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Toronto and Region Conservation Authority

In association with:

Lake Simcoe Region conservation authority

Credit Valley Conservation inspired by nature

EOR water ecology community

Advancing Resilient Water Management: One Water Approach in Practice

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Goal of the Talk

1. Inform people from different departments on sustainable water uses and the importance of cross-department collaboration.

2. Recognize that stormwater reuse can be an easy way for projects and communities to begin integrated One Water approaches.

3. Recognize opportunities to break linear thinking and apply reuse to make their systems more circular/resilient.

Outline

Overview of One Water Approach

- What it is and why it matters to *you*
- Water Management in Urban Areas

Why is integrated water management critical?

- Water Supply Demands & Constraints
- Climate Change, Population Growth
- Aging Infrastructure, Regulatory Changes

One Water/Reuse Examples

- Diverse Scales and Land Uses

Understanding the ONE-WATER Approach

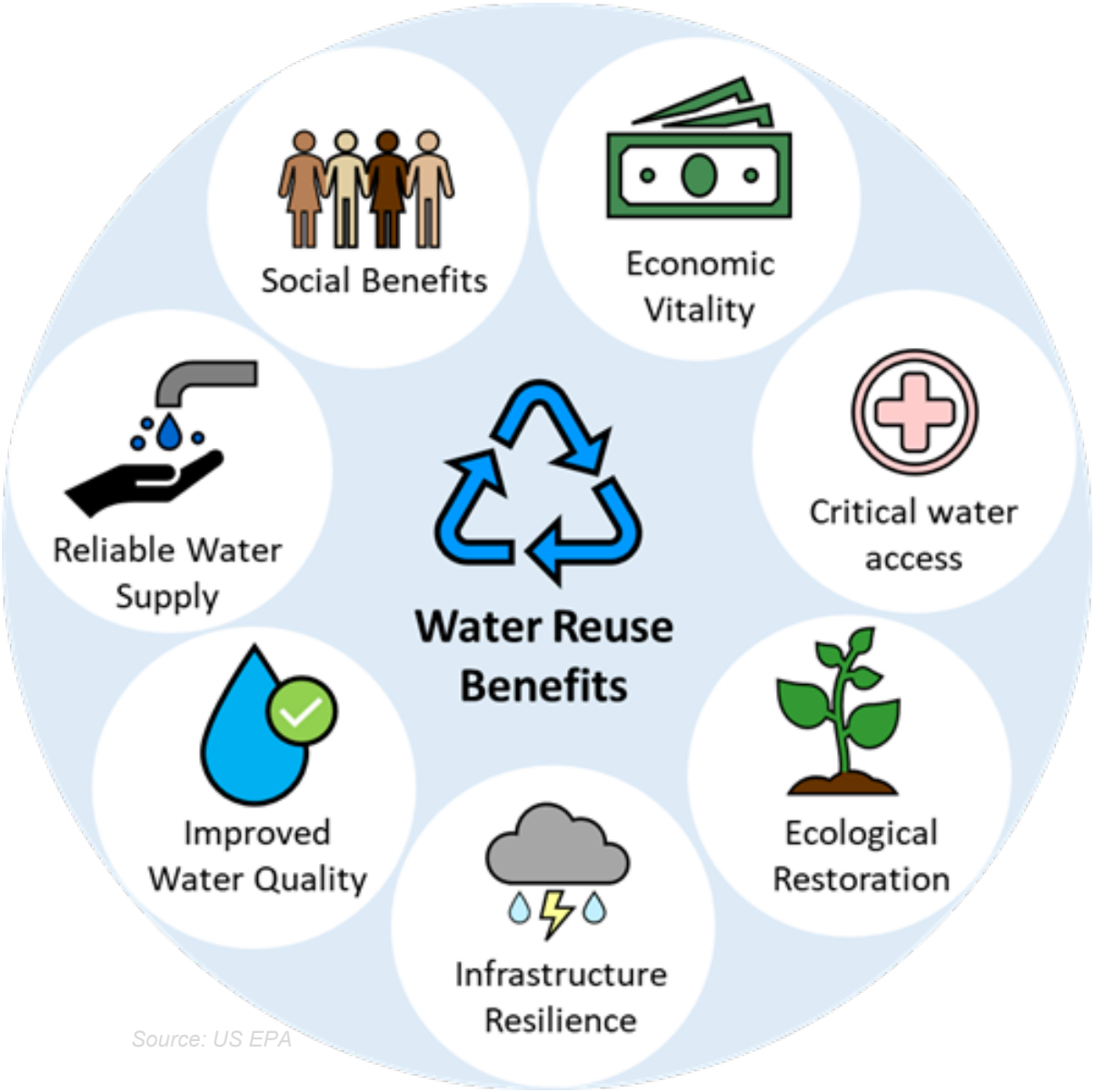
Integrated approach to managing all water sources

Key Elements:

- **Managing** water supply, wastewater, stormwater together → Plus: surface water and groundwater
- **Closing the loop:** treating wastewater/ stormwater as **resources** not "waste products"
- **Enhancing** sustainability, resilience, and efficiency

Replace Linear/Traditional with Circular/One Water

Benefits of the One Water Approach



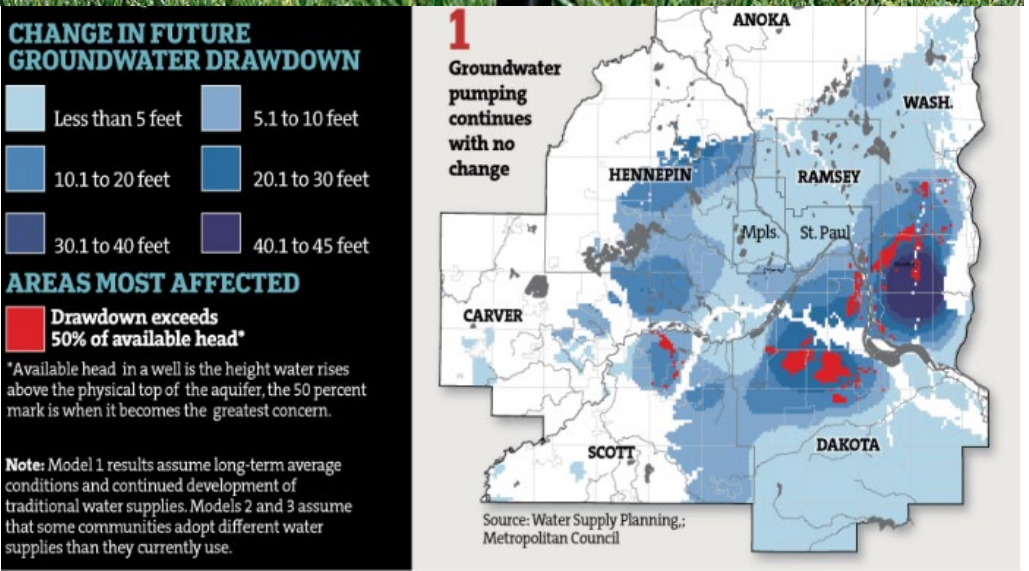
Economic: Reduced infrastructure costs, optimized resource use (Bloomington)

Environmental: Enhanced water quality, restored ecosystems (Lake Waconia/football fields)

Social: Increased community engagement, improved resilience (Hugo ponds & Homeowner Ass'ns, Calgary)

Regulatory Compliance: Streamlined permitting and policy alignment (Waconia, Stillwater District)

Convergence of Issues



Stormwater & Water Supply

Volume-Based Stormwater:

- Becoming the Norm – Driver of problems

Water Supply Concerns:

- Regional/Nat'l/Int'l - Water Supply is Big Issue
- MN – Water Table Decline & Impacts
  – White Bear Lake

The Paradox of Water:

- Pay to "dispose" of runoff (waste product)
- Pay for storm damages of extra water
- Pay for irrigation/other non-potable uses w/drinking water

Flexible Approach - GI, LID

Flexible Stormwater tool w/in LID/GI

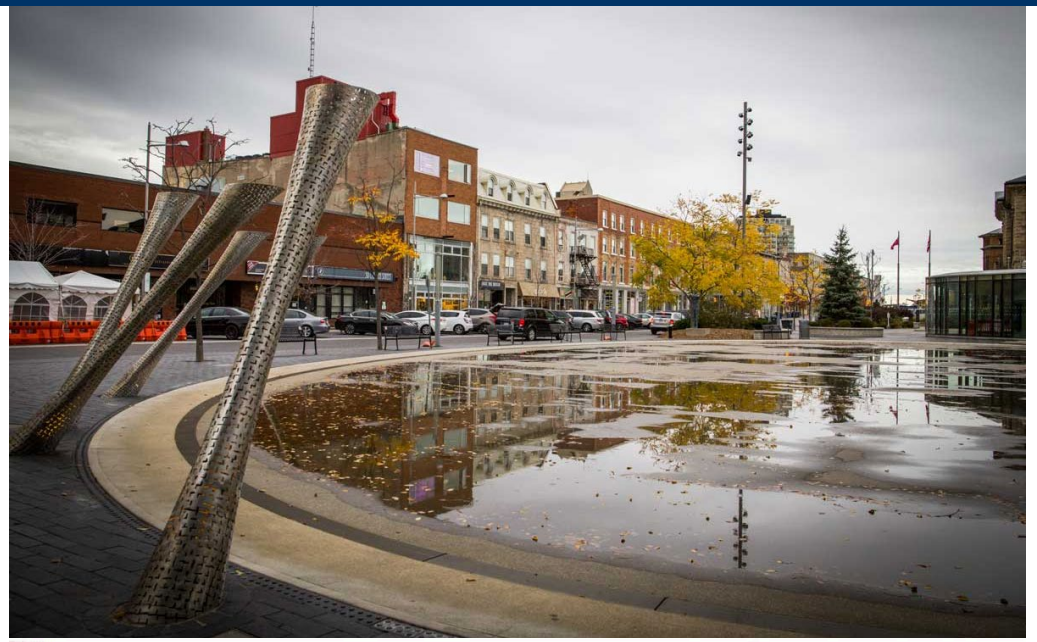
- Soils – Works for Impermeable/ Clay
- Shallow Groundwater (GW)
- Contamination – Soils, GW, *Wellhead Protection Areas*
- Shallow Bedrock
- Ultra-Urban Siting

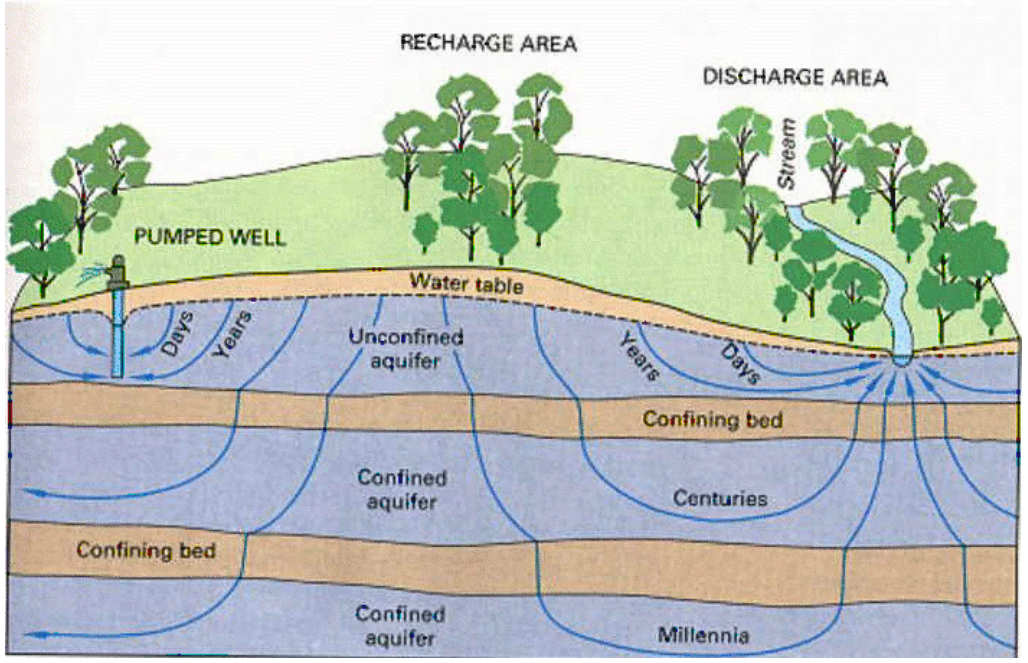
Case Study Overview

Source: CWEA

- **How municipalities are applying One Water principles**
- **Case studies from both Canada & USA**

The Blueprint: Guelph's One Water Plan





An integrated strategy treating drinking water, wastewater, and SW - *interconnected system.*

Holistic & Sustainable Approach – Balances human, environmental, and ecological needs for efficient management.

