RIVER FOR LIFE
STRATEGIC FRAMEWORK

OUR WATER. OUR CITY. OUR FUTURE

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THE CITY OF Edmonton

DECEMBER 2012

II

River for Life

Strategic Framework

December 2012

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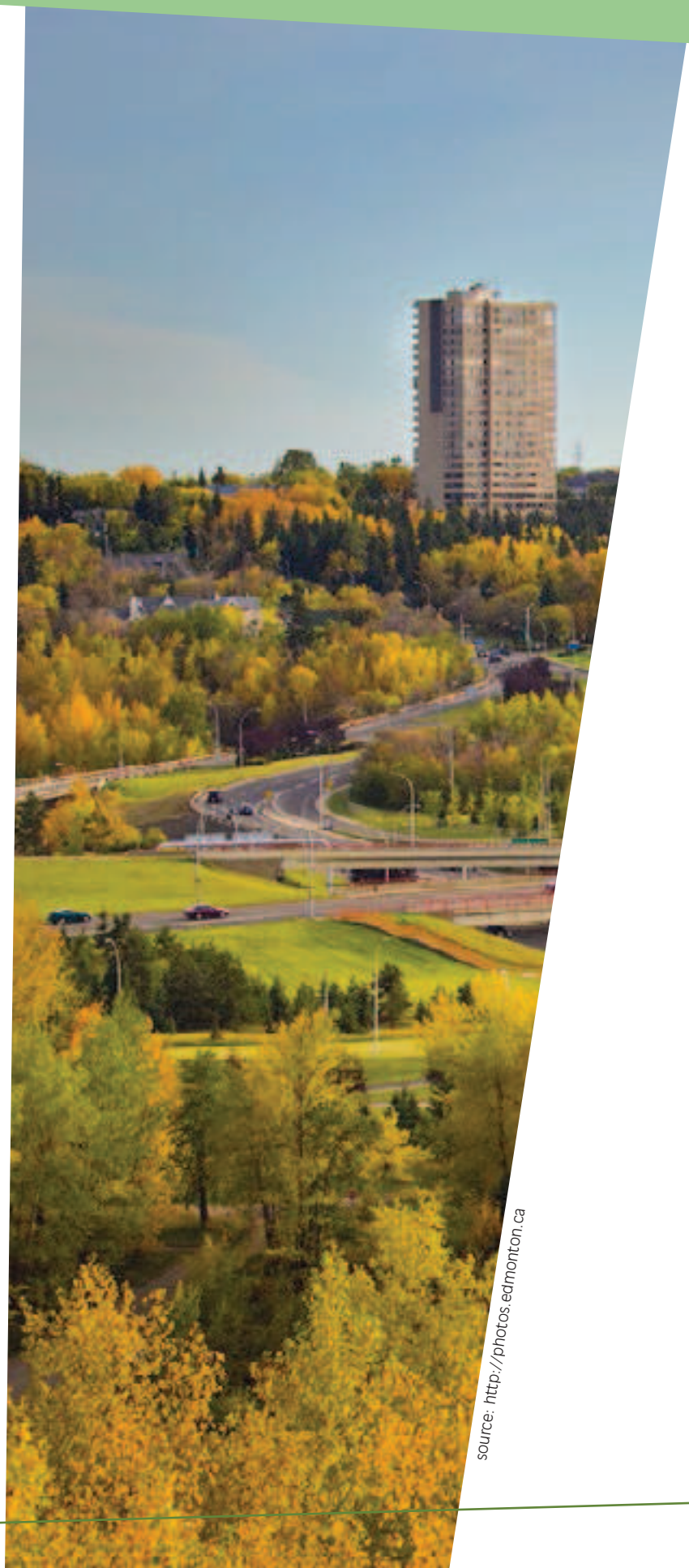

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LIST OF ACRONYMS/ ABBREVIATIONS

AI-EES	Alberta Innovative – Energy and Environmental Solutions
BMPs	Best Management Practices
BOD	Biochemical Oxygen Demand
CCME	Canadian Council of Ministrieers of the Environment
CEMS	Cumulative Effects Management System
CSOs	Combined Sewer Overflows
EMP	Environmental Monitoring Program
IHWMF	Integrated Hazardous Waste Management Facility
LID	Low Impact Development
NH3	Ammonia
NOx	Nitrogen Oxides
NSR	North Saskatchewan River
NSWA	North Saskatchewan Watershed Alliance
PCBs	Polychlorinated biphenyl
SSSF	Sanitary Servicing Strategy Fund
SWMF	Stormwater Management Facility
TDP	Total Dissolved Phosphorus
TDS	Total Dissolved Solids
TP	Total Phosphorus
TSS	Total Suspended Solids
WPAC	Watershed Planning and Advisory Council
WWTP	Waste Water Treatment Plant

INTRODUCTION

The City of Edmonton has committed to a number of policy objectives aimed at long-term protection of water quality of the North Saskatchewan River under its environmental strategic plan, *The Way We Green*. Drainage Services is contributing to these objectives by developing a framework and 30 year strategic plan to reduce pollutant discharge within the watershed, with the ultimate goal of achieving net zero impact from human activities. Drainage Services embarked on a three-phased planning initiative to develop the Strategy in 2011. This document, the River for Life Framework, provides the foundation for the Strategy and represents the first phase of that initiative.

River for Life will take into account three discharge pathways: urban runoff from storm events, combined sewer overflows, and municipal wastewater. It is intended to guide the City's efforts to reduce contaminants[1] in each pathway in the short, medium and long term.

The following tasks were undertaken to support the development of the framework:

- **Visioning Workshop:** This workshop provided a forum to explore River for Life, identify key drivers and define guiding principles.
- **Policy and Regulatory Review:** This review considered how the Federal and Provincial governments' policy and regulatory frameworks are evolving and identified potential influences on the City's River for Life strategy.
- **Jurisdictional Review:** This review examined potential approaches to reduce pollutants in the discharge pathways.
- **Public Perceptions:** This assessment reviewed the key priorities of the City's residents and explored their perspectives on current conditions of the North Saskatchewan River.
- **Target Substances Report:** This report identified pollutants of concern for the North Saskatchewan River and reviewed potential sources and pathways.
- **Integration Workshop:** This workshop engaged relevant stakeholders from other departments in developing the strategy and in identifying areas of alignment, challenges and opportunities.

[1] Research on pollutants of concern is included within Appendix D

STRATEGIC FOUNDATION

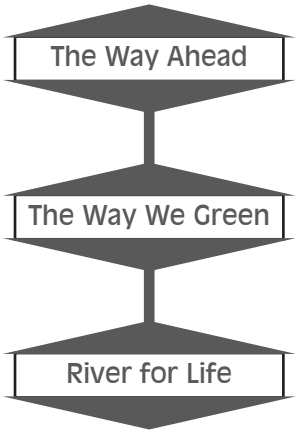
In *The Way Ahead*, the City of Edmonton clearly articulated its 2040 Vision and demonstrated continued commitment to enhance the quality of life for residents. It comprises six core plans[2] that will shape Edmonton in the coming years, including *The Way We Green* – the City's Environmental Strategic Plan. *The Way We Green* outlines twelve key goals that call for strong action to protect and preserve Edmonton's natural environment, and encourage Edmontonians to understand that nature has limits that must be respected.

Of the twelve key goals outlined, one is of particular relevance to River for Life:

Water Quality in the North Saskatchewan River sustains healthy people and ecosystems.

A number of complementary objectives were also established in *The Way We Green* in support of this goal:

- The City of Edmonton protects, maintains and continually enhances the water quality of the North Saskatchewan Watershed.
- The North Saskatchewan River and its tributaries are protected from pollution and erosion caused by stormwater runoff from Edmonton's built areas.
- The North Saskatchewan River and its tributaries are protected from pollution from Edmonton's combined sewer overflows.
- The North Saskatchewan River is protected from pollution caused by discharges from the Gold Bar Wastewater Treatment Plant.
- Impacts on Edmonton's water resources are mitigated by ensuring that new developments in Edmonton embody an exemplary standard of ecological design.



Drainage Services has established a River for Life to build from these objectives. The purpose of the Statement is to encompass the objectives in one clear and concise declaration:

A City that achieves sustainable growth in balance with the natural water environment.

This Vision is underscored by the River for Life Mission Statement:

The prevention of pollution by continuously reducing discharges of contaminants to the environment towards a goal of net zero impact from human activity.

[2] The Way We Grow, The Way We Move, The Way We Prosper, The Way We Finance, The Way We Live and The Way We Green

Key Drivers

River for Life represents the City of Edmonton's commitment to respond to the diverse stresses on the North Saskatchewan River and to help ensure its long-term sustainability. As a key stakeholder within the watershed, the City of Edmonton recognizes both the need and opportunity to develop a strategy that responds to a number of factors. The following represent a summary of key drivers for River for Life:

Support watershed planning initiatives to enhance water quality. The integrity of the watershed is an important driver for this Strategy. River for Life aims to complement the efforts of the North Saskatchewan Watershed Alliance, and the Integrated Watershed Management Framework, to protect the watershed by striving for specific water quality objectives and other relevant and supporting ongoing watershed planning initiatives.

