Program**, two rain gardens have been constructed within the community of Bridgeland to capture and treat stormwater at a local level. These projects also included significant education and engagement with the community resulting in much interest and excitement from local residents on incorporating such sustainable technologies within their communities. Building on the successes achieved to date, lessons learned will be applied to future community rain garden projects in 2015 and beyond.



- Water Resources and Calgary Parks partnered to install rain gardens at Carburn Park as well as an innovative underground storage system at Deerfoot Athletic Park to collect parking lot runoff and provide stormwater treatment, demonstrating how a redevelopment project can meet the Nose Creek Watershed Management volume runoff targets.



Appendix A provides more details on the types and location of City of Calgary low impact development projects.

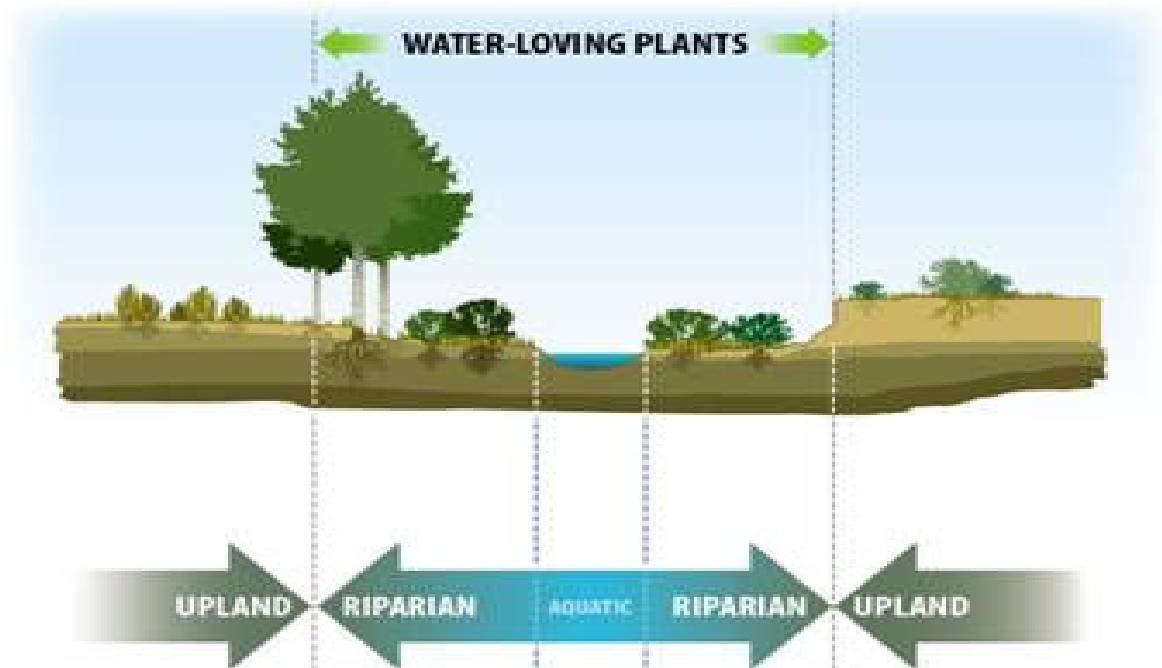
3.3 Flood Mitigation and Riparian Area Management

The City of Calgary's Expert Flood Mitigation Panel Report was released in 2014. The report contains 27 recommendations to help guide flood mitigation and achieve the vision of Calgary as a flood resilient city. The City's progress toward flood resilience requires both long and short-term efforts to assess and implement an optimal mix of structural and non-structural flood mitigation improvements to protect against future flooding.

- A variety of shorter-term mitigation efforts are underway or being examined that include exploring flood barriers, riverbank stabilization and erosion protection, developing new models and maps to better understand flood hazard, improving river forecasting tools, monitoring equipment, storm drainage improvements, sanitary lift station upgrades, wastewater treatment plant upgrades, and a focus on protecting, conserving and enhancing riparian areas.
- Long-term measures being explored include evaluating large scale storage and diversion alternatives, investigating the potential for expanding land use policy and regulation for flood resiliency, assessing and designing for a changing climate and continuing development and implementation of key strategies such as the Riparian Strategy.