Growth & Future-Proofing – Supports projected >208k residents and 116k jobs by 2051.

Resilient water management – for future generations by GW recharge and SW harvesting

Goals of The Blueprint: Guelph's One Water Plan

Key project goal: Develop a strategy to reduce water consumption in line with the Water Supply Master Plan (2022).

Enhance water systems

Improve resiliency and reliability and decrease reliance on piped water systems

Promote sustainability

Lower water management costs, boost the natural environment and foster sustainability

Plan collaboratively

Coordinate water planning and actions across sectors

Adapt to change

Build resilience to the effects of climate change, population growth, urbanization on water supply, demand, and quality

Encourage conservation

Build on the strong culture of water conservation

Source: City of Guelph

Progress on the Blueprint: Guelph's One Water Plan

Review current strategies and plans

- ✓ Review the City's current strategies and plans.
- ✓ Find common goals
- ✓ Understand how Guelph can work together for a One Water system.

Review of initiatives

- ✓ Review integrated water management programs from other municipalities to identify promising practices.

In Progress

Blueprint strategic direction

- ✓ Develop a plan with directions, solutions and actions.

Blueprint implementation plan

- ✓ Create a plan to put The Blueprint into action.
- ✓ This means figuring out what needs to be done, keeping track of progress, checking how well things are going, and making a case for each step.

Final Blueprint report

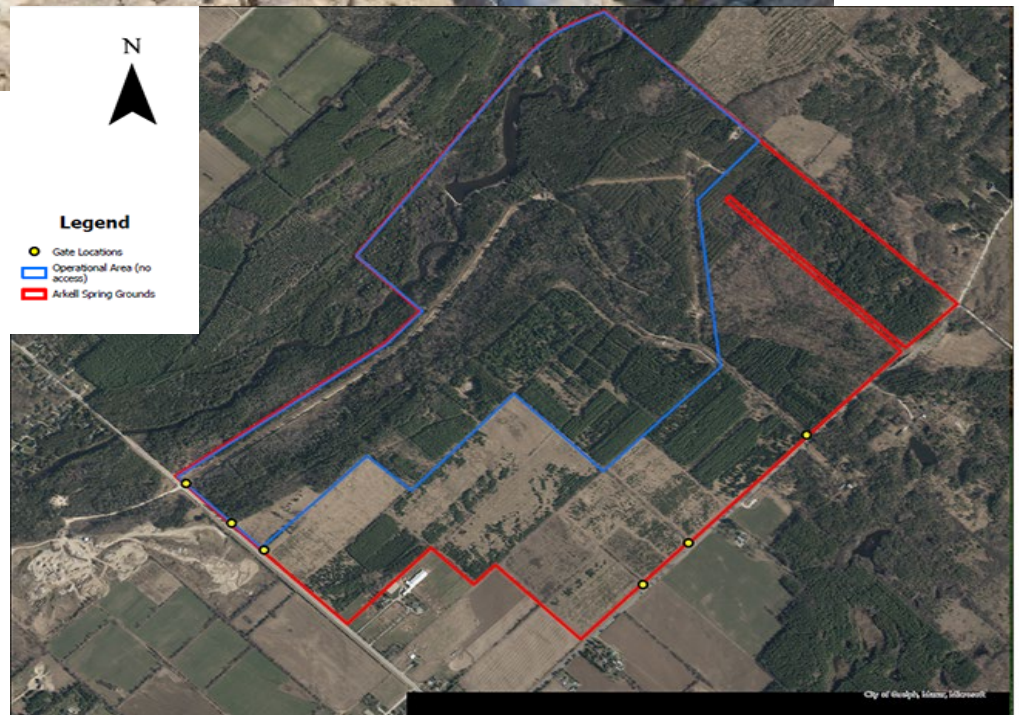
- ✓ Share The Blueprint and take the next steps towards becoming a One Water community.

Community engagement

Review of Initiatives_Guelph ONE-WATER

Case Study	Initiative Description
Local	
1. Region of Waterloo	Aquifer recovery, water awards, WET program for high water users
2. York Region	One Water example, digital initiatives
3. TRCA/CVC	Communication strategies, SNAPS
National	
4. Edmonton, AB	Water reuse, water restrictions, SIRP
5. Vancouver, BC	Water restrictions, focused on municipal facilities
6. Halifax, NS	Non-Revenue Water (NRW) management, One Water approach
North America	
7. San Francisco, USA	Targeting high water users, water reuse
8. Long Beach, CA, USA	Financial incentives and support
Case Study	**Initiative Description**
9. New York City, USA	Stormwater management
10. Los Angeles, USA	One Water strategy
11. Denver, USA	One Water strategy
12. Portland, USA	Stormwater management
13. Tucson, Arizona, USA	Water harvesting and decentralized water systems
International	
Greater Western Water, Australia	Industrial, Commercial, Institutional water use
15. Anglian Water, England	Smart meters
16. Terneuzen, Netherlands	Collaboration with Dow Chemical
17. Singapore, Singapore	NEWater (reclaimed water program)

Arkell Spring Grounds, Guelph

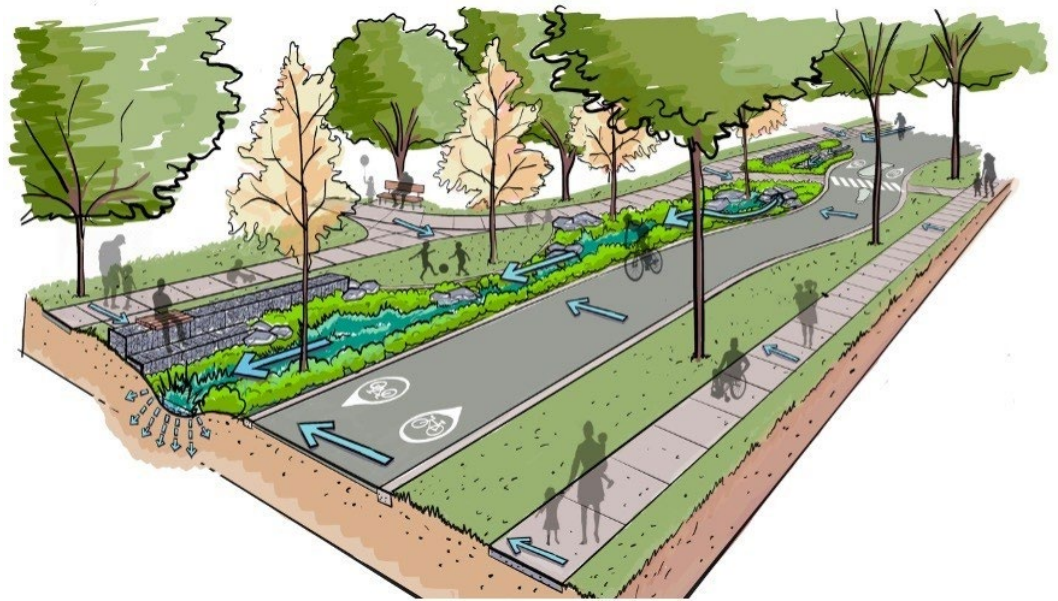


Vital GW Source: *Arkell Spring Grounds supplies 55-80% of Guelph's drinking water.*

Artificial Recharge System: *Eramosa River used for infiltration to recharge aquifer by natural filtration process through trenches and ravines.*

Integrates surface and GW management for resilient, viable potable water supply.

City of Vancouver's One Water Approach



Manages drinking water, rainwater, wastewater, and groundwater as interconnected resources.

Green Infrastructure: *Implements sustainable solutions to enhance water quality and reduce runoff.*

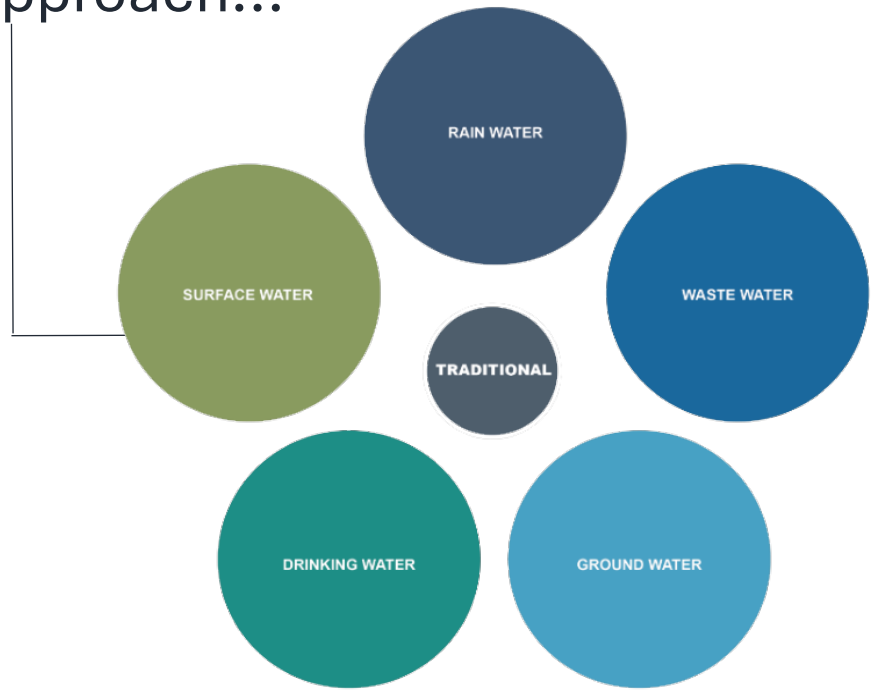
Data-Driven WM: *Uses analytics to understand and optimize urban water cycles.*

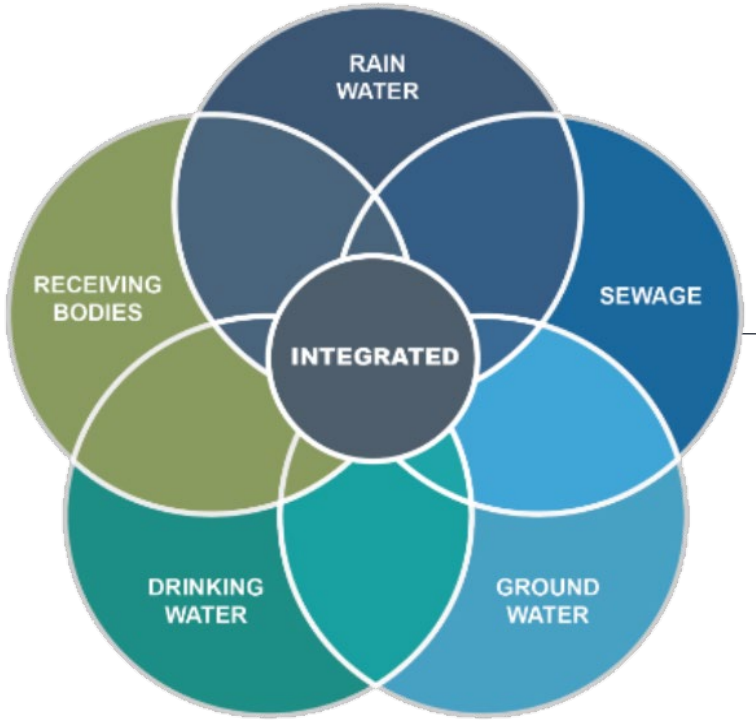
Sustainable Growth & Resilience: *Ensures water preservation while balancing community, economic, and environmental needs.*

***Robb Lukes** -Branch Manager, GI Implementation City of Vancouver*

City of Vancouver's One Water Approach

Shifting from a traditional urban water management approach...