Demonstrate municipal leadership. As Edmonton continues to grow, so do the cumulative impacts of the City's point and non-point source discharges to the North Saskatchewan River. In response to its changing effluent discharge profile, the City recognizes the need to further enhance its leadership in supporting innovative, integrated and cost-effective tools for pollutant reduction.

Respond to future regulations and policies proactively. The existing regulatory environment for management of watersheds and pollutant discharges is continually evolving. The City recognizes this and sees River for Life as a means to remain at the forefront of emerging environmental and regulatory trends.

Enhance the resiliency of community infrastructure. As the City's wastewater, stormwater and combined sewer assets age, enhancing infrastructure resiliency is critical to serving the demands of a growing community and responding to other stresses such as global climate change. River for Life offers an opportunity to strategically enhance the resiliency of built and natural infrastructure to protect the integrity of the North Saskatchewan River today and into the future.

Maximize the value of investments to reduce contaminant discharges. The City recognizes the importance of allocating financial resources to deliver the best outcomes for the public and the health of the North Saskatchewan River. To help ensure that the City is effectively allocating resources, River for Life will outline short, medium and long-term "actions" that leverage opportunities to chart the course for innovative water-borne pollutant management.

Sow the seeds for future innovation. As Edmonton continues to grow, the City will need to identify proactive and innovative practices to achieve the Vision and Mission of this strategy. River for Life offers the City of Edmonton an opportunity to plan and budget for innovative projects in the medium and long term.

Guiding Principles

The Way We Green articulates the City's goal to be a sustainable and resilient city, one which appropriately balances environmental protection, economic growth, social development and cultural vibrancy. High level guiding principles for River for LIfe are proposed to maintain consistency with this overarching goal. These principles will guide the development and subsequent implementation of short, medium and long term initiatives to achieve the outcomes outlined in this strategic framework.

The Guiding Principles of River for Life are to:

1. Adopt an interdisciplinary approach to continuous, adaptive implementation processes (e.g. processes which are responsive to evolving regulatory regime, environmental conditions, efficacy of improvements, etc.).
2. Foster strong partnerships with Edmontonians and with local and regional watershed stakeholders.
3. Emphasize the use of innovative and cost-effective actions to reduce pollutant discharges into the North Saskatchewan River.
4. Protect and enhance the City's valuable natural capital resources to meet multiple objectives, including the reduction of pollutant discharges.
5. Use decision-making processes that account for environmental, economic and social benefits and costs.
6. Use current scientific and technical knowledge to characterize, track, assess and reduce the discharge of water-borne pollutants.

source: http://photos.edmonton.ca

FRAMEWORK DEVELOPMENT

Policy and Regulatory Review

Relevant federal and provincial policies were reviewed to assess how specific regulations could influence the development and implementation of River for Life[3]. The City's discharges into the North Saskatchewan River are governed by a comprehensive provincial policy and regulatory framework that is primarily administered by Alberta Environment and Water, though Environment Canada also plays an important role. The existing policy and regulatory framework from both levels of government has long helped to protect the river's water quality.

There is recognition that management of the direct and indirect air, land and water impacts of all activities on the landscape is necessary to ensure that their cumulative footprint does not negatively impact the natural environment. To address this, the Government of Alberta is working to implement the *Cumulative Effects Management System* (CEMS). The implementation of this system will influence the future policy and regulatory regime that oversees the City of Edmonton's wastewater and stormwater discharge approvals. In addition to the provincial efforts to implement CEMS, the federal government is implementing the Wastewater Systems Effluent Regulations under the Fisheries Act and several other recommendations endorsed in the *CCME Canada-Wide Management of Municipal Wastewater Effluent Strategy*. Environment Canada also enforces the Fisheries Act to reduce pollutant impacts on the biodiversity of the receiving environment.

The development and implementation of River for Life will position the City to be ahead of any changes in provincial and federal regulations and standards by proactively, strategically and continually improving its discharge performance. Further, River for Life will allow the City to leverage opportunities identified in *The Water Management Framework: For the Industrial Heartland and Capital Region*.[4] This includes the implementation of innovative practices and technologies including wastewater reuse, and further supporting the watershed planning efforts of the North Saskatchewan Watershed Alliance.[5]

Jurisdictional Review

A detailed jurisdictional review was undertaken as a foundational component in the development of the River for Life Framework. This included an in-depth evaluation of water policy initiatives in seven North American cities as well as a broad based European review. Specific focus was placed on municipalities with climatic conditions similar to Edmonton and cities that have implemented particularly progressive approaches to water management. This review identifies numerous policy tools, management strategies and project types which could support the River for Life and highlights the strengths and weakness associated with the available options.

Based on this research, a number of key success factors or "lessons learned" were identified which are relevant

[3] Full Policy and jurisdictional review are included in Appendix C.

[4] This Framework was designed to manage the existing and potential impacts associated with the development of the Industrial Heartland and anticipated growth in the Capital Region. The Framework supports a number of complementary policy objectives to that of the Zero Discharge Vision Strategy.

[5] The North Saskatchewan Watershed Alliance (NSWA) is a Watershed Planning and Advisory Council (WPAC). As a WPAC established under the Water for Life Strategy, the NSWA is responsible for supporting the development of regional and watershed based plans to enhance the water quality, quantity within the North Saskatchewan River and support the health of the overall watershed today, and tomorrow.

to the development of River for Life. These elements consistently contribute to the acceptance, efficacy and feasibility of major water policy initiatives:

Clear and Structured Policy

The most forward-thinking water policy documents encompass several universal principles including: (1) recognizing and treating water (in all its forms) as a resource; (2) approaching stewardship and water management on a watershed basis; and (3) engaging citizens and stakeholders throughout the process in a meaningful way. In addition, the plans that have been implemented effectively are clearly structured; they identify goals and objectives as well as strategies and actions to address watershed improvements. Further, to facilitate implementation, many plans identify supporting financial strategies to fund the required works, include a provision for the development of technical tools and guidelines, and employ clear metrics/tools to assess results and measure progress.

Public Education and Engagement Programs

Public education and citizen engagement are central to all successful water policy initiatives. Most generally focus on raising public awareness with respect to issues of concern (e.g. consumption, erosion, watershed health, runoff quality/quantity) and providing venues for individuals to participate and provide input. Some programs incorporate a branding component that may include the use of a strong strategy name (e.g. "*Green City, Clean Waters*" in Philadelphia and "*Clean Water Plan*" in Denver) or elements/symbols to unify projects and initiatives throughout the community.

Public education initiatives are most effective when a number of tools are used, including:

- print, outdoor and television advertising, articles and editorials, and utility bill inserts;
- web-based tools including websites, blogs, online tours, maps and social media;
- demonstration projects in visible areas and public project tours;
- press conferences and ribbon-cutting ceremonies around major projects;
- information at trade shows and other public events; and
- educational programs for school-aged children.

Partnering with internal and external stakeholders is another critical success factor. Though municipalities approach stakeholder involvement in different ways, the most effective programs generally include interdepartmental task force(s) as well as initiation and participation in regional/watershed initiatives and advisory committees. With respect to green infrastructure, internal coordination is crucial to streamlining the process for permit review, inspection and approval.

source: http://photos.edmonton.ca

Supportive Planning/Policy/ Regulatory Tools

There are a number of policy and regulatory tools that effectively support the implementation of watershed protection initiatives. Those municipalities that have had the most success have developed and adopted progressive standards, which are often performance based rather than prescriptive. These documents typically incorporate regulations which limit volume of runoff and peak discharge, and also specify minimum requirements for water quality; such standards are effective when supported by reference documents which aid in the selection and design of Best Management Practices (BMPs). In addition, some municipalities have developed land use rules that mandate the development of planted areas or bioswales for highly impervious land uses (e.g. parking lots). Incentive programs represent another avenue; in such cases, developers with sustainable sites may be granted perks that may come in the form of financial support (e.g. tax credit or development charge refund), streamlining of the approval process, or development oriented bonuses, such as additional floor area. Other methods to encourage private property owners to implement on-site controls include grant programs, utility discounts and award programs to give special recognition to sustainable projects.

On another front, one of the most important tools at the disposal of any jurisdiction is to demonstrate that it leads by example. This may include a commitment to green building for city facilities (e.g. green roof construction), the development of LID BMPs on City grounds or a focus on water conservation in City operations. Further, it is crucial that the implementation of such projects be communicated to the public and, where possible, used as educational opportunities.

Municipal Pilot Projects

The projects undertaken in any jurisdiction are highly dependent on the specific watershed or regulatory needs and an overarching plan which links actions to identified goals and objectives. Many cities are looking to green infrastructure not only to manage stormwater but also to reduce CSOs and, in general, address water quality. Green infrastructure programs have significant appeal because of their high social value and becuase the sustainability benefits begin to accrue immediately and build over time. In contrast, traditional "grey" infrastructure (e.g. tanks, tunnels and expansions) projects typically have a high initial cost and lengthy construction period. However, once installed, the benefits of grey infrastructure improvements are immediate and qualifiable whereas the benefits of green infrastructure are not well understood. In consideration of this, many jurisdictions are choosing to implement a balanced approach, launching a green infrastructure program in conjunction with key grey infrastructure projects. Demonstration projects can be a good way to "test-drive" unproven technologies, providing an opportunity to assess effectiveness, identify issues and, in some cases, educate the public. Many successful pilot projects have naturally evolved into larger scale programs.