Riparian areas are the ribbons of green infrastructure that occur where water and land meet. Intact riparian open spaces within and adjacent to the floodplain provide room for our rivers, creeks and watercourses to flood and shift location over time, which is essential for public safety. Well vegetated, healthy riparian areas also control erosion, improve water quality, support fish and wildlife, and provide many aesthetic and social benefits to Calgarians.

The *Riparian Program: A Blueprint for Resilience* document was drafted during 2014. This implementation plan for the Riparian Strategy (2013) establishes outcomes, indicators, targets, and a road map for the management and stewardship of Calgary's riparian systems. Collaboration and integration across business units and a wide range of stakeholders is being pursued on multiple fronts to realize synergies and efficiencies both within and outside The Corporation.



A series of riparian maps, illustrating the location, condition, land use, infrastructure, and management priorities (e.g., Restoration, Recreation, Flood + Erosion Control, etc.) for Calgary's riparian areas were recently developed and posted to the City's Open Data Catalogue, as well as information on the Environmental Reserve (ER) Setback Guideline extent along major rivers and streams. A sample of one of these maps can be found in Appendix B. A riparian website was also created in 2014 to maximize the distribution of strategies, guidelines, maps, and data, including links to the Calgary.ca flood mitigation web pages to promote the connection between riparian and flood management. These technical tools help to enable the consulting and development industries to consider and incorporate this information in planning and design processes.

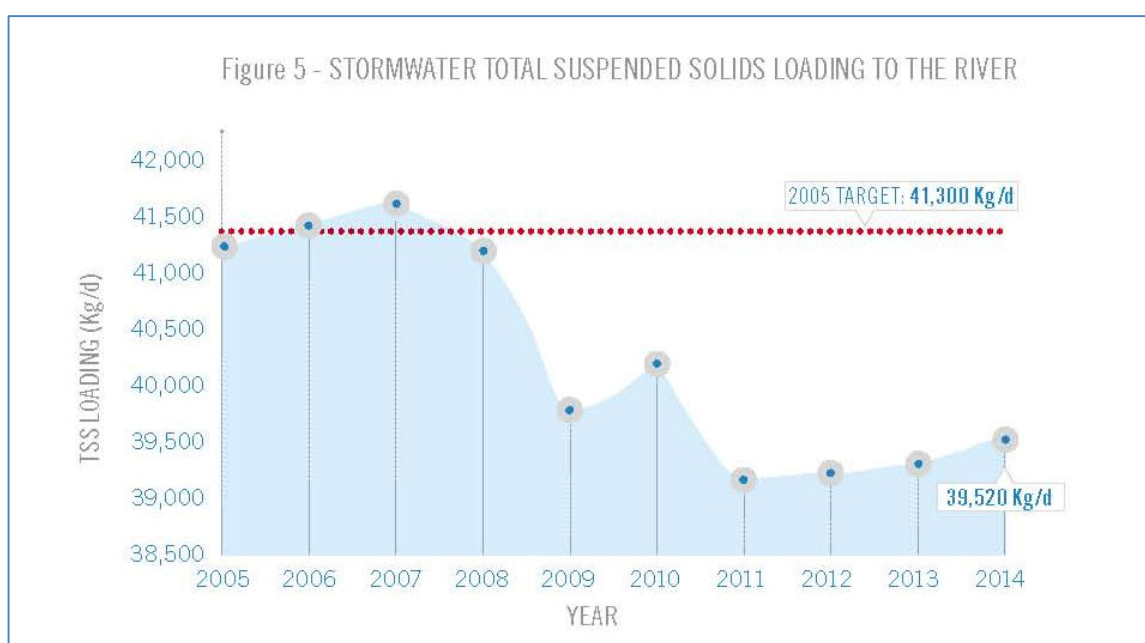
A detailed *Calgary River Morphology and Fish Habitat Study* was also initiated in 2014 to understand how Calgary's rivers and creeks and associated aquatic habitat will adapt to various influences such as urban development, flood events, ice, stormwater and wastewater releases, and bank protection projects.

3.4 Stormwater Quality Performance

The City's Stormwater Management Strategy has identified total suspended solids as its goal to monitor performance.

Total Suspended Solids (Figure 5)

Goal	2014	Target
Total suspended solids loading to the Bow River	39,520 kg/day	Total suspended solids entering the Bow River continue to remain below 2005 levels (41,300 kg/day)



In 2014, Total Suspended Solids entering the Bow River remain well below 2005 levels. Many actions highlighted throughout this report have contributed to this success; in particular the construction of stormwater quality retrofit projects to treat stormwater from existing development that previously had little or no stormwater treatment.