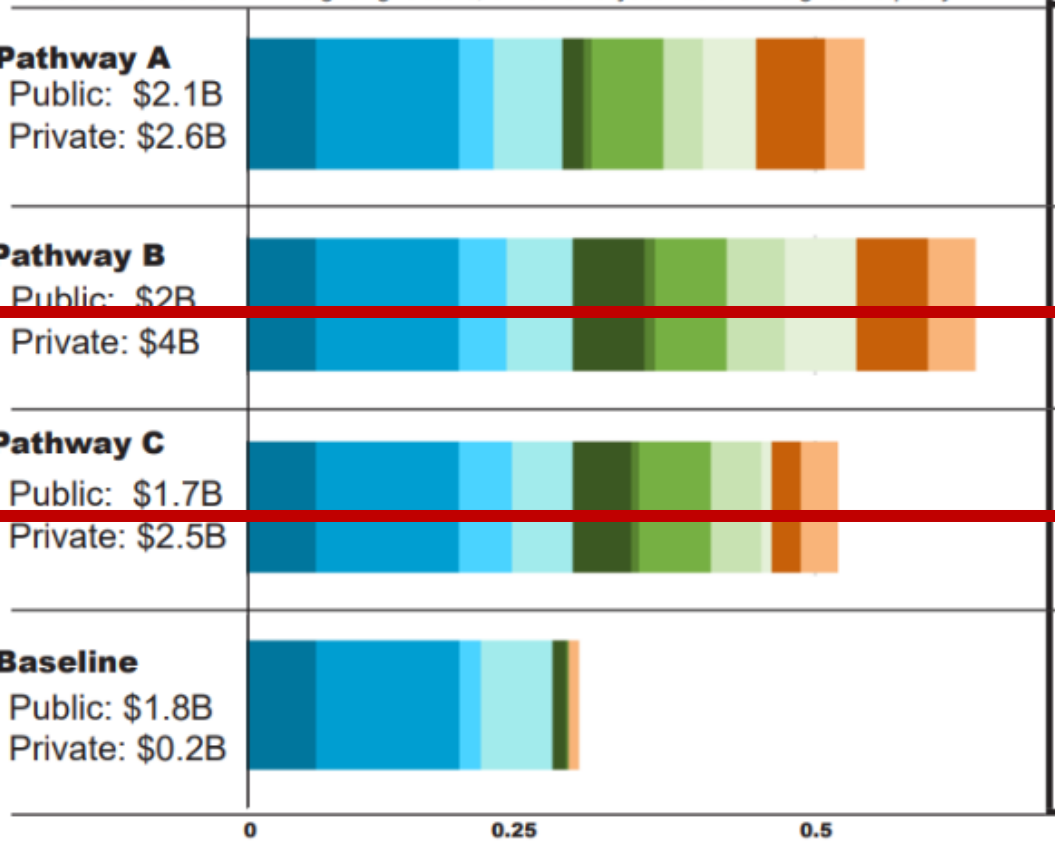
... to an integrated urban watershed management approach.

***Robb Lukes** -Branch Manager, GI Implementation City of Vancouver*

ONE WATER – HEALTHY WATERS PLAN

INNER HARBOUR

**Scores reflect CREF weighting factors; all other objectives are weighted equally*



	Separation Complete by 2075	Grey Infra-structure	Total GRI	Creek daylighting	Private Property Retrofits	RWM Policy	Flood Policy	Flood Capital Projects
Pathway A	100 %	N/A	**132 ha managed**	Historical creek restoration: **150 m** Vegetated channel: **500 m**	Downspout disconnect: **131 ha managed**	**24 mm**	Redevelopment conditions for **flood-proofing:** **50%** reduction in population impacted	**0**
Pathway B	70 %	8,700 L/s high rate CSO treatment plant	**210 ha managed**	Vegetated channel: **1,000 m**	Downspout disconnect: **131 ha managed**	**48 mm**	Redevelopment conditions for **flood-proofing:** **50%** reduction in population impacted	**0**
Pathway C	37 %	12,000 L/s high rate CSO treatment plant	**90 ha managed**	Historical creek restoration: **250 m** Vegetated channel: **2,000 m**	Downspout disconnect: **121 ha managed**	**24 mm**	Restrictions to redevelopment **density:** **20%** reduction in population impacted	Stormwater storage tanks: **10,000 m3** Floodable streets: **4 km**
Baseline	100 %	N/A	**113 ha managed,** green streets only	0	0	N/A	N/A	0

***Robb Lukes** -Branch Manager, GI Implementation City of Vancouver*

One Water Project by Nipissing First Nation

"One Water" project, fostering collaboration with three Indigenous communities in Mexico

Problem: *Water scarcity and infrastructure challenges affect Indigenous communities in Ontario and Mexico.*

Objective: *Combine traditional knowledge and modern water management for sustainable community solutions.*

Solution: *The One Water project enhances resilience through rainwater harvesting and cross-cultural alliance.*

Data center alternative cooling

Data Centers using Evaporative Cooling:

- 1 megawatt (MW) data center uses ≈ 300k people's daily water consumption (World Economic Forum)

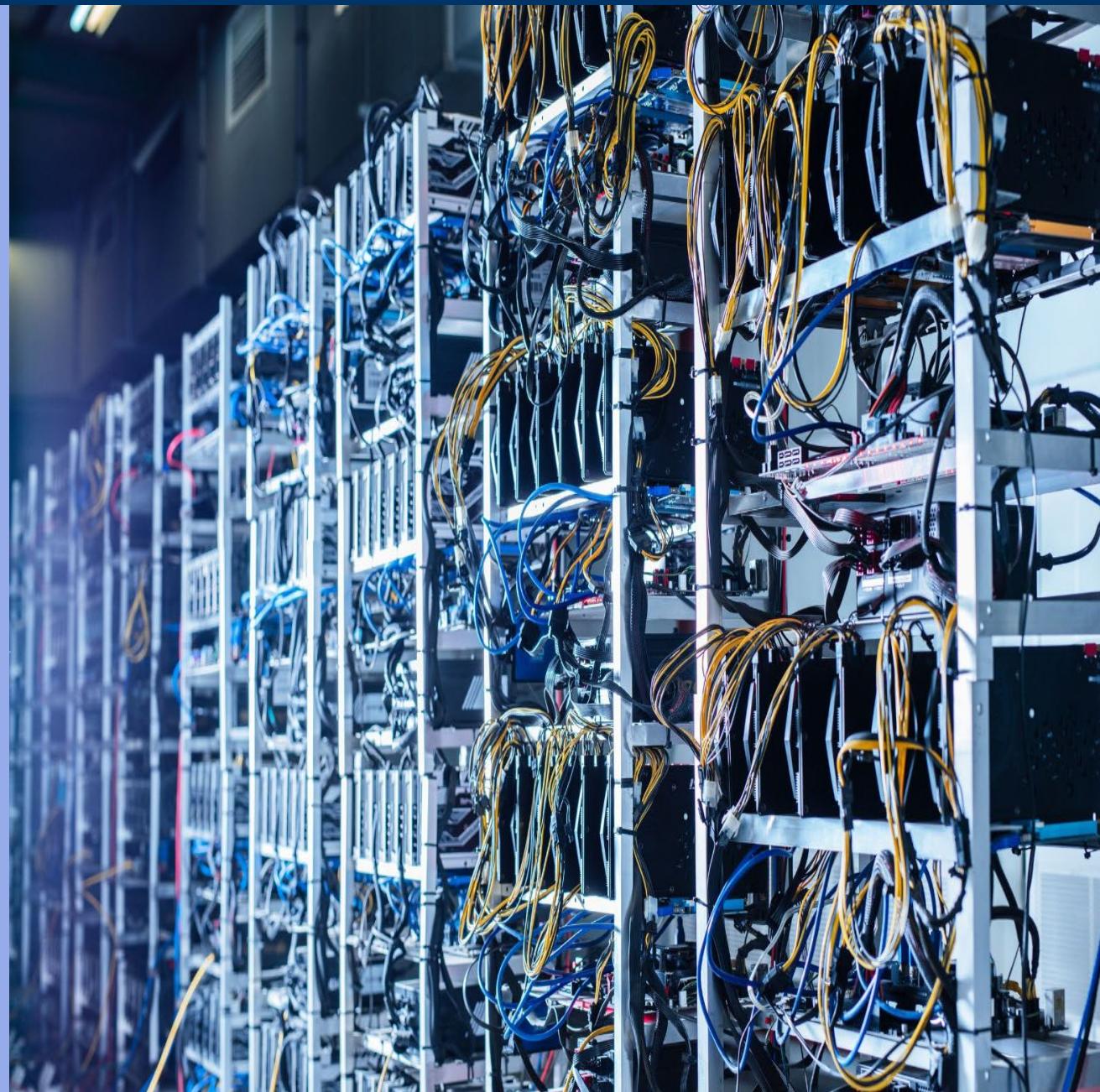
One-water approach to solve the challenges:

"Closed-loop" – Sealed liquid coolant cools hardware directly.

"Grey water" cooling – Reusing treated wastewater or nearby rainwater.

Alternative aquifer cooling –Using moving aquifer for heat transfer for efficient year-round cooling

Heat re-use – Excess heat powers district heating, reducing CO_2.



The Rose-Urban Redevelopment

AWARDS:

2017 MASLA Merit Award for Residential Design 2016 AIA-MN Honor Award
2016 Jack Kemp Excellence in Affordable and Workforce Housing Award
2016 MN Innovation Award
2016 Environmental Initiatives Award – finalist
2015 "Top Project" Recognition (Finance and Commerce Magazine)

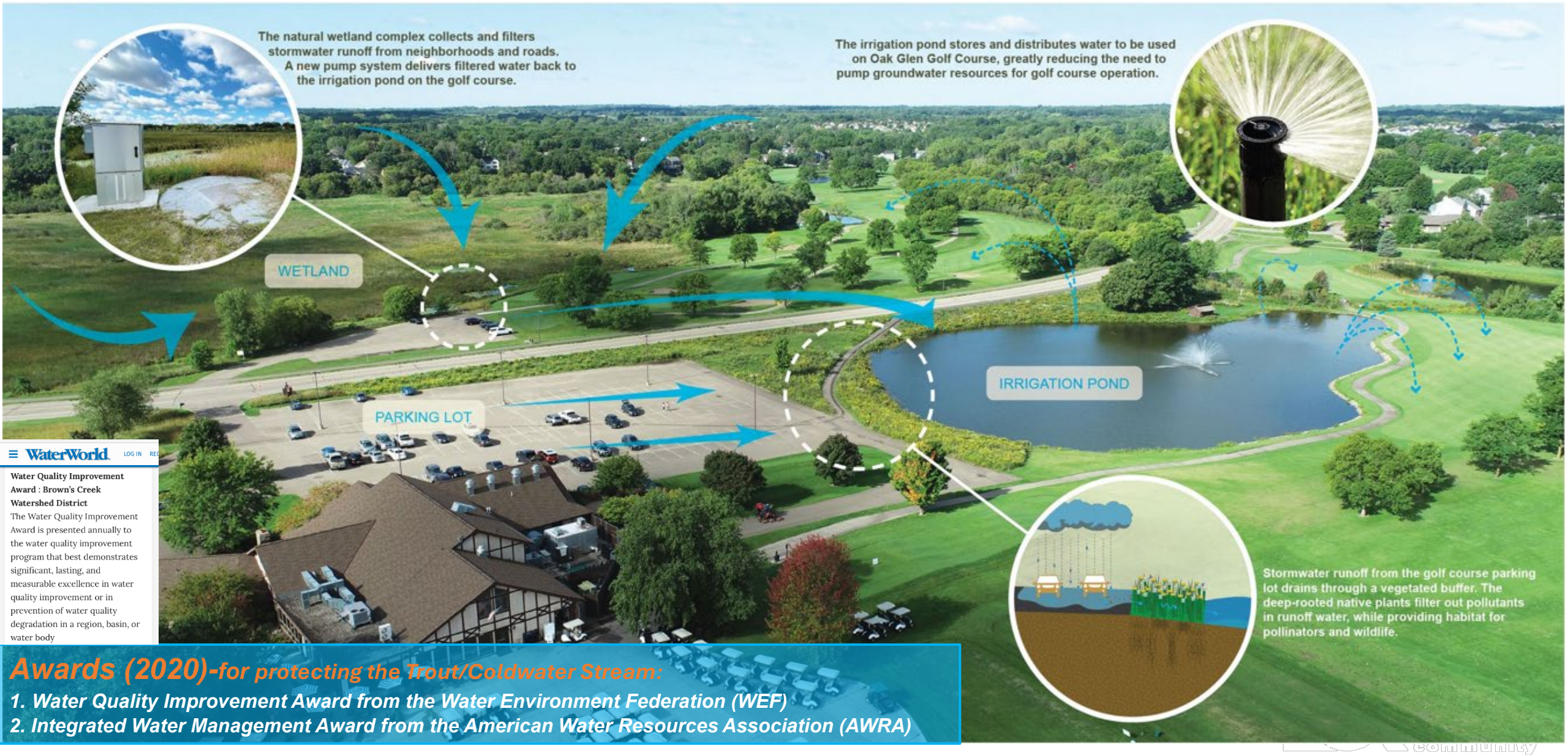
Livable Communities / Quality of Life

The Rose-Urban Redevelopment

Urban Greyfield Redevelopment to Multi-Family, Mixed-Income, Sustainable Community Housing