Consistent Funding

While all of the profiled municipalities make use of available external funding mechanisms (e.g. grants from other levels of government, "green" funds, corporate support), the most successful programs are primarily financed via a dedicated and consistent funding source. One such mechanism is a variable stormwater drainage fee which is calculated based on the impervious coverage on the property, sometimes with discounts or other benefits to encourage

application of runoff reduction measures on site. This charge is most effective when managed as a utility, with the collected fees based on a capital program and O&M costs. Another mechanism is the development of a "green fund" to help finance specific projects. For example, Portland requires that projects that are exempt from specific requirements pay 1 percent of the total construction cost into a fund that supports green street projects.

Many successful water quality programs are based on a triple bottom line analysis that quantifies the social, economic, and environmental benefits. Such approaches provide a useful perspective for administrators because they identify the true cost of a program, acknowledging that there is a cost associated with inaction and demonstrating that spending money in some areas may serve to generate alternative benefits or bring other costs down.

Regular Monitoring and Reporting

An adaptive management program is crucial to tracking water quality and assessing progress. Based on identified goals, the first phase of an adaptive management program would necessitate the development of a monitoring program to establish baseline conditions. As the program is implemented, key pollutants of concern would be tracked versus the baseline condition. This allows incremental measures to be continually evaluated and rejected or improved. Stakeholder involvement is also a critical component to monitoring efforts. In addition to regular reporting of results/progress (typically done on an annual basis), many municipalities look to stakeholder advisory committees to help evaluate/optimize the plan.

Pollutants Research

Various substances were researched in order to identify and prioritize key pollutants of concern for the Strategy. Probable pathways for these pollutants were described and a ranking tool was developed to assist in setting priorities to address each pollutant over time.

This review encompassed information from a variety of sources including:

- Water quality data obtained by the City in its monitoring programs;
- Water quality studies associated with the Industrial Heartland (IH) Water Management Framework;
- Canadian Council of Ministers of the Environment (CCME) municipal effluent strategy document and the related draft "Wastewater Effluent Regulations" document prepared by Environment Canada;
- Water quality objectives for the North Saskatchewan River from North Saskatchewan Watershed Alliance (NWSA);
- Various technical reports, including those focused on North Saskatchewan River and Industrial Heartland, and;
- General references on pollutant management.

From these sources, the following 34 pollutants[6] were identified and grouped into seven major categories:

- Inorganics (pH; TDS; TSS; chloride; residual chlorine);
- Surrogate measurements (BOD);
- Nutrients (NH_3; NO_X; TDP; TP);
- Organics (hydrocarbons; pesticides; PCBs; surfactants);
- Pathogens (E. coli; parasites);
- Metals (14 different trace metals); and

[6] Detailed information on identified pollutants included in Appendix D.

source: http://photos.edmonton.ca

- Emerging Pollutants (flame retardants; endocrine disrupting compounds; nanoparticles; pharmaceuticals; antibiotic resistant microorganisms).

Potential sources and pathways were also researched. The general presence or absence of each substance in natural waters was reviewed and potential human, aquatic and wildlife health issues were described. In general, these substances can all be found in the three primary discharge pathways over which the City has jurisdiction (wastewater; stormwater; combined sewer overflow). Further, findings showed that municipal effluent, lawn and landscaping activities, residential activities, commercial businesses, industrial activities, construction, roads and highways, agriculture activities and atmospheric deposition all contribute to the presence of these pollutants.

The ranking tool developed to prioritize pollutants is based on nine different criteria:

- **Regulatory context:** This criterion describes whether a pollutant is currently regulated or will be potentially regulated under the City's approval to discharge or draft wastewater regulations.[7]
- **Industrial Heartland Water Management Framework:** This criterion identifies whether or not a pollutant has been identified by the IHWMF[8] as a substance of concern.
- **Relevance to Edmonton:** This criterion evaluates whether a pollutant is of concern within Edmonton based on whether it is anthropogenic or natural in origin, and whether its concentration or load increases as a result of activities or operations within the City.
- **Public perception:** This criterion evaluates whether a pollutant has been identified by the public as a concern (determined through consultation), or whether it could affect the taste, color or odour of water.
- **Aquatic effects:** This criterion evaluates whether a pollutant is currently present in the river at concentrations that are considered toxic, and could directly affect aquatic life, or at concentrations that could affect recreation or use of the river by industry or agriculture.
- **Aquatic, human, and wildlife guidelines:** This criterion evaluates whether a substance is currently present in the river at concentrations above guidelines for aquatic life, human health, or wildlife (early indicator - aquatic life guidelines are more conservative than aquatic effects thresholds).
- **Persistence in the environment:** This criterion evaluates whether a pollutant has the potential to be persistent in the environment.
- **Bioaccumulation:** This criterion evaluates whether a pollutant has the potential to bioaccumulate in the environment.
- **Dissolved oxygen:** This criterion assesses the impact a pollutant could have on dissolved oxygen levels.

[7] Government of Canada. 2010. Wastewater Systems Effluent Regulations. Canada Gazette. Part I: Notices and Proposed Regulations. Volume 144, Number 12. March 20, 2010.

[8] McDonald, D. 2011. Interim Maximum Allowable Contaminant Loads for the North Saskatchewan River to Support Engineering Design for Wastewater Management in the Industrial Heartland. DRAFT. September 2011.

Based on this tool, pollutants were categorized as being a concern in the short term, mid-term or long term. In the short term, key pollutants included Total Phosphorus (TP), Total Suspended Solids (TSS), total ammonia, E. coli, and Biochemical Oxygen Demand (BOD). The major drivers for identifying these substances in the short-term timeline included regulation (both existing and upcoming), relevance to Edmonton, concentrations in the river above thresholds, public perception and effects on dissolved oxygen in the river. In the mid-term, this list expands to include nutrients (TDP and nitrate+nitrite), residual chlorine, metals (cobalt, copper, mercury, selenium, and zinc), pesticides, hydrocarbons, and pharmaceuticals.

Public Perceptions Research

Public perceptions of water quality and conservation in Edmonton and the Province of Alberta are consistent with national and international research findings. No single pollutant emerges as the sole focus of concern. Sensory perception is the major contributor to peoples' beliefs and attitudes about water quality (colour, flavour, smell, remembering a water-related health problem). In general, Edmonton residents support conservation and preservation efforts; however, there is a low level of awareness about existing programs. Residents most frequently mention water pollution when asked about environmental issues facing the community, and a majority of residents believe sewage, garbage (that they can see), run-off and human activity are the biggest sources of contamination in the North Saskatchewan River.

A staged communication approach to Public Outreach (focused on stages of attention, awareness, understanding and action) address the research findings that residents are more influenced by perceptions than actual pollutant content. Target audiences for this project are diverse demographically as well as in their needs and existing awareness of water quality issues. Therefore, outreach should include communication with key audiences in phases specific to their readiness and understanding related to the goals of River for Life.

Stakeholder Engagement

Internal outreach with City of Edmonton departments under *The Way We Green* Strategic Plan has been a significant communication focus during Phase 1. Face-to-face interviews between the project team and department representatives (outside Drainage Services), followed by a facilitated "integration" workshop have allowed for discussion of current and future programs aligned with River for Life. Identification of opportunities and barriers during the workshop has provided Drainage Services with a basis for working with other departments on implementation of the plan.

External outreach included contact with key stakeholder groups (EPCOR, North Saskatchewan Watershed Alliance, Alberta Capital Region Wastewater Commission, Alberta Reclaimed Water Working Group, and the Alberta Water Council) to outline framework objectives and to:

- Share project timelines;
- Request participation and feedback on the plan moving forward;
- Identify potential projects and initiatives led by these groups that align with River for Life; and
- Identify potential capacity for information sharing through stakeholder tools/channels to expand the reach of River for Life.

All representatives expressed a willingness to participate or provide input, identified external projects that would align and/or be impacted by River for Life, and identified potential tools and contacts for future outreach.

STRATEGIC FRAMEWORK

It is recognized that achieving the mission of "continuously reducing discharges of [water-borne] contaminants to the environment" will need to account for three primary pollutant discharge pathways within the City:

1. **Stormwater:** This pathway includes surface runoff from precipitation events, including snowmelt.
2. **Wastewater:** This pathway includes sewage from domestic, commercial and industrial sources.
3. **CSOs (combined sewer overflows):** This pathway includes combined stormwater and wastewater that discharges from the combined sewer system to the river during precipitation events.

For each pathway, there are effectively two means by which contaminants may be addressed. The pollutant loading to the river may be reduced by managing the quality component (i.e. pollutant concentration and/or mass) or the quantity component (i.e. rate and/or volume) of a given discharge pathway. Therefore, all strategies, programs, projects and operations can be considered in the context of six broad objectives:

1. **Control Stormwater Quantity:** Reduce the volume and/or rate of stormwater runoff.
2. **Control Stormwater Quality:** Improve the quality of stormwater runoff.
3. **Control Wastewater Quantity:** Reduce the volume and/or rate of wastewater generated by domestic, commercial and industrial sources.
4. **Control Wastewater Quality:** Improve the quality of wastewater from domestic, commercial and industrial sources.
5. **Control CSO Quantity:** Reduce the volume, rate and/or frequency of CSO discharge to the river.
6. **Control CSO Quality:** Improve the quality of CSO discharges.