4. GOAL: BE GOOD NEIGHBORS

The City's efforts to protect water supply, use water efficiently, and maintain river health, contribute to the needs of those relying on this same precious water resource in the region and downstream of Calgary. There is an ever increasing awareness and acknowledgement of the importance of considering cumulative impacts, as The City's actions, along with those in the

region can have broad reaching implications. The City works extensively with regional partners to protect water resources for all users.

The **Bow River Phosphorus Management Plan** (BRPMP), led by Alberta Environment and Sustainable Resource Development in a collaborative process with The City of Calgary and other contributing parties, was finalized in April 2014. The plan outlines various strategies and actions to help manage current water quality conditions in the Bow River through control of phosphorus inputs. The City continues to manage phosphorus through its Total Loading Management Plan embedded in the wastewater Environmental Protection and Enhancement Act (EPEA) approval and will continue collaboration with Alberta Environment and Sustainable Resource Development (AESRD) and other members through participation on the BRPMP implementation committee and various working groups.

The **South Saskatchewan Regional Plan** was legislated by the Province of Alberta on September 1, 2014. The South Saskatchewan Regional Plan will require local governments and provincial decision makers to consider cumulative impacts on air quality, surface water, biodiversity and other aspects of the environment. The Province will monitor the region's environmental health and actions may become necessary to mitigate negative regional environmental impacts. As a result, the citizens of Calgary will benefit from the South Saskatchewan Regional Plan and the City's compliance with the Plan.

The City of Calgary is a member/participant in the **Cooperative Stormwater Management Initiative** (CSMI), which was formed to assist municipalities and the Western Irrigation District (WID) to work together to find an effective and feasible solution to the stormwater challenges on the eastern edge of Calgary and the nearby region. CSMI is comprised of The City of Calgary, Western Irrigation District, Calgary Regional Partnership, Chestermere Utilities Incorporated, Rocky View County, Town of Strathmore and Wheatland County. The objective of CSMI is to ensure that both the municipal and irrigation sectors work together, share resources and develop a mutually beneficial solution. The shared solution will provide:

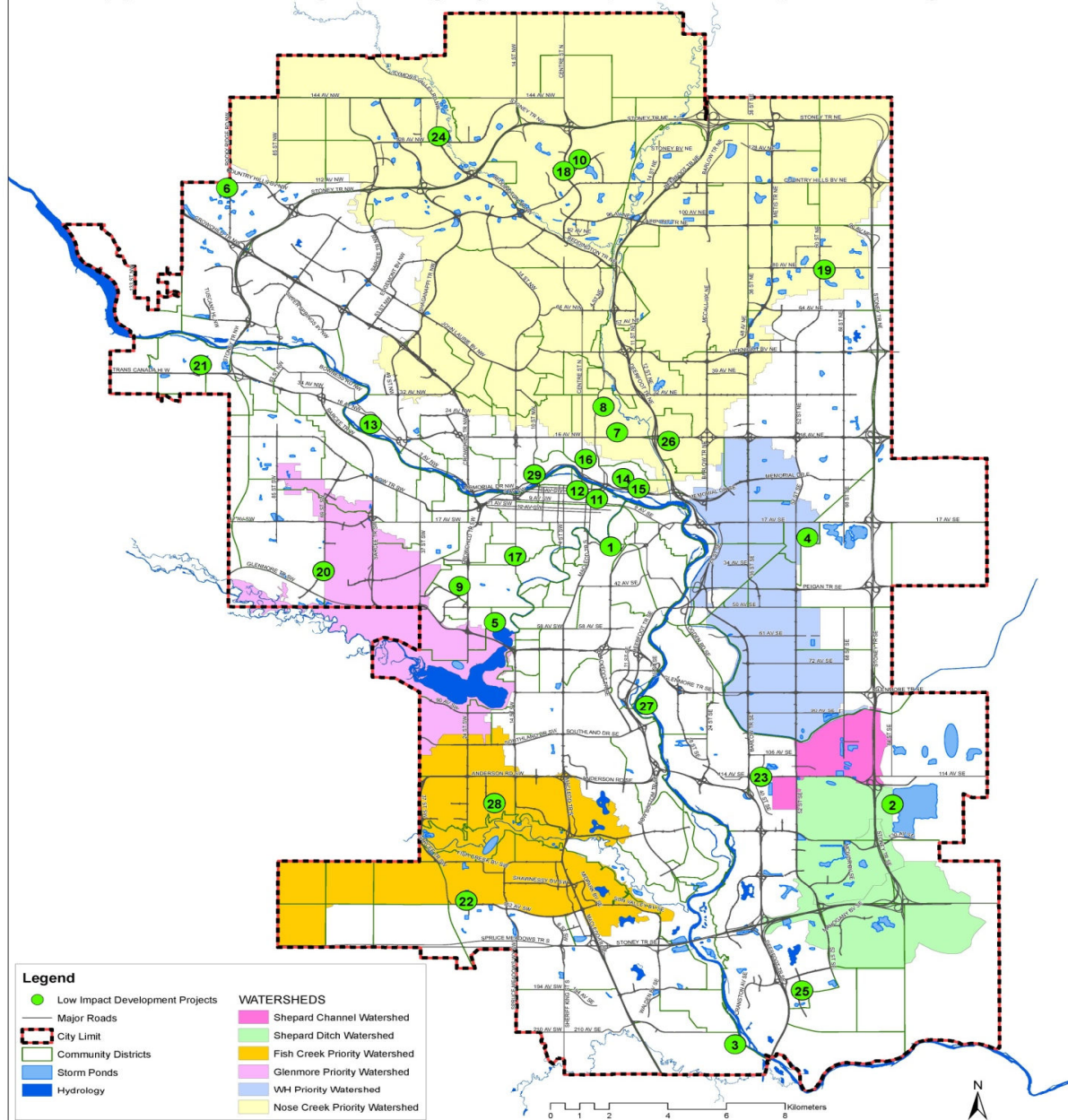
- WID with long-term sustainability for an irrigation system that supports a vibrant agricultural economy; and
- Municipalities with the certainty of servicing growth through regional stormwater infrastructure based on the principles of full cost recovery and proportional cost.