Campus - Organic Valley Headquarters, Cashton, WI

Oak Glen Golf Course



WaterWorld LOG IN

Water Quality Improvement Award : Brown's Creek Watershed District

The Water Quality Improvement Award is presented annually to the water quality improvement program that best demonstrates significant, lasting, and measurable excellence in water quality improvement or in prevention of water quality degradation in a region, basin, or water body

Awards (2020)-for protecting the Trout/Coldwater Stream:

1. ***Water Quality Improvement Award from the Water Environment Federation (WEF)***
2. ***Integrated Water Management Award from the American Water Resources Association (AWRA)***

Shields Lake CLFLWD

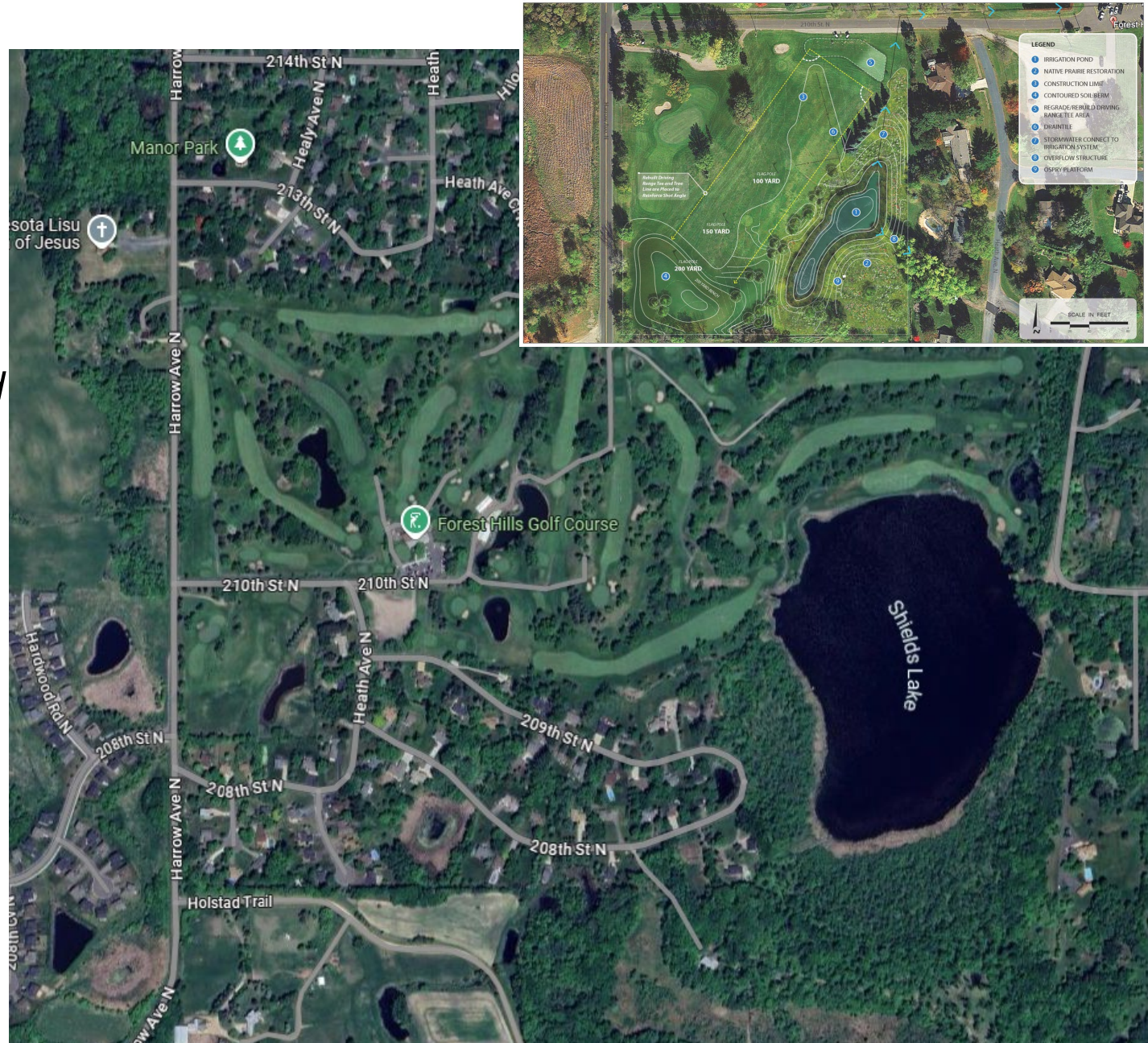
Challenges: *Clay soils, shallow water table*

Irrigation Supply: *26 million gallons/year*

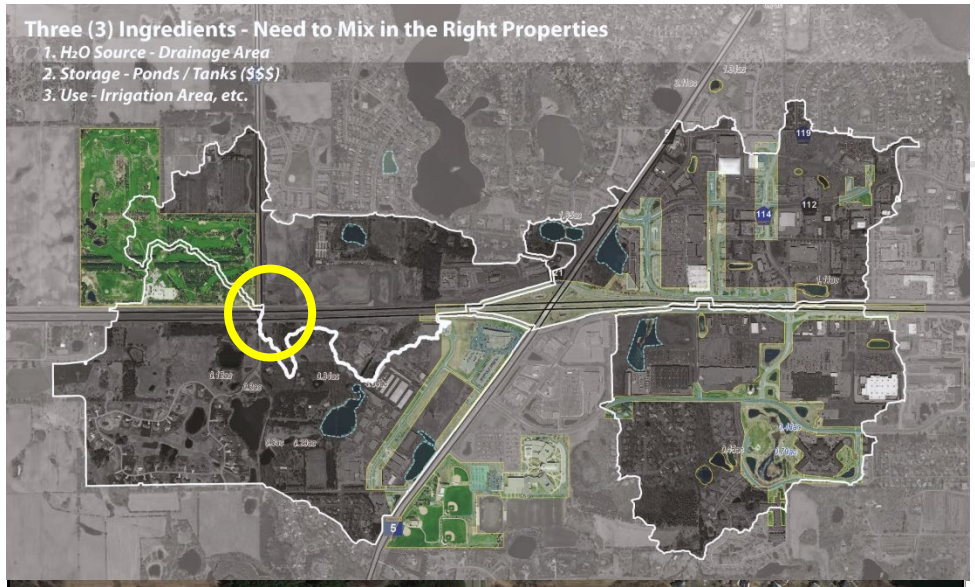
Pollutants: *77 lbs/yr of Phosphorus Removed*

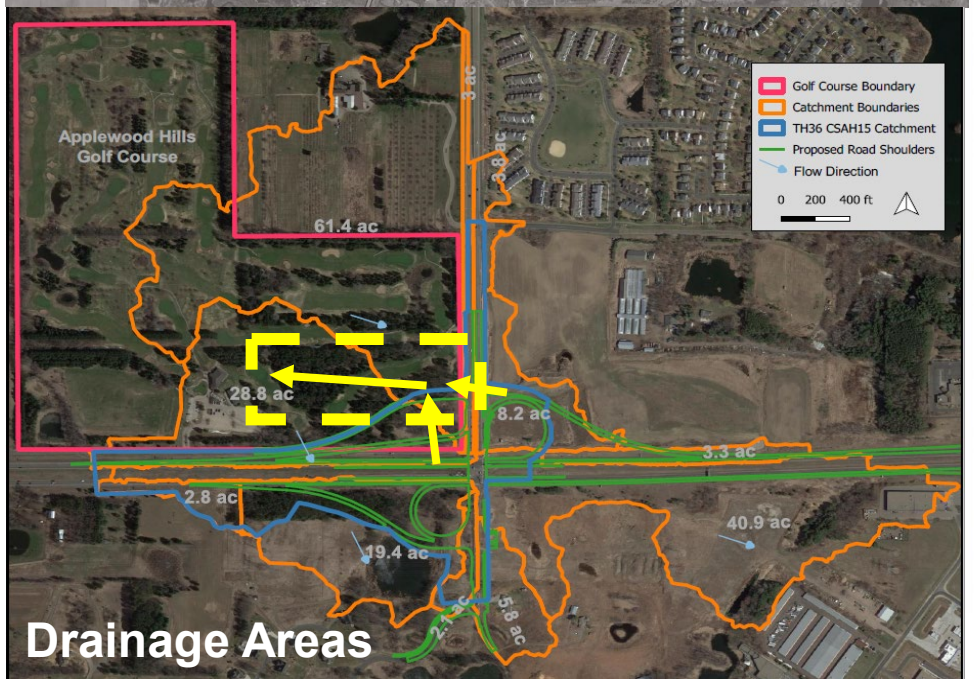
Restoring Shields Lake!