Pursuing these six key objectives towards "a goal of net zero impact from human activity" supports the broader River of Life vision that Edmonton "achieves sustainable growth in balance with the natural water environment." In practice, this will entail a variety of actions relating to aspects such as public education, interdepartmental coordination, funding, policy tools, monitoring, the design and construction of capital projects, and adoption of on-site green control measures.

As presented in Figure 1, it is proposed that future action be guided by four strategic directions:

Strategic Direction 1 - "Align City policies, strategies and programs"

Existing and future policies, strategies and programs affecting pollutant discharge will be aligned in support of the River of Life Vision. This includes Drainage Services initiatives and those across other City departments, as well as water management initiatives undertaken by external stakeholders and regulatory agencies.

Strategic Direction 2 - "Sustain RIver of Life into the future"

Drainage Services and other City Departments will support the resiliency of River for Life by obtaining reliable funding, allocating sufficient human resources and ensuring flexibility to meet current as well as future challenges.

Strategic Direction 3 - "Engage residents and stakeholders"

Drainage Services will engage, educate and energize residents and key stakeholders to inspire long-term support and implementation of River of Life initiatives.

Strategic Direction 4 - "Provide the means for implementation"

Drainage Services and other City Departments will develop appropriate tools and implement projects to yield reductions in pollutant discharges from all three pollutant pathways wastewater, stormwater and combined.

Figure 1

As shown in the figure, each strategic direction is linked to a number of desired outcomes. To achieve these outcomes, a variety of tasks will need to be undertaken. This framework document identifies key core activities associated with each desired outcome. However, it should be noted that the identified activities do not constitute an exhaustive or complete list. Rather, it includes those activities which can be identified at this time.

Vision

A city that achieves sustainable growth in balance with the natural water environment.

Mission

The prevention of pollution by continuously reducing discharges of contaminants to the environment towards a goal of net zero impact from human activity.

Objectives

- Control Stormwater Quantity
- Control Stormwater Quality
- Control CSO Quantity
- Control CSO Quality
- Control Wastewater Quantity
- Control Wastewater Quality

Strategic Directions

1 Align City policies, strategies and programs

- Policies, strategies and programs of key City departments, including Drainage Services, Buildings and Landscape Services, Transportation Services, Sustainable Development, and Community Services are well **aligned** with respect to River for Life.
- River for Life is **aligned with the watershed management and pollutant reduction policies** of regulatory agencies and key external watershed stakeholders, including Alberta Environment and Water, Alberta Municipal Affairs, and the North Saskatchewan Watershed Alliance.

2 Sustain Zero Discharge into the future

- Key City departments, including Drainage Services, Buildings and Landscape Services, Transportation Services, Sustainable Development and Community Services, and Planning and Development Services have the **capacity**, that is, sufficient staff with the right experience, skills and commitment to creatively drive River for Life implementation process in the short, medium and long-term.
- River for Life has **reliable funding sources** to cover the costs of planning, designing, operating, maintaining, monitoring and adapting River for Life-related initiatives.
- A long-term **adaptive management program** is established. This adaptive management program guides the implementation of the Zero Discharge Vision Strategy by responding to changing environmental, political, regulatory and technical priorities.
- The principles of River for Life are supported by the means to encourage and/or compel **compliance** with regulatory guidelines and requirements.

3 Engage residents and stakeholders

- An on-going **public education and outreach** process informs residents about the specific issues and concerns driving the need for the River for Life. The process encourages residents to reduce or eliminate pollutant discharges through their own personal choices and actions and will be integrated with the existing and planned efforts of the City's *The Way We Green* strategy.
- **Internal stakeholder engagement** continues through formal and informal arrangements among City departments. This will foster inter-departmental collaboration with respect to the reduction and elimination of pollutant discharges to the North Saskatchewan River.
- Strong **external stakeholder and partnership engagement** efforts are made with both public and private organizations, including senior regulatory agencies, inter-agency groups, other municipalites, North Saskatchewan Watershed Alliance, developer groups, contractors, consultants and EPCOR.

4 Provide the means for implementation

- Master planning has **assessed and recommended cost-effective mixes** of public and private facilities, including major capital projects (e.g. end-of-pipe stormwater facilities, CSO storage facilities, WWTP upgrades), LID/BMPs and protection of natural areas. The focus is on bringing together "grey infrastructure" (large scale infrastructure improvements) with "green infrastructure" into a cohesive approach to improving discharge quality.
- Critical public facilities are **designed and constructed to reduce the discharge of pollutants** from areas of existing development and, in concert with private developers when appropriate, areas undergoing re-development.
- **Operation and maintenance** of public infrastructure and lands contribute to on-going reductions in water-borne pollutant discharges.
- **Technical and financial tools** are in place to encourage, and/or require developers and property-owners to use innovative means to eliminate or reduce pollutant discharges from new development and redevelopment. These tools will include standards and guidelines for the incorporation and use of LID/BMPs and water re-use strategies; financial strategies such as incentives, grants and development bonuses; technical tools such as templates and/or software to assist with proper design of facilities, and revised operations and maintenance guidelines.
- On-going **research** into the design, performance, operation and maintenance of best management practices (BMPs), provides the basis for continuously improving River for Life implementation. The research includes a combination of pilot and demonstration projects, financial and/or in-kind support of work by universities or others, and review and assessment of original research reported in pertinent literature within the water quality management field and focuses on all three pollutant pathways.

Desired Outcomes

Strategic Direction 1: Align City policies, strategies and programs

The institutional complexity of the City's administration means that there are myriad policies, strategies and programs located within different branches/ departments that may either support or be in conflict with River for Life. Not only must Drainage Services continue to develop and adapt its own departmental policies with respect to pollutant reductions but other City initiatives not normally associated with pollution reduction must also be aligned and integrated with River for Life. While the policies and programs of many departments with an environmental sustainability focus (i.e., Office of the Environment, Office of Biodiversity, Parks) typically support the River for Life Vision, it is important to identify departments and programs which may conflict with the pollutant reduction objectives and work towards better alignment. Current policies, strategies and programs of various City departments which generally support River for Life are presented in Table 1.

In addition to the need for internal integration, it is also important for the City to align River for Life with external partners and stakeholders. Specifically, the City of Edmonton recognizes its unique partnership with EPCOR and collaborative opportunities that exist both through strategies to positively impact infrastructure as well as initiatives that increase awareness of water quality among the public. The City also recognizes key stakeholders such as Alberta Environment and Sustainable Resource Development, Alberta Municipal Affairs, the North Saskatchewan Watershed Alliance, among others, will contribute, significantly, to the development of River for Life.

Desired Outcomes and Core Activities

1.1 Policies, strategies and programs of key City departments, including Drainage Services, Buildings and Landscape Services, Transportation Services, Sustainable Development, and Community Services are well aligned with respect to River for Life.

1.1.1 Establish an internal task force that will undertake the review of cross-departmental policies, strategies and programs to identify conflicts with River for Life objectives and work to develop options for better alignment (e.g. revised street sweeping schedule to reduce sediment wash-off, improved sanding mixes to reduce salt in runoff, bylaw revisions)

1.1.2 Ensure that high level planning documents (Municipal Development Plan, Downtown Redevelopment Plan, Transportation Plan, Neighborhood Development and Redevelopment Plans) include strong policy statements that support sustainable water management. This may include setting limits to effective imperviousness, requiring innovative water management and water re-use strategies, limiting stormwater runoff quantity, and requiring treatment train approaches through lot-, community- and watershed-level LIDs.

1.1.3 Undertake an assessment of land-use bylaws and zoning provisions to identify congruence (or lack thereof) with River for Life. Identify changes in land-use bylaws that can be implemented in the short term to better support pollutant reduction objectives. This may include changes to Erosion and Sediment Control Guidelines, land stripping and grading permits, increasing topsoil depths, restricting the use of fertilizers and pesticides, and requiring LID practices to be incorporated into new development projects.

1.1.4 Review and revise the stormwater management requirements at various levels of community and neighborhood planning (i.e., Area Structure Plans, Area Redevelopment Plans, etc.) to ensure early consideration of treatment LID/BMPs and water conservation strategies.

1.1.5 Ensure future policies, strategies and programs of key City departments, including revisions and updates of existing policy documents, are reviewed and harmonized with River for Life prior to adoption.

1.1.6 Update existing design standards and specifications to enable implementation of LID/BMPs and green infrastructure.

1.1.7 Review and revise Building Code to allow implementation of LID/BMPs on commercial, industrial and institutional sites.

1.1.8 Periodically review and update Surface Drainage Bylaw and Sewer Use Bylaw.

1.2. River for Life is aligned with the watershed management and pollutant reduction policies of regulatory agencies and key external watershed stakeholders, including Alberta Environment and Water, Alberta Municipal Affairs, and the North Saskatchewan Watershed Alliance.