The City of Calgary is actively involved in a number of **watershed stewardship groups** in the region. Watershed stewardship groups take action at a community level to protect water resources and advance stewardship opportunities in a particular watershed. Typically, these groups include individuals, organizations, agriculture, industry, municipalities and other stakeholders to set common goals and achieve shared outcomes. The City promotes regional collaboration and dialogue with our regional neighbours through active participation in the Bow River Basin Council, Elbow River Watershed Partnership and Nose Creek Watershed Partnership.

FUTURE WATER MANAGEMENT PLANNING

- Remaining on track to reach the water efficiency targets requires ongoing efforts to achieve success. As the city continues to grow, new water conservation opportunities must be evaluated and developed. Water Resources is undertaking a **Water Efficiency Plan Review and Program Development study**. As a result of this study, and leveraging the successes achieved through residential programs to date, new programs will be developed for other customer groups such as industrial, commercial and institutional customers.
- A **City of Calgary Water Reuse Strategy** is currently under development which will provide strategic direction on water reuse programming within The Corporation. Many cities around the world are looking for new ways to develop and manage their local water resources. One way cities conserve, protect and diversify their water supply is by collecting, treating and reusing water on-site and matching water quality to water use. Reusing water and reducing the intensity of water treatment ensures that we are using the right water for the job, rather than fresh, treated, potable drinking water for all our water needs. The Strategy is needed to meet watershed management objectives including water quality, stormwater management and the growing pressure of providing potable drinking water to Calgarians. The strategy identifies current water reuse in Calgary, goals and strategies for water reuse practices within The Corporation, a proposed model for water reuse, planning priorities and timelines for future work.
- Calgary's ongoing **watershed monitoring** measures surface and runoff water quality. The monitoring programs have been designed to characterize watershed conditions, determine long-term water quality trends, improve the predictions for Calgary's stormwater loadings, and measure the impacts of runoff water on local waterways. Monitoring records are analyzed and incorporated into The City's Total Loading Management Plan report to fulfill the regulatory requirements under The City's Approval to Operate and achieve the ultimate goal in protecting Bow River aquatic health. The monitoring plans will continue and be adapted to meet the current and emerging regulatory requirements.