- Stopping the Source
- In-Lake Mitigation

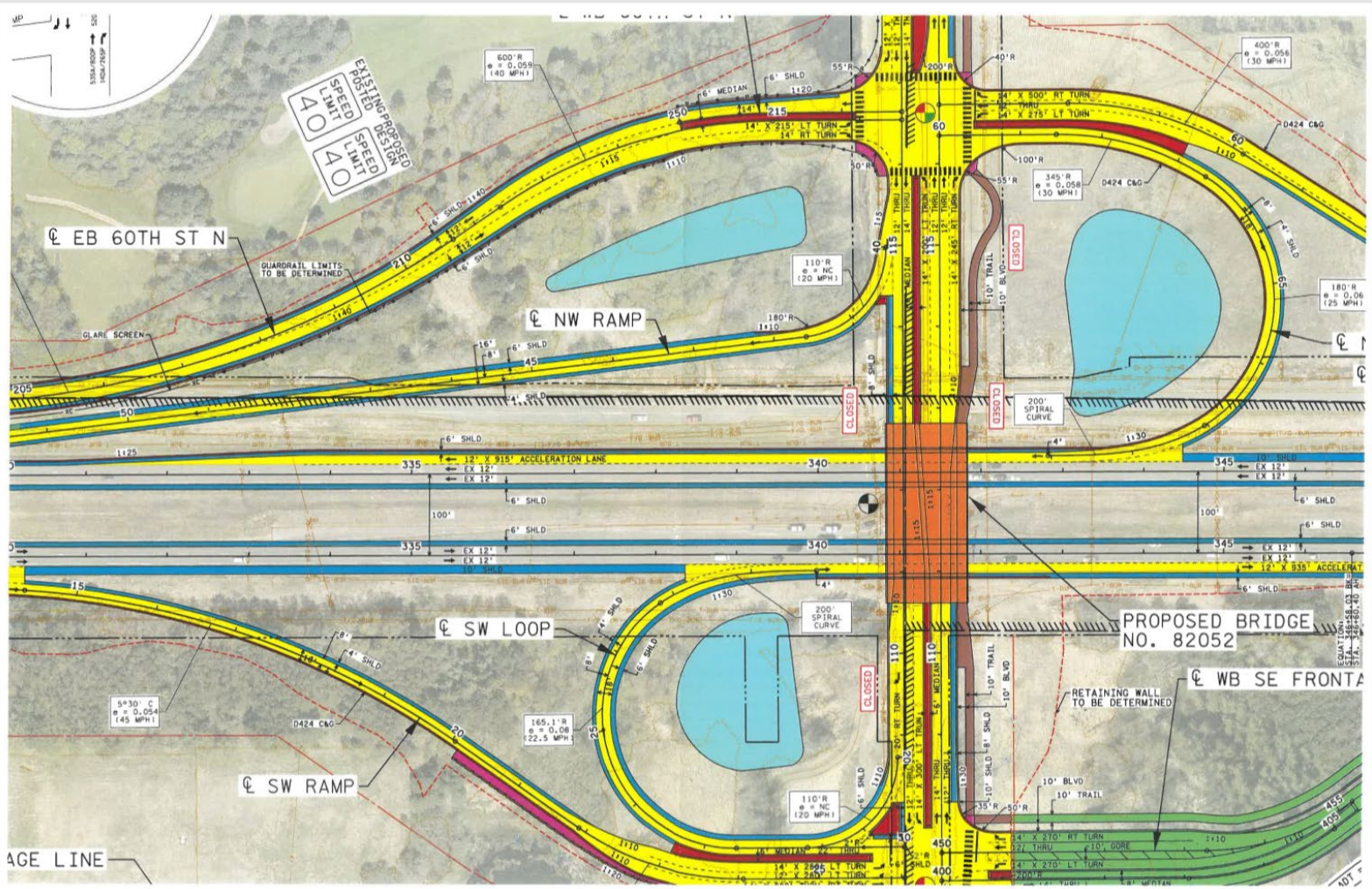


Hwy 36 & Co Rd 15 Interchange, Applewood Hills



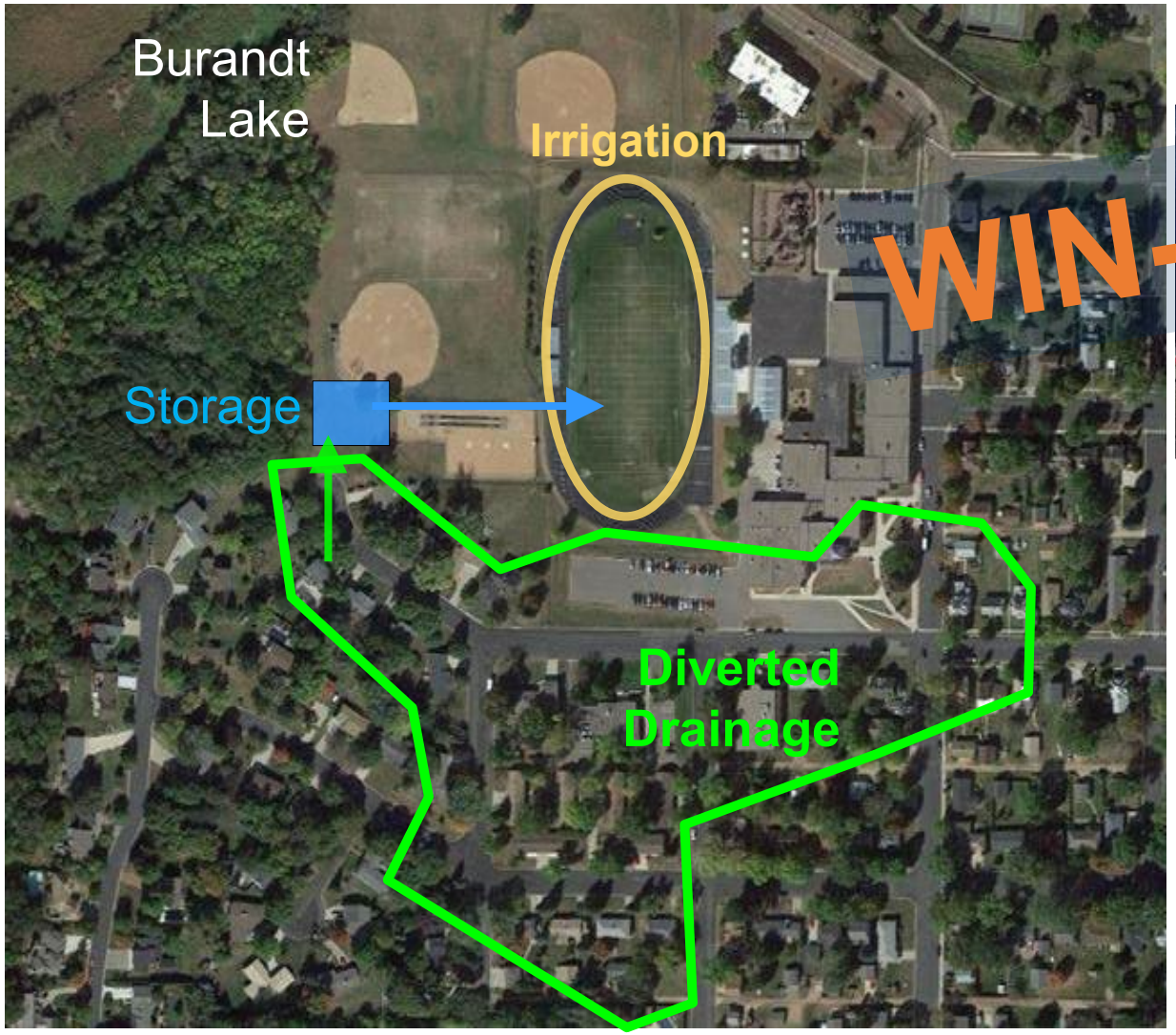


Layout with Storage – Reuse



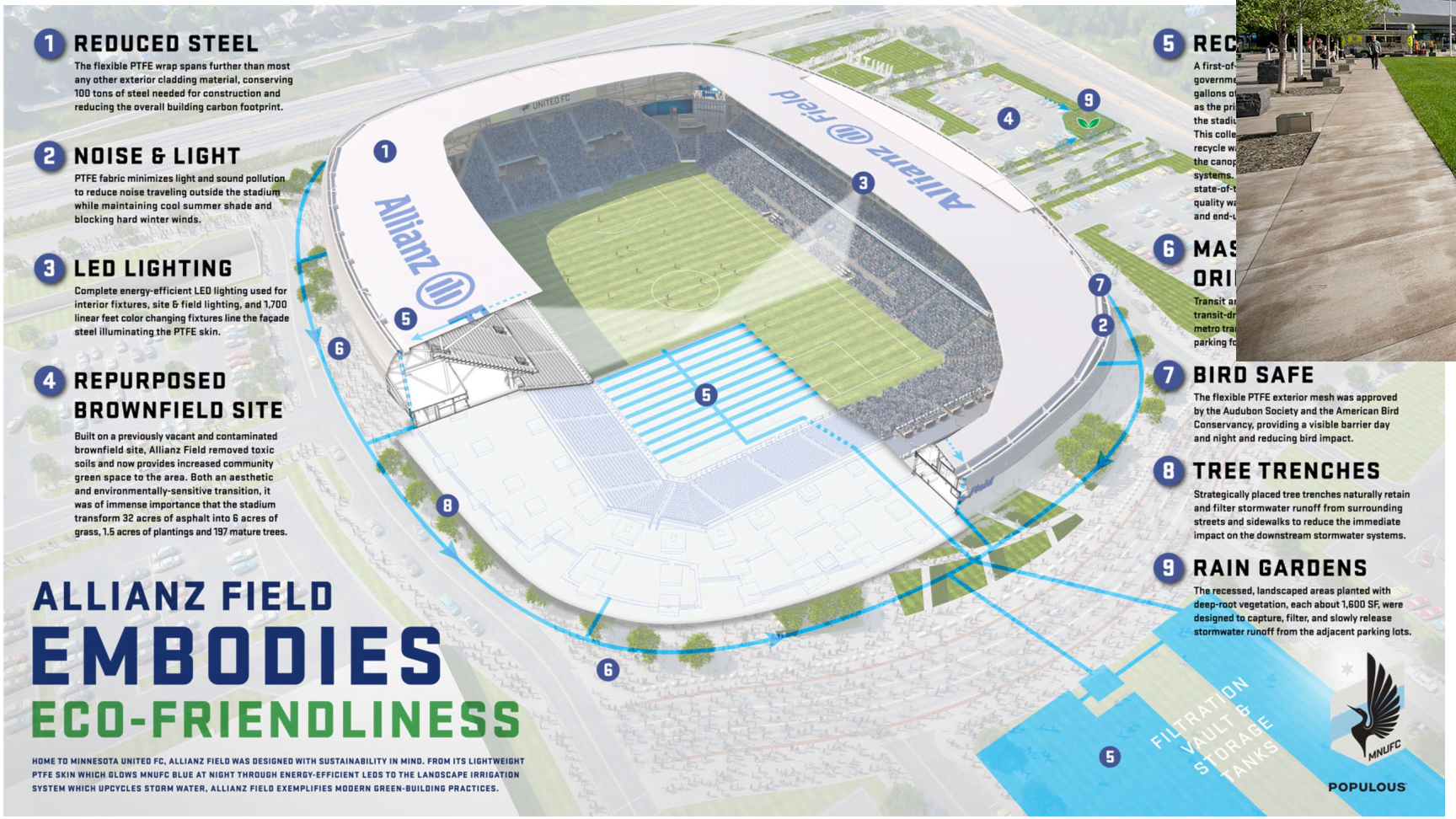
Hwy 36 & Co Rd 15 Interchange, Applewood Hills

Bayview School Reuse, Waconia



WIN-WIN-WIN!

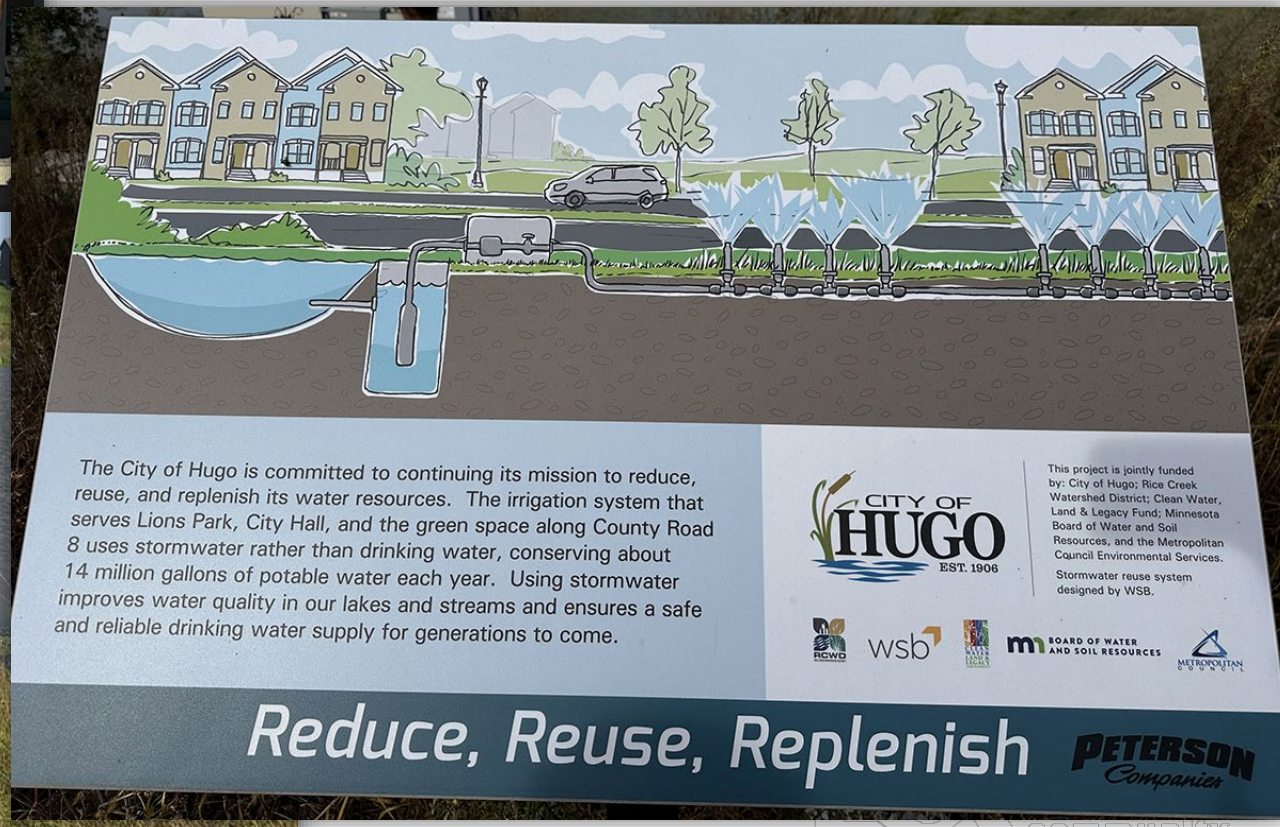
Allianz Soccer Field, MN



- ✓ Annual potable water saves ≈2 MGs - reducing demand.
- ✓ Prevents SW runoff to Mississippi River – protecting pollution & ecosystems.
- ✓ Irrigating 20,500 ft2 lawn, 192 trees, and air quality improvement

District/Regional Reuse Examples – Waconia & Hugo

- ✓ Installation of subsurface chambers to collect SW
- ✓ Use decommissioned potable water tower for additional storage
- ✓ Developed an irrigation network for stored SW use