1.2.1 Ensure that River for Life aligns with the water quality objectives of Cumulative Effects Management System, currently under development by Alberta Environment and Water.

1.2.2 Review and ensure alignment of River for Life with the Integrated Watershed Management Plan for the North Saskatchewan River and the Water Management Framework for the Industrial Heartland and Capital Region.

1.2.3 Review and revise all applicable bylaws, design standards, building and plumbing codes to enable implementation of rainwater harvesting and reclaimed water re-use as per the standards and guidelines developed and/or under development by Alberta Municipal Affairs.

Table 1: Activity Identification and Alignment

Initiative Type	Initiative Name	Description	Control Stormwater Quantity	Control Stormwater Quality	Control Wastewater Quantity	Control Wastewater Quality	Control CSO Quantity	Control CSO Quality
Infrastructure Services								
Drainage Services								
Regulatory Commitment	Total Loading Plan (TLP)	The TLP establishes a framework for limiting annual loadings of contaminants from municipal operations to the NSR.	●	●	●	●	●	●
Strategy/Plan	CSO Control Strategy/CSD Strategy	The CSO Control Strategy is a long term plan to mitigate the environmental impacts of the City's CSOs. Currently nearing completion, it will be superceded by the CSD Strategy.	◐	◐	◐	◐	●	●
Supporting Study/Project	*Early Action Control Plan (EACP)*	*The EACP employs real time control to utilize conveyance system capacity for storage.*					●	
Supporting Study/Project	*Enhanced Primary Treatment (EPT)*	*Implementation of EPT at Gold Bar will provide some treatment to combined flows.*				●		●
Supporting Study/Project	*Opportunistic Sewer Separation*	*Initiative to separate combined system where economically viable.*					●	
Supporting Study/Project	*W12*	*This pipeline across the NSR will convey combined sewer flows (which would otherwise be untreated) to Gold Bar.*			◐	◐	◐	●
Supporting Study/Project	*CSO Storage*	*Additional CSO storage may be implemented as part of the CSD strategy.*					●	
Supporting Study/Project	*LID Implementation*	*Recommendations for LID may come out of the CSD strategy.*	●	●			◐	◐
Strategy/Plan	Interconnection Strategy	Program to eliminate dry weather sanitary overflows into the storm system.	●	●	◐			
Strategy/Plan	Stormwater Quality Strategy	Strategy to manage the impact of stormwater discharges to the NSR to protect river water quality.		●				
Supporting Study/Project	*End-of-pipe Solutions*	*Kennedale constructed wetland and Groat Facility provide end-of-pipe treatment.*	◐	●				
Supporting Study/Project	*Low Flow Diversions*	*Diversions in Quesnell and 30th Avenue Trunks would divert stormwater to Gold Bar under low flow conditions.*	●	●			◐	◐
Supporting Study/Project	*Treat it Right Outreach Program*	*Outreach program to elementary and junior high students on watershed protection, stormwater and wastewater systems.*	●	●	●	●	●	●
Supporting Study/Project	*Stormwater Reuse*	*Strategy pursuing stormwater reuse applications for irrigation.*	●					
Supporting Study/Project	*LID Research Coordination with U of A*	*Initiative to understand the performance of bioretention in Edmonton.*	●	●			◐	◐
Supporting Study/Project	*LID Guidelines / Feasibility Study*	*LID Design Guidelines are now finalized and the LID Implementation Feasibility Study is aimed at addressing outstanding issues regarding the performance, cost and approval process of LID BMPs.*	●	●			◐	◐
Strategy/Plan	Sanitary Servicing Strategy	This strategy develops large trunk sewers to facilitate long term growth.			●			
Strategy/Plan	Stormwater Servicing Strategy	This strategy addresses stormwater servicing for the entire city including existing areas, new development, redevelopment and creek systems.	●	●			◐	◐
Supporting Study/Project	*Wetlands Acquisition*	*Acquire wetlands and develop responsibly to maintain watershed health*	●	●				
Supporting Study/Project	*Joint Watershed Studies*	*Partnering with neighbouring municipalities, trans-boundary studies will address sub-watershed health.*	●	●				
Supporting Study/Project	*Erosion Protection*	*Implement erosion protection works along vulnerable watercourses.*	●	●				
Supporting Study/Project	*Servicing Standards Review*	*Update standards to address different development types*	●	●	●	●	●	●
Strategy/Plan	Biosolids Management	The Early Action Plan and Long Term Biosolids Strategy deal with short term and long term biosolids accumulation and management at the City-owned Clover Bar Lagoons.				◐		
Program	Drainage Neighbourhood Renewal Program	This program serves to renew/replace storm and sanitary sewers in older neighbourhoods.	●		●		●	
Program	Flood Prevention Program	This program is aimed at identifying the causes and reducing the risk of flooding in at-risk neighbourhoods.	●					
Program	Environmental Monitoring Program (EMP)	Established in 1991, the EMP serves to quantify material released by the City to the NSR		●		●		●
Program	Store it, Don't Pour It	Education program encouraging Edmontonians to store fats, oils, grease in a tin instead of pouring it down the drain.				●		
Program	Trash it! Trap it! Strain it!	Education program for commecial/institutional kitchens to properly dispose of fats, oils, grease.				●		
Operation/Practice	Catchbasin cleaning	Practice to reduce the amount of sediment released into storm sewers.		●				◐
Operation/Practice	Industrial wastewater investigations	Practice to monitor/control commercial/industrial wastewater discharge.		●		●		●
Operation/Practice	Increased naturalization of wetlands	Practice to improve watershed health, wildlife habitat, stormwater treatment.		●				
Operation/Practice	Erosion and Sediment Control (ESC) Guidelines	ESC requirements reduce the amount of sediment released into the storm system.		●				
Bylaw	Sewer Use Bylaw (no. 9675)	Bylaw identifying contraints/restrictions associated with discharges to sewer system (e.g. loading limits, mercury amalgam separators, etc.)		●		●		●
Bylaw	Sewers Bylaw (no. 9425)	Bylaw regulating connections between private drainage systems and the City of Edmonton sewerage system, to regulate the use of storm water management facilities, to prevent damage or misuse of the sewerage system and to allow the collection of sanitary sewer trunk charges and other cost assessments.	●	●	●	●	●	●
Bylaw	Surface Drainage Bylaw (no. 11501)	Bylaw regulating lot grading and surface drainage requirements within private lands.	●				●	◐
Bylaw	North Saskatchewan River Valley Area Redevelopment Plan (no. 7188)	Identifies a boundary for the river valley and ravine system and a set of policies and development approval procedures for lands within this boundary.	●	●				

KEY / Notes

● Initiative has a primary focus or impact on the pathway component.

◐ Initiative has a secondary focus or impact on the pathway component.

Impacts can be positive or negative, though in general the nature of the initiatives included in the matrix yield a positive impact with respect to reducing quantity and/or quality components of the three pollutant pathways. E.g., diversion of CSO from an overflow point will have a positive impact on CSO quantity but a negative impact on wastewater quantity (that must be treated). Conversely, reduction in runoff yield will positively impact both stormwater and CSO pathways.