Appendix A - City of Calgary Low Impact Development Projects

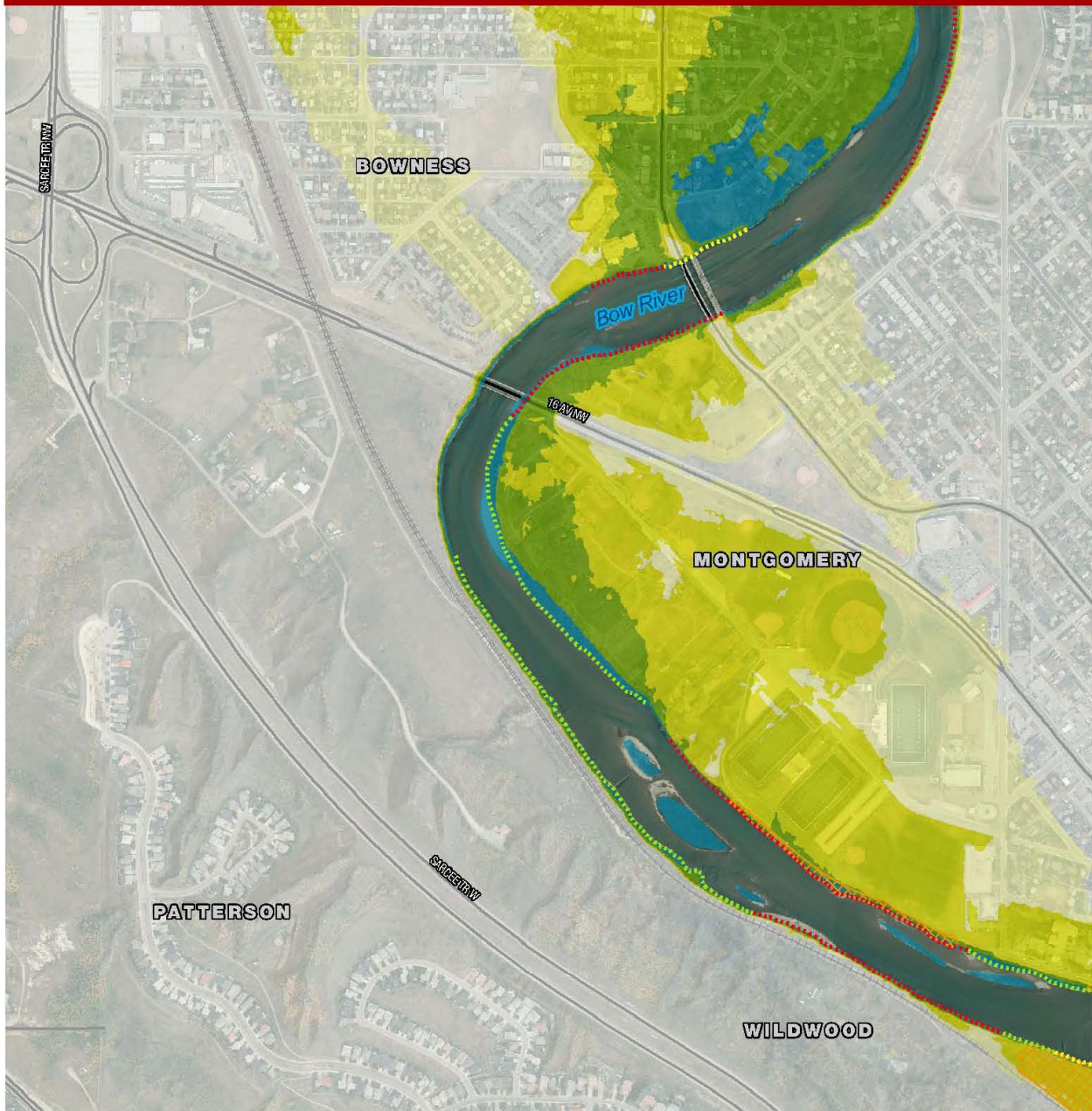


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|---|---|---|
| <ul style="list-style-type: none"> 1 Water Centre (625 25 AV SE) <ul style="list-style-type: none"> • Rain Garden • Vegetated Swales • Green Roof • Permeable Pavement • Rainwater capture and reuse • Soil Cells 2 Ralph Klein Park (12350 84 ST SE) <ul style="list-style-type: none"> • Vegetated Swales • Green roof • Permeable Pavement • Rainwater capture and reuse 3 Pine Creek Wastewater Treatment Plant (3131 210 AV SW) <ul style="list-style-type: none"> • Green roof 4 Calgary Fire Training Academy (5727 23 AV SE) <ul style="list-style-type: none"> • Vegetated Swales • Stormwater capture and reuse 5 Glenmore Water Treatment Plant (1634 56 AV SW) <ul style="list-style-type: none"> • Rain Garden 6 Rockborough Park (Rockborough PA NW) <ul style="list-style-type: none"> • Vegetated Swales 7 Winston Heights/Mountview (17 AV and Marlow PL NE) <ul style="list-style-type: none"> • Rain Garden 8 Winston Heights/Mountview (520 27 AV NE) <ul style="list-style-type: none"> • Rain Garden | <ul style="list-style-type: none"> 9 Currie Barracks (In proximity to Battleford AV SW) <ul style="list-style-type: none"> • Rain Garden • Vegetated Swales 10 Country Hills Multi-Services Centre (11955 Country Village LI NE) <ul style="list-style-type: none"> • Vegetated Swales • Stormwater capture and reuse 11 Municipal Building (800 Macleod TR SE) <ul style="list-style-type: none"> • Green roof 12 James Short Parkade (112 5 AV SW) <ul style="list-style-type: none"> • Green roof 13 Shouldice Athletic Park (1515 Home RD NW) <ul style="list-style-type: none"> • Vegetated Swales 14 Bridgeland - Murdoch Park (McDougall RD NE and 9 ST NE) <ul style="list-style-type: none"> • Rain Garden 15 Bridgeland - Riverside Park (McDougall RD NE and 11 ST NE) <ul style="list-style-type: none"> • Rain Garden 16 Emergency Operations Centre (673 1 ST NE) <ul style="list-style-type: none"> • Absorbent Landscape 17 South Calgary Fire Station #5 (3129 14 ST SW) <ul style="list-style-type: none"> • Rainwater capture