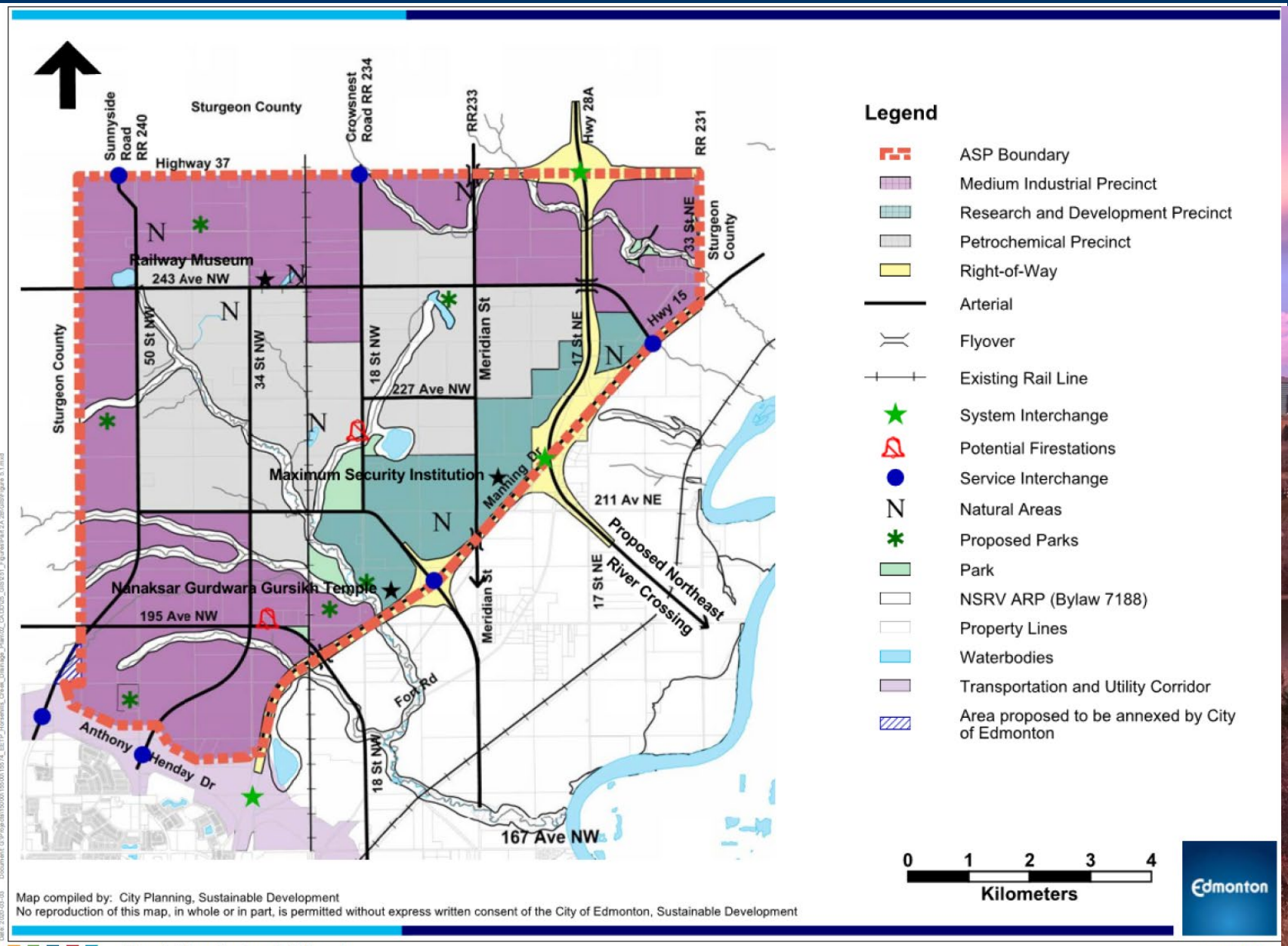


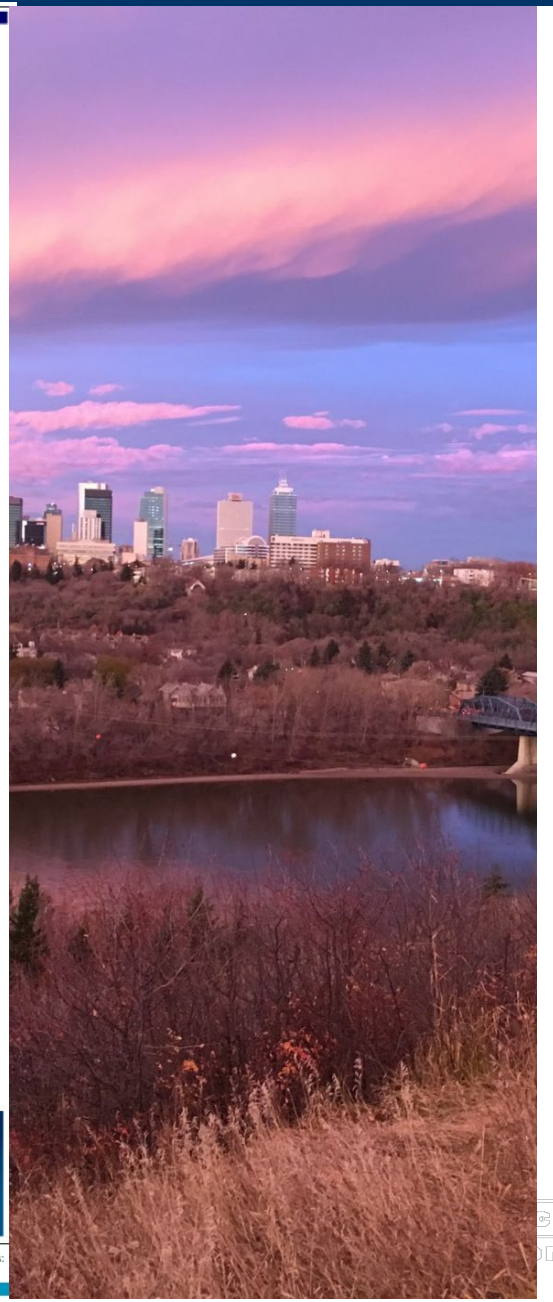
Industrial Stormwater Reuse (Cooling Water)

Stormwater management standards:

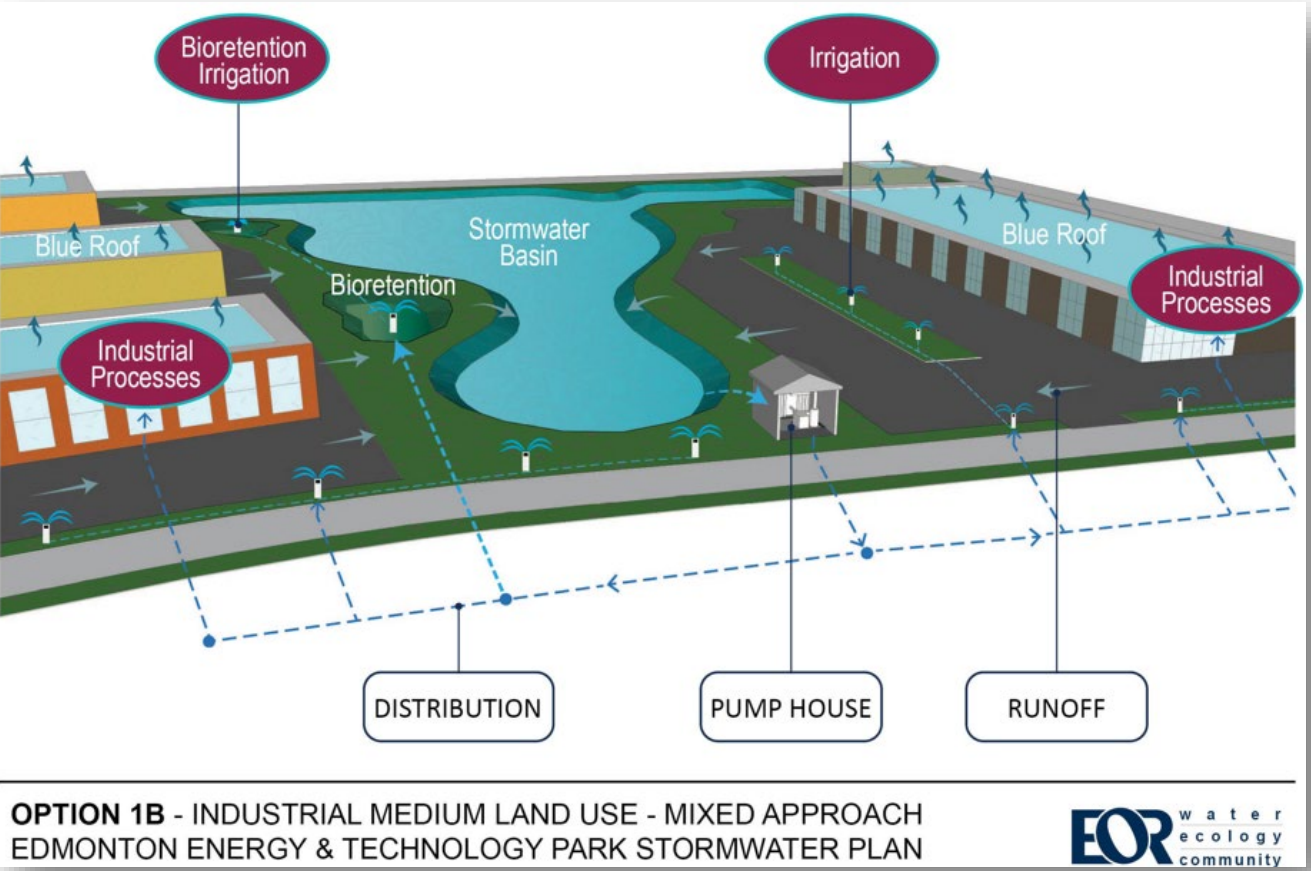
1. Peak discharge control through 100-year event
2. Sediment control for water quality: 80% reduction compared to no controls
3. Runoff volume reduction: retain 100% of increased runoff volume for specified runoff analysis year (1981)

Edmonton EETP (Industrial Park)