Initiative Type	Initiative Name	Description	Control Stormwater Quantity	Control Stormwater Quality	Control Wastewater Quantity	Control Wastewater Quality	Control CSO Quantity	Control CSO Quality
Buildings and Landscape Services								
Operation/Practice	Erosion and Sediment Control (ESC) Requirements	ESC requirements reduce the amount of sediment released into the storm system.		●				
Transportation Services								
Standard/Guideline	Complete Street Design Guidelines	The Complete Streets Guidelines will provided guidance to integrate transportation and land use, encouraging active transportation. They will emphasize an area's accessibility for various travel modes such as walking cycling driving and riding transit.	●	●			●	●
Operation/Practice	Street Sweeping	Street cleaning practices affect the quality of runoff from roads.		●				●
Operation/Practice	Winter Road Maintenance Program	The winter road maintenance program, including the controlled use of road salt (for de-icing) and abrasives affects the quality of runoff from roads.		●				●
Operation/Practice	LID Applications	Specific roads related LID Applications (e.g. Bioswales, Green Streets, Permeable Pavements) will impact stormwater quantity and quality.	●	●			●	●
Operation/Practice	Hard Surfacing of RM District Yards	Hard surfacing the sand/salt stock pile and mixing areas of district yards will impact runoff quantity and quality.	●	●			●	●
Operation/Practice	Erosion and Sediment Control (ESC) Requirements	ESC requirements reduce the amount of sediment released into the storm system.		●				
Sustainable Development								
Urban Planning and Environment								
Planning Initiatives Section								
Standard/Guideline	Residential Infill Guidelines	These guidelines address location of various scales/forms of residential development as well as appropriate site/building design.	●	●			●	●
Standard/Guideline	Neighbourhood Design Guidelines	These guidelines will address develpoment in new neighbourhoods.	●	●			●	●
Standard/Guideline	TOD Guidelines	These guidelines address develpoment near transit stations, concentrating housing, shopping and employment along a network of walkable/bikable streets.	●	●			●	●
Policy Section								
Strategy/Plan	Growth Coordination Strategy	This strategy will manage future public obligations and growth opportunities, linking growth to infrastructure investment.	●	●	●	●	●	●
Strategy/Plan	Integrated Infrastructure Management Plan	Outlines future infrastructure requirements to manage growth.	●	●	●	●	●	●
Strategy/Plan	Industrial Land Strategy	Framework for programs and policies relating to industrial development	●	●	●	●	●	●
Strategy/Plan	City-wide Food and Agriculture Strategy	Strategy to outline initiatives for increasing access to local food.	●	●			●	●
Operation/Practice	Review of environmental documents	Ongoing review and comment on environmental screening reports, assessments, etc.	●	●			●	●
Office of Environment								
Strategy/Plan	Harmful Substances Reduction Plan - Community	Plan to establish long-term direction for Edmonton's reduction of harmful substances.		●		●		●
Strategy/Plan	Harmful Substances Reduction Plan - City Operations	Plan to establish long-term direction for the reduction of harmful substances in City operations.		●		●		●
Strategy/Plan	Climate Change Adaptation Plan (CCAP)	The CCAP will identify specific actions and implementation steps required to make Edmonton (including City operations) resilient to the effects of climate change.	●	●			●	●
Strategy/Plan	Brownfields Action Plan	This plan will increase remediation of brownfields in Edmonton		●				●
Strategy/Plan	Contaminated Sites Action Plan	This plan will establish a program to identify, assess and manage city-owned contaminated sites.		●				●
Strategy/Plan	Green Building Plan	This plan will provide a set of actions to improve the environmental, health and socio-economic performance of city buildings.	●	●	●	●	●	●
Supporting Study/Project	*Green Building Checklist*	*This checklist and resource guide will promote green building practices, build capacity, and provide a way for builders to access incentives provided by the City.*	●	●	●	●	●	●
Office of Biodiversity								
Strategy/Plan	Natural Connections Strategic Plan	This plan will provide a strategic framework for the conservation of natural areas in Edmonton and the City's role within the region.	●	●			●	●
Strategy/Plan	Biodiversity Action Plan	This plan will articulate a high level community vision and general approach to how the City will realize this goal.	●	●			●	●
Strategy/Plan	Wetlands Strategy	This plan will compile all of the City's existing wetland strategies, policies and guidelines into one document.	●	●			●	●
Strategy/Plan	City-wide Natural Area System Restoration Plan	This plan will develop a strategic approach for ecological restoration of the City's system of almost 4000 ha natural areas.	●	●			●	●
Strategy/Plan	City-wide Natural Areas Management Plan	This plan will establish a management sytem for city-owned natural areas that ties operational guidelines to conservation goals.	●	●			●	●
Strategy/Plan	Sustainable Sites Plan for City-Owned Land	This plan will develop/adopt sustainable standards for the design of the landscaping component on all City-owned land.	●	●			●	●
Parks Planning								
Strategy/Plan	Urban Parks Mangement Plan	This plan will provide strategic direction for the acquisition , design, construction, maintenance and preservation and use of parks.	●	●			●	●
Strategy/Plan	Ribbon of Green Concept Plan	This plan is aimed at creating a natural river valley park system that balances open space conservation and recreation development.	●	●				
Office of Development Coordination								
Standard/Guideline	Design and Construction Standards	Current standards (Drainage, Water, Roadways, Landscping) may require updates to facilitate LID, set allowable rate/volume for stormwater release, revised roadway cross-sections, etc.	●	●	●	●	●	●

Initiative Type	Initiative Name	Description	Control Stormwater Quantity	Control Stormwater Quality	Control Wastewater Quantity	Control Wastewater Quality	Control CSO Quantity	Control CSO Quality
Community Services								
Neighbourhood and Parks								
Strategy/Plan	Urban Forest Management Plan	This plan is a 10-year strategy for sustainably managing and enhancing our diverse urban forest	●	●			○	○
Strategy/Plan	Integrated Pest Management Strategy	This plan is aimed at the sustainable management of pests, including human and plant pathogens, disease vectors and invasive species.		●		●		○
Strategy/Plan	Water Use Reduction Plan - City Operations	This plan will set out a framework for reducing potable water use in City operations.	●		●		○	
Operation/Practice	Stormwater re-use	Parks will substitute stormwater for potable water for suitable applications (e.g. sports field irrigation, lake filling).	●		●		○	
Operation/Practice	Promotion of infiltration	Implement practices to encourage infiltration(e.g. continuous trenching for boulevard trees, improving soil conditions to increase infiltration)	●	●			○	○
Standard/Guideline	Re-use water quality guidelines.	These guidelines will provide guidance on water quality parameters for irrigation applications.	●					
EPCOR								
Strategy/Plan	Long Term Water Efficiency Plan	This plan will outline measures to ensure a sustainable supply of water now and in the future.			●		○	
Supporting Study/Project	*Water Metering / Water Rates*	*Establish rate structure based on usage.*			●		○	
Supporting Study/Project	*Conservation Targets*	*Identifying and aligning practices to meet targets.*			●		○	
Supporting Study/Project	*Wise Water Use Public Education*	*Education program*			●			
Strategy/Plan	Gold Bar Wastewater Treatment Plant Operations Plan	This plan identifies capacity and treatment upgrades to provide long term service to Edmonton.				●		●
Supporting Study/Project	*Enhanced Primary Treatment*	*Treatment Process*				●		●
Supporting Study/Project	*Biological Nutrient Removal*	*Treatment Process*				●		
Supporting Study/Project	*Dechlorination*	*Treatment Process*				●		
Supporting Study/Project	*Struvite Recovery*	*Treatment Process*				●		
Supporting Study/Project	*Sludge Digestion*	*Treatment Process*				●		
Supporting Study/Project	*Direct Filtration in Winter*	*Treatment Process*				●		
Bylaw	EPCOR Water Services and Wastewater Treatment Bylaw	This bylaw provides wastewater treatment services for the City of Edmonton.				●		
Regional/Provincial Initiatives								
Strategy/Plan	Integrated Watershed Management Plan (North Saskatchewan Watershed Alliance)	Overarching plan to guide the protection, maintenance and restoration of the NSR.	●	●	●	●	●	●
Strategy/Plan	Water Management Framework for the Industrial Heartland and Capital Region (Alberta Environment and Water)	Manages the existing and potential impacts associated with the development of the Industrial Heartland and anticipated growth in the Capital Region.	●	●	●	●	●	●
Strategy/Plan	Cumulative Effects Management System (Alberta Environment and Water)	Manages the air, land and water impacts of all activities on the landscape to ensure that their cumulative footprint does not exceed the carrying capacity of the natural environment.	●	●	●	●	●	●
Strategy/Plan	Reclaimed Wastewater Initiative (Alberta Municipal Affairs)	Provincial initiative to develop a management framework to facilitate safe use of reclaimed water for domestic applications in Alberta.			●			
Strategy/Plan	Rainwater Harvesting Initiative (Alberta Municipal Affairs)	Provincial initiative to facilitate and promote rainwater harvesting applications.	●		●		○	
Strategy/Plan	ENVIRx (Alberta Pharmacists Association)	Initiative to promote and facilitate the safe disposal of unused pharmaceutical products.				●		○

KEY / Notes

● Initiative has a primary focus or impact on the pathway component.

○ Initiative has a secondary focus or impact on the pathway component.

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Strategic Direction 2: Sustain River for Life into the future

A key lesson learned from the review of successful pollutant management initiatives across North America is the importance of planning for and providing the needed resources to support action over the long-term. The current level of pollutant discharges from the City to the North Saskatchewan River are the result of many years of traditional land use practices, urban development patterns, servicing and the decisions and actions of the City. Transitioning from these historical practices and actions will require the City to allocate an appropriate amount of resources to facilitate short, medium and long-term actions. The current time horizon for achieving the River for Life Vision is expected to be at least 30 years. Adequate financial and human resources are required to support the strategy's longevity and sustainability.

Desired Outcomes and Core Activities:

2.1 Key City departments, including Drainage Services, Buildings and Landscape Services, Transportation Services, Sustainable Development and Community Services have the capacity, that is, sufficient staff with the right experience, skills and commitment to creatively drive the River for Life implementation process in the short, medium and long-term.

2.1.1 Assess the resource requirements associated with any recommended policies, programs and projects or activities. This may include the resource requirements for shorter term tasks undertaken by City staff, stakeholders and consultants, as well as the need for new full-time positions to resource implementation activities over the medium and long-term. It is expected that this resource assessment would be revisited on a periodic basis.

2.1.2 Determine costs and benefits of any added resource requirements to ensure River for Life is adequately supported.

2.1.3 Identify how and where internal financial and capacity resources can be leveraged between various departments. Establish a cross-departmental group with a mandate to motivate and coordinate staff in the implementation of the Strategy.

2.1.4 Source required financial and people resources to support new training opportunities for staff, the retention of new staff and the engagement of consultants or contractors.

Understanding the resource requirements of the City to facilitate the programs, projects and initiatives under River for Life is critical for long-term strategy success. This will facilitate efforts to allocate the needed resources in a more efficient manner to help respond to key priorities and realize opportunities. Furthermore, it will help strategically leverage the resources of stakeholders and partners and facilitate understanding of the costs and benefits of the City's resource allocations.