and reuse 18 Country Hills Fire Station #31 (11955 Country Village LI NE) <ul style="list-style-type: none"> • Absorbent Landscape 19 Saddleridge Fire Station #32 (800 Saddletowne CI NE) <ul style="list-style-type: none"> • Absorbent landscape 20 Springbank Hill Station #33 (3800 69 ST SW) <ul style="list-style-type: none"> • Absorbent Landscape • Rainwater capture and reuse | <ul style="list-style-type: none"> 21 Valley Ridge Station #35 (11280 Valley Ridge BV NW) <ul style="list-style-type: none"> • Absorbent Landscape 22 Evergreen Station #37 (2511 Eversyde AV SW) <ul style="list-style-type: none"> • Rainwater capture and reuse • Permeable Pavers • Green roof 23 Douglas Glen Fire Station #39 (4199 114 AV SE) <ul style="list-style-type: none"> • Rainwater capture and reuse • Absorbent Landscape 24 Symons Valley Station #40 (12920 Symons Valley RD NW) <ul style="list-style-type: none"> • Rainwater capture and reuse • Absorbent Landscape 25 Seton Multi-Services Station #41 (3790 Seton DR SE) <ul style="list-style-type: none"> • Rainwater capture and reuse • Absorbent Landscape 26 Deerfoot Athletic Park (14 AV and 16 ST NE) <ul style="list-style-type: none"> • Rain Garden • Infiltration Gallery 27 Carburn Park (67 Riverview DR SE) <ul style="list-style-type: none"> • Rain Garden 28 Woodcreek Community Centre (1991 Woodview DR SW) <ul style="list-style-type: none"> • Rain Garden 29 2nd Avenue Soil Cell Installation (2 AV and 10 ST NW) <ul style="list-style-type: none"> • Soil Cells |
|---|---|---|

Appendix B

RIPARIAN AREAS MAP PROJECT

RIPARIAN AREA - LOCATION AND FUNCTION BOW RIVER 04



Riparian Zone*

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

*Variable Width Riparian Model Outputs

Riparian Health**

- Healthy
- Healthy, but with Problems
- Unhealthy

**Based on field studies of sampled riparian polygons only

Bank Health***

- Good
- Moderate
- Poor

***Based on field studies of major rivers / creeks, excluding private residential riverfront lots or steep valley slopes with limited riparian habitat

City Boundary
Major Roads
Rail
Streams
Fish Creek Provincial Park



THE CITY OF
CALGARY

O2



0 50 100 200 300 400
Metres