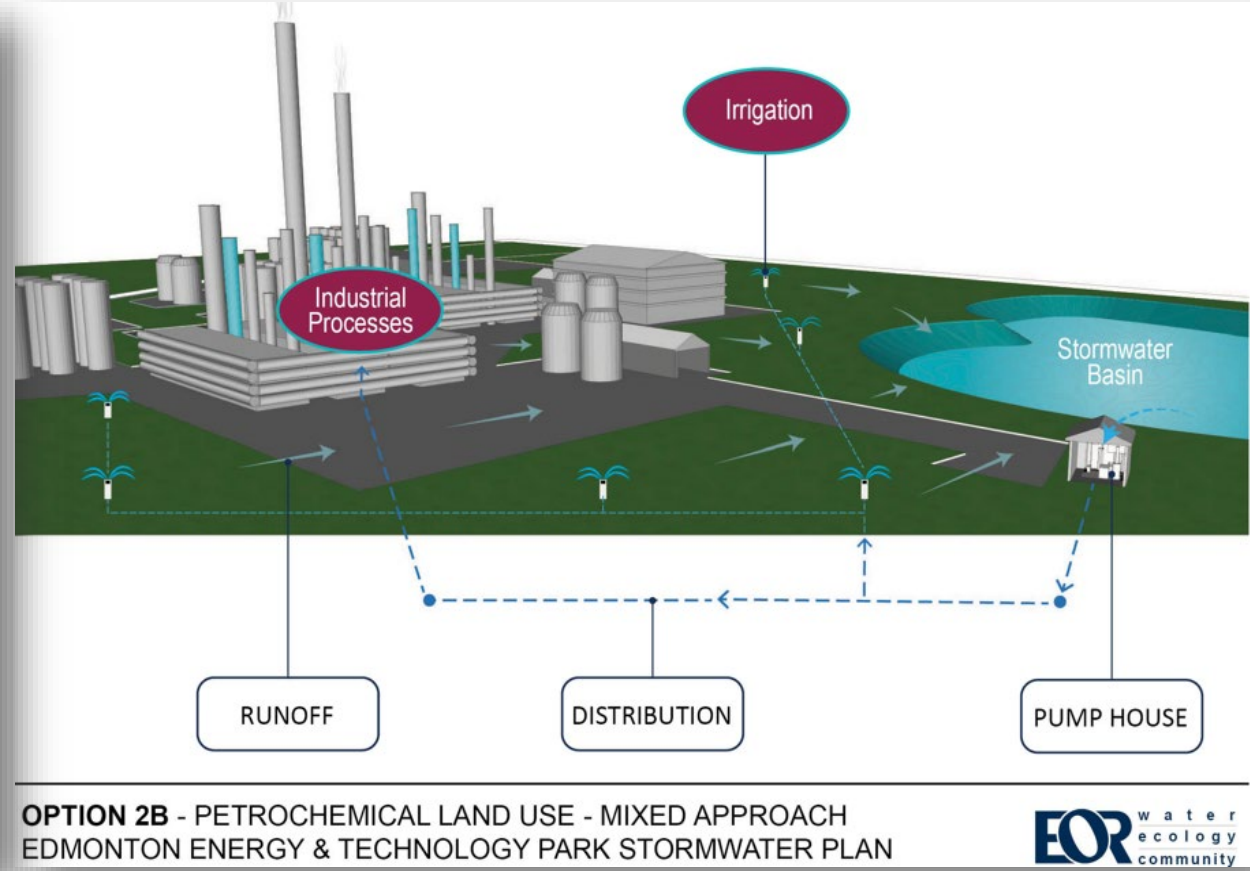




Edmonton EETP Site Characteristics



OPTION 1B - INDUSTRIAL MEDIUM LAND USE - MIXED APPROACH
EDMONTON ENERGY & TECHNOLOGY PARK STORMWATER PLAN



OPTION 2B - PETROCHEMICAL LAND USE - MIXED APPROACH
EDMONTON ENERGY & TECHNOLOGY PARK STORMWATER PLAN

Inver Grove Heights, MN

Zero Stormwater Discharge Community

National & International Design Award Winner

Brett H. Emmons, PE
bemmons@eorinc.com / 651.770.8448

Emmons & Olivier Resources, Inc. (EOR)
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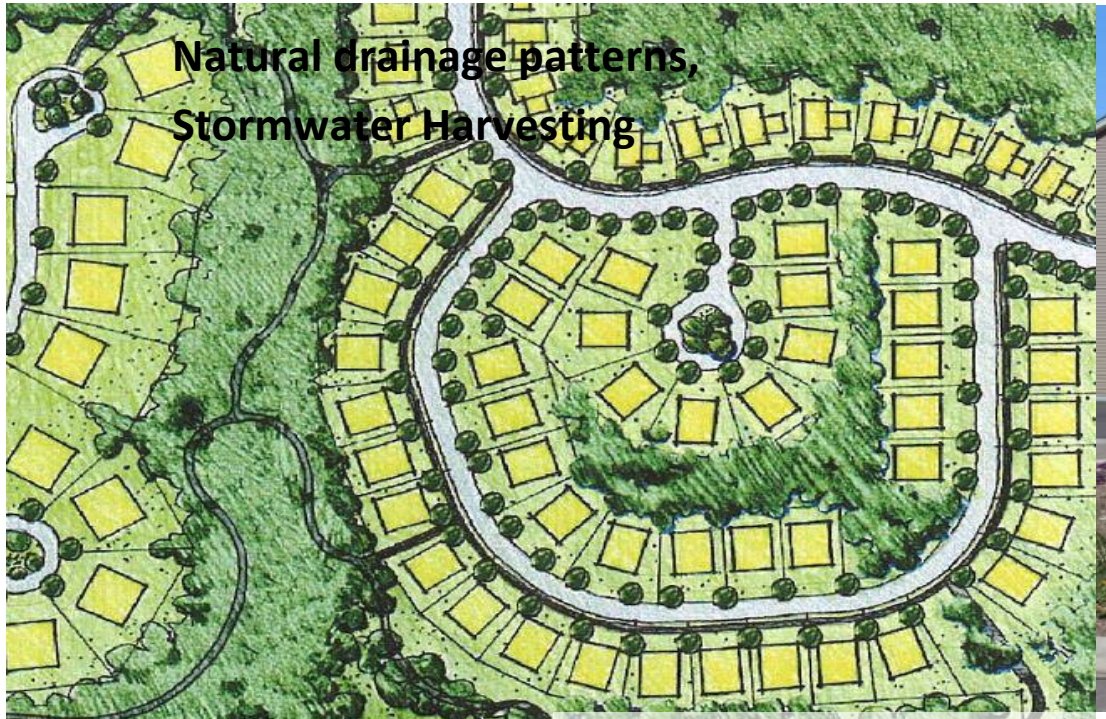
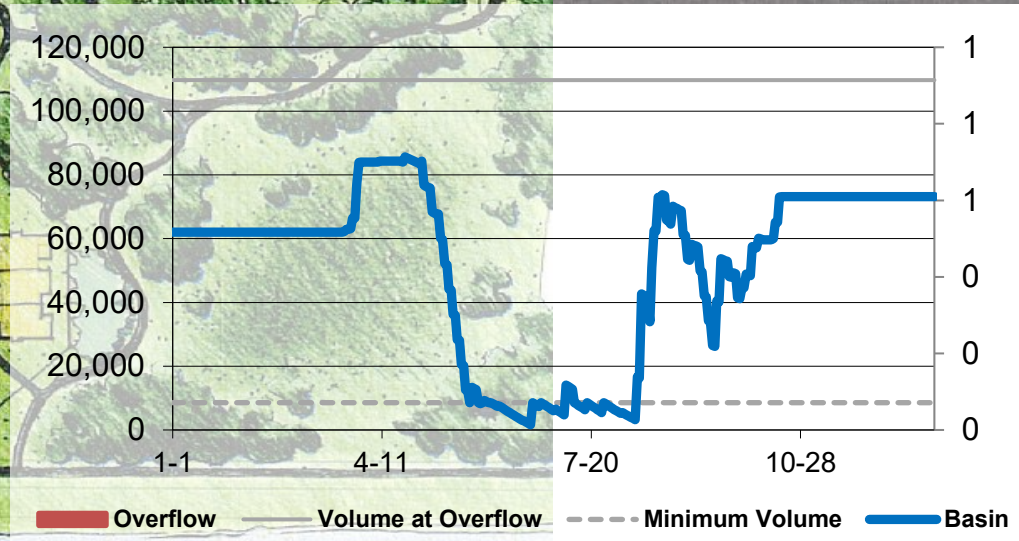
Residential - Argenta Hills Phase 2-9 (Residential)



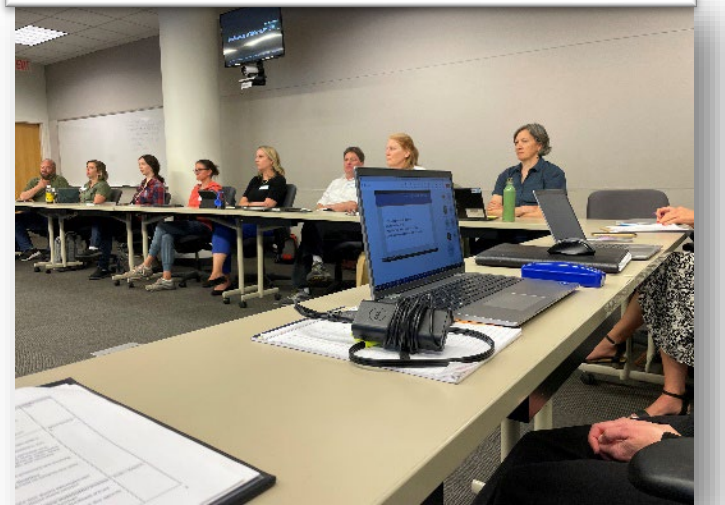


MN Dept of Health – SCU/Reuse Facilitation

Prepared by: EOR

Date: January 30, 2025

Update on Developing a Clear Process for Implementing Stormwater Capture and Use in Minnesota



***2018 Report**: Advancing Safe and Sustainable Watter Reuse in MN*

***2022 Report:** Resuse of Stormwater and Rainwater in MN-A Public Health Perspective*

Objective from MN Legislature:

Create a policy framework for Minnesota's SCU, addressing health risks, treatment guidelines, and strategies for safe, effective stormwater reuse.

RAPID Decision Process and Roles

For defining Agency roles and responsibilities and risk-based management system

Input

Provide **input** to recommendation; their views may or may not be reflected in the final recommendation or decision.

Engagement Core
SCU Community
(Public Meetings)

Recommend

Responsible for driving **decision** process, seeking **input** and developing a robust **recommendation**; 80% of work done here.

Steering Team
Engagement Core

Approve

Ensures **recommendation** is feasible; views must be incorporated.

Interagency Work Group

Decide

Makes the **decision**; ideally a single individual

Interagency Coord. Team
Agency leadership
(Communication)
Or Governor

Perform

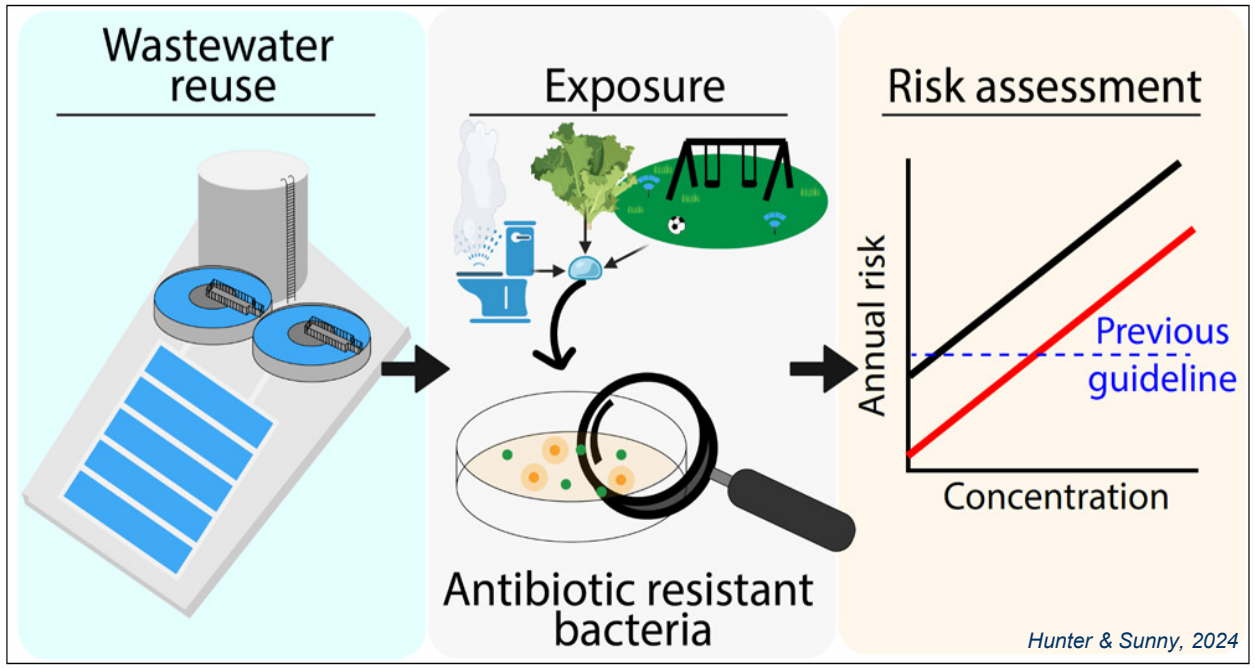
Accountable for **performing or executing** decision

Agencies
SCU Community

MN Dept of Health – SCU/Reuse Facilitation

Perceived Risks Vs Health Concerns

To identify and differentiate between perceived risks and actual health concerns in the context of stormwater reuse.



Key Findings

Actual health risks from ***pathogen***, & ***chemical contaminants*** as secondary (low volume ingested).

- Treatment - *inactivating pathogens* (UV, chlorine, etc.).
- Health Risks – *balancing act of risk and benefit.*

Communication gaps between perceived ***risks*** and ***scientific evidence***, impacting policy acceptance and implementation.