2.2 River for Life has reliable funding sources to cover the costs of planning, designing, operating, maintaining and adapting related initiatives.

2.2.1 Complete high level cost estimates for recommended projects, programs and tools to help achieve the Vision.

2.2.2 Evaluate, rank and recommend potential financing and funding tools to meet the resource demands of the Strategy. Consider various financing and funding tools in terms of their advantages and disadvantages in the Edmonton context. Consideration will be given to each tool's ability to meet the cost estimates developed for key recommended projects, programs and tools.

2.2.3 Develop business cases for recommended funding and financing tools. This will consider the cost to implement the identified tools, the prospective revenue streams, timing implications and, perhaps most importantly their respective ability to help incent BMPs.

2.2.4 Adopt the financing and funding tools needed to appropriately resource River for Life.

A broad variety of potential financial tools have been identified through jurisdictional research, which are likely to be suitable for Edmonton. These include the following:

- *Adopting variable utility fee structures for residential and non-residential properties; implemented based on a property's surface imperviousness and presence of innovative pollutant reduction strategies (e.g. LID/BMPs, water re-use).*
- *Leveraging private investment for new development and redevelopment. The City currently employs a financing model to leverage private investments into sanitary improvements via the Sanitary Servicing Strategy Fund (SSSF). A similar model could be developed for stormwater quality works.*
- *Allowing tax credits for property owners who implement BMPs. This tax credit would be applied to help reduce property taxes.*
- *Implementation of a "green fund" (e.g. similar to the 1% for green program in Portland, Oregon) which requires that a portion of construction costs of specific development and redevelopment projects be allocated to fund water quality related initiatives.*
- *Pursuing funding sources from other levels of government, either independently or in concert with other municipalities (via joint initiatives).*
- *Working cooperatively with watershed stakeholders to share costs for activities such as monitoring, maintaining and operating water quality models.*

2.3 A long-term adaptive management program is established. This adaptive management program guides the implementation of RIver for Life by responding to changing environmental, political, regulatory and technical priorities.

2.3.1 Develop performance indicators for the adaptive management program.

2.3.2 Review current discharge monitoring program(s) and assess what changes may be required to better map pathways and evaluate pollutant impacts.

2.3.3 Identify regulatory and non-regulatory requirements for reviewing, reporting and assessing discharge data from the City of Edmonton into the North Saskatchewan River.

2.3.4 Establish a monitoring framework to support the adaptive management approach. This includes identifying key performance metrics, and roles and responsibilities of internal and external partners.

2.3.5 Develop a process to determine when action is required to reduce discharges based on provincial regulatory triggers and environmental thresholds established through watershed planning initiatives and City priorities. The establishment of "thresholds and trigger points" will indicate to the City when a discharge issue exists to help identify appropriate corrective action(s).

2.3.6 Implement an adaptive management system. Review and revise program to suit changing needs.

Edmonton currently carries out an annual Environmental Monitoring Program (EMP) which annually quantifies material released by the City to the NSR. It includes annual water quality surveys of main storm sewer outfalls (4 locations), combined sanitary and storm sewer outfalls (2), tributaries (8), wastewater treatment plant outfalls (2), stormwater management facilities (SWMFs) (6), and water intakes (4) along the North Saskatchewan River (NSR) as it flows through the City.

While this represents valuable information on the drainage performance of outfalls and how point sources can influence water quality in the NSR, there are limited data from tributaries and SWMFs. More frequent sampling from these locations are required to allow for a thorough examination of spatial and temporal trends in tributaries, efficiency of SWMFs at improving water quality, and the link between physical properties of SWMF and water quality. Further, under the current monitoring protocol, it is challenging to understand the impacts of non point source pollution or assess the potential benefits of LID BMPs. Moving forward with RIver for Life, the monitoring program will need to be revisited in order to link specific actions to water quality benefits. Project specific monitoring will be an important component and an adaptive management process will ensure that actions can be regularly assessed and revised.

2.4. The principles of River for Life are supported by the means to encourage and/or compel compliance with regulatory guidelines and requirements.

2.3.1 Determine the components of the Strategy for which compliance is desired and the level of compliance necessary to fulfill the Strategy (e.g. voluntary versus mandatory).

2.4.2. Identify the responsible parties outside of Drainage Services from whom compliance is sought.

2.4.3. Develop the procedural framework for obtaining compliance (e.g. submission and review requirements, application fees, operation and maintenance certifications, etc.).

2.4.4. Determine and establish consequences for non-compliance (e.g. development application denial, maintenance performed by City at owner expense, fines, etc.).

source: http://photos.edmonton.ca

Strategic Direction 3: Engage residents and stakeholders

To facilitate the short, medium and long-term success of River for Life, the City of Edmonton will need to proactively engage Edmontonians, key partners and watershed stakeholders in the development and implementation of the strategy. Further, building relationships with residents, partners and stakeholders will form an integral part of the success of RIver for Life. Building these relationships includes coordinating efforts within the City, educating, enabling and energizing Edmontonians, and working with key watershed stakeholders and partners to reduce pollutant discharge.

Within River for Life, stakeholders have been categorized according to their engagement with the initiative, the potential impact of the Strategy on operations or policies, the ability to support River for Life and the different messages, strategies, tools and techniques needed to communicate with each stakeholder group. Accordingly, the following stakeholder groups have been identified[9]:

- **Internal City of Edmonton Stakeholders:** includes City departments whose operations and policies may either support or challenge the River for Life objectives.
- **External Key Stakeholders:** public or private organizations who operate independently from the City of Edmonton but have closely-linked operational goals, practices or mandates.
- **External Public Stakeholders:** organizations who are currently active in some aspect of water protection but have a smaller mandate than Key Stakeholders. Includes single-issue stakeholders.
- **Residents / Public:** includes all residents within the City of Edmonton.

Desired Outcomes and Core Activities:

3.1 An on-going public education and outreach process informs residents about the specific issues and concerns driving the need for River for Life. The process encourages residents to reduce or eliminate pollutant discharges through their own personal choices and actions and will be integrated with the existing and planned efforts of the City's *The Way We Green* strategy.

3.1.1 Develop and implement a public education plan. The plan will identify specific communication media and education platforms for target key audiences (e.g. print and visual media, school programs, demonstration projects, tours) and outline a timeframe for implementation.

3.1.2 Develop key educational and outreach resources that can be used to provide foundational information to Edmontonians about the need to reduce discharges into the North Saskatchewan River.

3.1.3 Identify opportunities to complement educational and outreach program initiatives with potential regulatory and/or incentive programs that are instituted under River for Life. By integrating education and outreach programs with other tools that help reduce discharges, the City will be better positioned to translate the knowledge of local residents into action.

[9] More detail on the stakeholder roles and proposed communications activities can be found in Zero Discharge Vision Communication Strategy (Appendix E)

3.2 Internal stakeholder engagement continues through formal and informal arrangements among City departments. This will foster inter-departmental collaboration with respect to the reduction and elimination of pollutant discharges to the North Saskatchewan River.

3.2.1 Develop an interdepartmental task force to coordinate activities in support of River for Life and consider broadening mandate of Water Management Task Force to fill this role.

3.2.2 Challenge the interdepartmental task force to identify and implement key activities, projects or initiatives that will cooperatively lead to the reduction of discharges.

It is clear that valuable working relationships have developed among the various departments both organically and as a result of Edmonton's Environmental Strategic Plan (The Way We Green). One such example of this collaboration is the Water Management Task Force. This group has a mandate to develop a water management strategy in consideration of The Way We Green and to provide vision, strategy, technical advice, and coordination of City Operations water management initiatives. It includes representation from Neighbourhoods & Parks, Facilities & Programs, Fire Rescue Services, Drainage Services, Building and Landscape Services and Transportation Operations as well as EPCOR and Alberta Health Services. Though the Task Force's current focus is on water management strategies to reduce potable water use, it has the potential to expand its scope and serve broader water management goals. Moving forward, it is recommended that the City build on these collaborative efforts to establish a task force (or broaden the membership and mandate of the Water Management Task Force) which focuses on key areas of concern, including:

- *continued efforts to reduce potable water consumption;*
- *stronger collaboration with respect to reducing stormwater runoff (e.g. increasing forest canopy, implementing LID BMPs, green roofs, landscaping practices to promote infiltration);*
- *stronger collaboration with respect to improving runoff quality (e.g. pesticide/fertilizer use, street cleaning and de-icing practices, management/restoration of natural areas); and*
- *identification of opportunities to pool resources (especially with respect to research, inspections and monitoring).*

Some of the most effective schemes in other jurisdictions have employed similar interagency task forces or groups to lead and motivate various departments in implementation efforts. Such an office/group need not have authority over other departments but could play a primary coordination role. However, as the scope and commitment of the task force increases, it is possible that resource requirements may ultimately compel its transition into a staffed department.

source: http://photos.edmonton.ca

3.3 Strong external stakeholder and partnership engagement efforts are made with both public and private organizations, including senior regulatory agencies, inter-agency groups, other municipalities, North Saskatchewan Watershed Alliance, developer groups, contractors, consultants and EPCOR.

3.3.1 Circulate draft River for Life framework and solicit input from first wave external stakeholders and partners.

3.3.2 Provide opportunities for external stakeholders and partners to inform the development of implementation plans, identify project opportunities and support educational and outreach programs.

3.3.3 Identify collaboration opportunities with stakeholders and partners to pool resources (financial, in-kind, etc.) to effectively and efficiently carry out "flagship" partnership projects, plans and initiatives in support of River for Life.

The Outreach Partnership Model will be a critical component of River for Life. In order to approach management from a watershed mindset and effectively integrate with the activities undertaken by other watershed stakeholders, early and meaningful consultation and engagement is key. This will help make the most of resources geared towards watershed stewardship and ensure the approach(es) are consistent.

source: http://photos.edmonton.ca

Strategic Direction 4: Provide the means for implementation

The success of River for Life will rest on the specific projects, programs and initiatives put in place that lead to real reductions in pollutant discharges. Some of these initiatives will be undertaken directly by the City, while others will require residents, developers and others to pursue innovative practices, change behaviors and invest in new capital projects.

Desired Outcomes and Core Activities

4.1 Master planning has assessed and recommended cost-effective mixes of public and private facilities, including major capital projects (e.g. end-of-pipe stormwater facilities, CSO storage facilities, WWTP upgrades), LID/BMPs and protection of natural areas. The focus is on bringing together "grey infrastructure" (large scale infrastructure improvements) with "green infrastructure" into a cohesive approach to improving discharge quality.

4.1.1 Complete the current round of master planning updates for all three pollutant pathways.

4.1.2 Establish a methodology for determining cost-effective mixes of public and private projects to be used in future master plan updates.

4.1.3 Prepare an inventory of end-of-pipe stormwater quality improvement retrofit projects in priority areas.

4.1.4 Prepare an inventory of potential public projects (road right-of-ways; schools; parks) where runoff quality controls and LID/BMPs can be incorporated.

4.2 Critical public facilities are designed and constructed to reduce the discharge of pollutants from areas of existing development and, in concert with private developers when appropriate, areas undergoing re-development.

4.2.1 Design and construct key improvements identified under existing strategies or master plans (e.g. treatment upgrades at the Gold Bar WWTP, W12, low flow diversions)

4.2.2 Acquire and protect designated wetlands per Stormwater Servicing Strategy and recognize the ecological, social and economic value of these wetlands.

4.2.3 Install erosion protection works along vulnerable watercourses.

4.2.4 Identify opportunities for large scale LID/BMP implementation projects (e.g. redevelopment of Edmonton City Airport)

4.2.5 Identify potential partners for joint public/private facilities for re-development projects in the early planning stages of the projects.

source: http://photos.edmonton.ca

4.3 Operation and maintenance of public infrastructure and lands contribute to on-going reductions in water-borne pollutant discharges.

4.3.1 Evaluate and adjust as necessary the City's street sweeping and catch basin cleaning procedures and schedules.

4.3.2 Develop an asset management system for tracking the operation and maintenance of wastewater, stormwater and combined sewer facilities, including catch basins, pipes, pump stations, diversion structures, real-time control facilities, sediment traps, oil separators, and other civic water infrastructure.

4.3.3 Revise the City's snow management and deicing procedures to minimize potential for release of pollutants (notably sand and chlorides).

4.3.4 Prepare and make available a best practices guide for operation and maintenance of LID/BMP measures.

4.3.5 Review and adjust design review procedures as needed to maximize facility function and operability.

4.3.6 Monitor and maintain constructed wetlands to optimize performance.

4.4 Technical and financial tools are in place to encourage, and/or require developers and property owners to use innovative means to eliminate or reduce pollutant discharges from new development and redevelopment. These tools will include standards and guidelines for the incorporation and use of LID/BMPs and water conservation strategies; financial strategies such as incentives, grants and development bonuses; technical tools such as templates and/or software to assist with proper design of facilities, and revised operations and maintenance guidelines.

4.4.1 Develop stormwater quantity and quality performance targets in priority areas to reduce the impact of discharges.

4.4.2 Complete the development of a "green building checklist" that includes provisions to help reduce the runoff discharges.

4.4.3 Update Design and Construction Standards to facilitate use of LID. Encourage other departments (Transportation, Parks) to adopt LID Design Guidelines. Further develop LID guidelines for specific land uses (e.g. Green Street standards)

4.4.4 Develop a homeowner's guide to stormwater management, which includes guidelines for LID techniques on private property and describes maintenance requirements.

4.4.5 Prepare "better site design" guidelines that focus on site planning and landscaping and the way these can enhance pollutant reduction efforts.

4.4.6 Develop and implement an incentives program to support implementation of sustainable water management on private property. Incentives may include grants, tax rebates, density bonuses, development credits, fast-track approval process for "green" developments, etc.

4.5 On-going research into the design, performance, operation and maintenance of BMPs, provides the basis for continuously improving River for Life implementation. The research includes a combination of pilot and demonstration projects, financial and/or in-kind support of work by universities or others, and review and assessment of original research reported in pertinent literature within the water quality management field and focuses on all three pollutant pathways.

4.5.1 Complete the LID feasibility study to address outstanding issues regarding efficacy, approval process and maintenance of LID BMPs.

4.5.2 Establish a protocol for on-going review, assessment and dissemination of pertinent information from scientific and technical literature.

4.5.3 Identify potential demonstration and/or pilot projects for LID and other sustainable practices to establish viability, design parameters and maintenance requirements in Edmonton's climate conditions.

4.5.4 Coordinate with research and support institutions such as Alberta Innovates-Energy and Environmental Solutions (AI-EES) and University of Alberta; consider financial and in-kind support to research efforts by these organizations.

4.5.5 Investigate the potential value and role of enhanced and/or increased street cleaning efforts as a best practice for runoff pollutant control, including use of a demonstration project in one or more sections of the City.

source: http://photos.edmonton.ca

MOVING FORWARD PLAN

The Moving Forward Plan, outlined in Table 2, is structured around the four Strategic Directions. The Plan summarizes work completed in Phase 1, and highlights the follow-up tasks that will be undertaken in Phases 2 and 3. Also included in the Plan are brief notations regarding "post-strategy" work in the chart. This post-project work consists of the many core activities discussed under the four Strategic Directions.

source: http://photos.edmonton.ca

Table 2

Table 2: Moving Forward Plan

Strategic Direction	Phase 1 (now)	Phase 2 (2012-2013)	Phase 3 (2013-2014)	Post-Strategy (2014-2044)
Align City policies, strategies and programs	Identify and inventory relevant policies, strategies and programs accross City departments.	Further identify potential areas of concern requiring review (e.g. Land use bylaw changes, building code changes).	Carry out required detailed reviews. Identify what needs to be changed, who needs to make the change, and estimate the potential costs associated with implementing the changes.	Implement identified changes.
	Highlight the relationships between the goals of Zero Discharge Strategy and the identified strategies, policies and programs.	Identify potential enhancement opportunities to better align policies, strategies and programs with Zero Discharge objectives.		
Sustain Zero Discharge into the future	Research and identify potential financial and policy tools.	Evaluate pros/cons of potential financial tools in the Edmonton context. Rank/recommend tools for implementation.	Compile more detail on short, medium and long term costs, timelines, prospective financial sources.	Adopt mechanisms for raising funds.
			Formulate recommendations for adaptive management.	
	Research potential approaches to monitoring and adaptive management.	Review current monitoring program and assess what changes may be required to better evaluate pollutant impacts and map pathways.	Establish a monitoring framework to support an adaptive management plan (include performance metrics, roles/responsibilities, cost projections).	Implement ongoing adaptive management.
	Research potential approaches to building capacity for implementation.	Assess resource requirements associated with implementing the recommended tools (e.g. internal task force, staffing requirements, consultant studies).	Establish costs for identified needs. Identify how budget/resources could be leveraged from various departments and source required resources.	
Engage residents and stakeholders	Develop understanding of current public perceptions.	Develop Public Education Strategy.	Develop and promote draft report. Finalize report, incorporating stakeholder feedback.	
	Initiate contact and collect input from key internal stakeholders.	Work with City to support internal communications strategy.		
	Initiate contact and share information with key external stakeholders.	Continue to engage key external stakeholders in plan development.		
	Initiate brand development.	Set measurable communication objectives.		
Provide the means for implementation	Identify relevant projects/programs which are either planned or already underway.	Develop ranking tool for potential projects/programs/tools which: -connects pollutants of concern to pathways -targets top priorities and "low hanging fruit" -considers implementation timing -assess potential improvement in river	Develop high level cost estimates for the recommended projects/programs/tools.	Undertake core activities (identified in phase 2 and costed -structure and establish development incentives -execute/update related strategies (e.g. CSD, LID feasibility) -design/construct projects
	Develop an inventory of potential projects/programs/tools.	Recommend specific projects / programs / tools in the short, medium and long term.	Revise implementation timing as necessary to align with watershed priorities and projected funding/income stream.	

Denotes completed activity

In early stages of development, this initiative was referred to as the Zero Discharge Vision Strategy; it was subsequently rebranded as River for Life in late 2012.

The attached appendices reference the original strategy name. All references to Zero Discharge were maintained to reflect an accurate summary of the discussion.