- Local Implementers – *Perceive risk overstated, Low exposure*.
- Regulators/State – *Concerns based on sampling, Cautious approach*

Challenges in Implementing One Water Approach

Institutional Barriers

Siloed departments, regulatory hurdles

Technical Issues

Lack of unified design standards

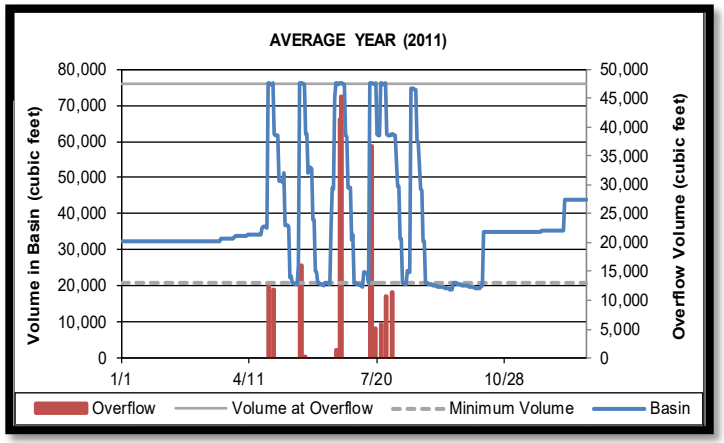
Financial Constraints

High upfront investment

Community Buy-in

Need for education and stakeholder engagement

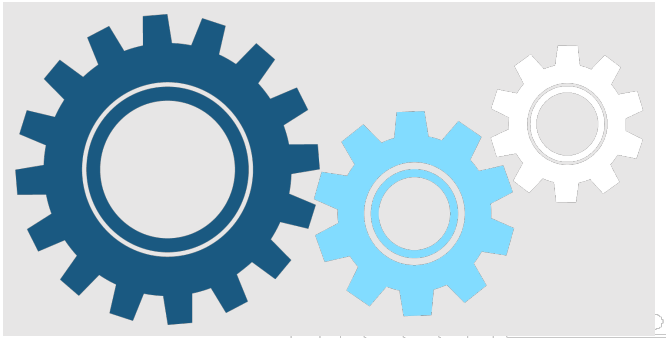
Innovative Solutions & Future Directions



Stormwater Reuse Model (EOR)
Tool for evaluating compliance

Standardized Design & Policy Development

Cross-Sector Collaboration & Partnerships



Pilot Projects to Demonstrate Feasibility

Takeaways and Conclusion

- ✓ ***One Water is a necessary shift for sustainable water management***
- ✓ ***Multiple successful case studies demonstrate feasibility***
- ✓ ***Addressing challenges requires policy innovation, financial investment, and collaborative governance***

What can municipalities do today?

- Invest in pilot projects
- Develop integrated policies
- Engage the public & stakeholders

Future research & funding opportunities

Thank you!

visit us at: www.eorinc.com

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Toronto and Region Conservation Authority

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Credit Valley Conservation inspired by nature

Wilmette/Chicago, IL – Sustainability/Land Use Plan

Opportunity: Large/Single-Use Flood Storage Reservoir – Add WQ Benefits via Reuse

Solution: Utilize Storage for Reuse

Benefits: On Great Lakes, Reduce Beach Closures, Smart Water Uses, Added Resiliency

Extra Slides

The Toronto's Wet Weather Flow Master Plan

Wet Weather Flow Master Plan and green infrastructure to manage stormwater.

Integrating wastewater and stormwater systems to prevent overflows.

Further efforts to promote water reuse.

Improving water quality in local waterways
Restoring natural hydrologic cycles,
Enhancing natural areas and wildlife
Improving the sewer system

Enwave's Toronto deep lake water cooling (DLWC) system

Integrated Water-Energy Use: DLWC harnesses lake water for cooling, reducing energy demand - One Water sustainability.

Sustainable Expansion: The intake lowering emissions & enhancing water-energy integration.

Efficiency & Resilience: DLWC reduces peak electricity use by 80%.

Holistic Development: Integrates district energy, geo-exchange, & waste heat recovery –

One Water principles: Water-Energy nexus that links water use and energy consumption interdependently

Dale Hodges Park, Calgary

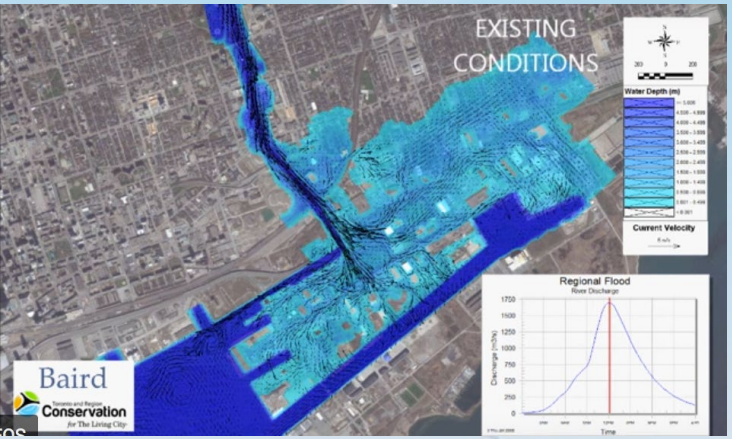
Integrated Stormwater Management: Incorporates naturalized SW treatment before discharge into the Bow River.

Ecological Restoration: Transforming a former gravel pit to restores native habitats and promotes biodiversity.

Public Engagement and Education: The visible SW treatment system serves as an educational tool - fostering public awareness on water cycles.

Collaborative Design Approach: Including landscape architects, engineers, and artists to create a functional and aesthetic public space.

Port Lands Flood Protection and Enabling Infrastructure, Toronto

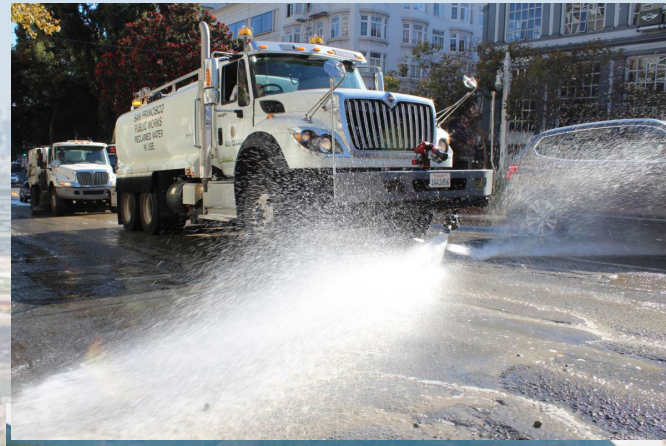


Comprehensive Flood Protection: Developed a new river valley and naturalized Don River mouth to mitigate flood risks.

Ecological Restoration: Transformed industrial lands into 25 hectares of green space, including wetlands and habitats.

Infrastructure Enhancement: Constructed new bridges, roads, and municipal services to support sustainable urban development.

Collaborative Urban Renewal: Unified efforts of multiple government levels and agencies to revitalize Toronto's waterfront.



City of Vancouver's One Water Approach

Green rainwater infrastructure

Restoring streams

Healthy Waters Plan

Separating sewage from rainwater

Apr 2021 to Dec 2022	**Phase 1: Strategic Framework and Current State Assessment**
Feb 2023	**Phase 1 approved by City Council**
Jan 2023 to Dec 2024	**Phase 2: Developing the Healthy Waters Plan**
Feb 2025	**Phase 2: Key directions presented to Council**
	WE ARE HERE
Feb 2025 to Mar 2026	**Phase 3: Developing the Healthy Waters Implementation Plan**

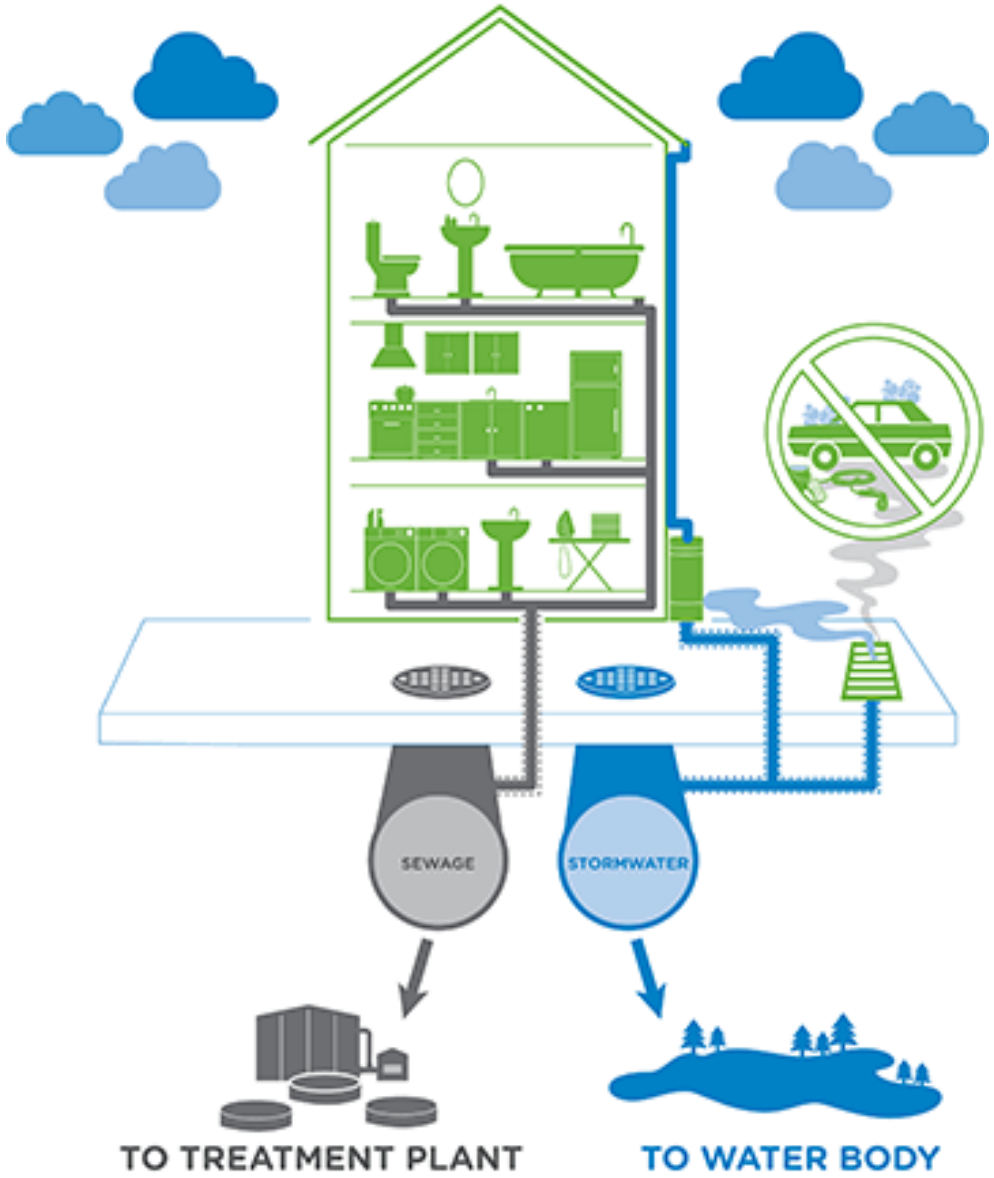
*The **Healthy Waters Plan*** prioritizes sewage, and drainage while aligning with regional investments.

has the potential to **eliminate an equivalent amount of fecal coliforms** (the primary public health performance measure) as separating the entire sewer network by 2050

will **reduce the impacts of urban rainwater runoff pollution by integrating investments** in sewer separation with GRI and stormwater treatment

will **deliver on a broader range of objectives** including flood protection, healthier watersheds, reducing urban heat, improving biodiversity and livability

City of Vancouver's One Water Approach



Separating sewage from rainwater

Problem: Some partially combined sewer systems cause inefficiencies and environmental impacts.

Objective: Achieve a fully separated sewer system, including both private and regional infrastructure.

Solution: Prioritize sewer separation by pipe conditions, failure risks, and redevelopment.

MN Dept or Health – SCU/Reuse Facilitation

Key Findings

- Actual health risks - pathogen presence and chemical (low volume ingested).
  - Treatment - inactivating pathogens (UV, chlorine, etc.).
  - Health Risks – is a balancing act of risk and benefit.
- Communication gaps between perceived risks vs scientific evidence, impacting policy acceptance and implementation.
  - Local Implementers – Perceive risk overstated, Low exposure.
  - Regulators/State – Concerns based on sampling, Cautious approach

Proposed Solutions:

- Standardized treatment protocols, monitoring to address actual health risks effectively.
- Enhance stakeholder engagement through transparent communication and inclusive decision-making processes to build trust.
  - Fit for Purpose – Map out source and end-use match ups
  - Limit Exposure – Applications (e.g. irrigation) in off-hours, low access
    - Start with Irrigation
    - Later Water play features, wash water, grey water, etc.