

## ENVIRONMENTALLY SUSTAINABLE PREVENTION OF URBAN FLOODING

The Applicant to this Intervenor Submission to the City of Edmonton, Water Utility Regulator for the citizens of Edmonton, will present recommendations intended for the implementation into the Epcor Water Rate Application (2022-2026), to help prevent residential flooding in mature neighborhoods. These recommendations compliment the City's sustainable development plans moving forward.

*Below is an excerpt from the Alberta Urban Municipalities Association website.*

### Stormwater

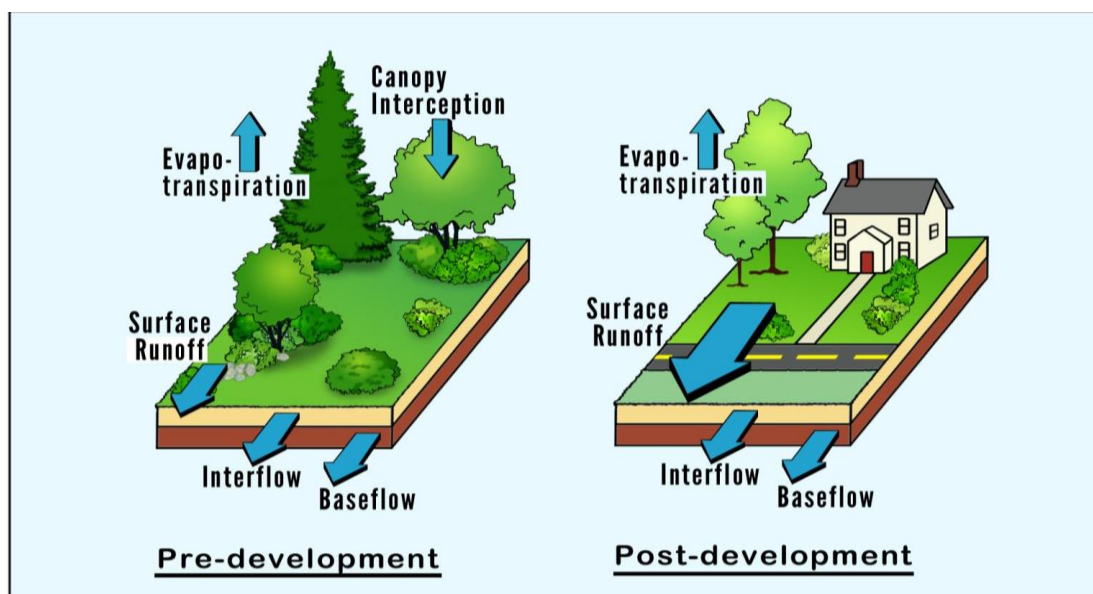
Stormwater is any water that flows over land and impervious surfaces during rainfall and snowmelt events. In natural environments, stormwater is filtered by vegetation and "infiltrates", or seeps into the ground. These processes slow runoff rates and remove pollutants before stormwater returns to surface and groundwater sources.

As natural areas become urbanized, changes in landscape properties and land development contribute to increased runoff rates, larger stormwater volumes, and the accumulation of pollutants and sediments. This is largely because impervious surfaces such as parking areas and roads prevent the water from infiltrating the ground. As this runoff flows across the land, water quality deteriorates as sediment, heavy metals, hydrocarbons, pesticides, and other pollutants accumulate.

Increased runoff rates and pollutants in stormwater can also increase the risk of flooding, damage property and infrastructure, increase the frequency of sewer overflow events, degrade water quality, reduce available groundwater, compromise the health of aquatic habitats, decrease biodiversity, increase erosion and sedimentation rates, and disrupt water flow patterns.

*The illustration below is courtesy of the Department of Environmental Protection Montgomery County – Maryland.*

### ***Increased stormwater runoff due to development.***



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Below is an excerpt from a past Epcor Water Rate Application for Stormwater Charges.

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**Rate Sheet 1**
**Stormwater Utility Charges**

**January 1, 2020 to December 31, 2020**

**Applicable** To all domestic service customers within the city of Edmonton.

Stormwater utility charges are levied on each premises and calculated based on a monthly rate using the following formula:

$$\text{stormwater utility charge} = A \times I \times R \times \text{rate}$$

Where:

**A is:** the area of premises (m<sup>2</sup>), and  
the proportion of building lot area attributable to each unit for multiple units sharing a single building or property

**I is** the development intensity factor of 1.0, except for properties where owners have demonstrated that they contribute significantly less stormwater per m<sup>2</sup> to the City's sewerage system during rainfalls than other similarly zoned properties by making an application for a reduction in the intensity development factor pursuant to this bylaw.

**R is** the runoff coefficient based on the zoning of the premises:

R	Zoning
0.20	A, AG, RR
0.30	AP, US (schools)
0.50	RF1, RF2, RF3, RF4, RMH, IH, MA, AGU
0.65	RSL, RF5, RF6, RA7, RPL
0.75	RA8, US (except schools), PU
0.90	RA9, RMX, CNC, CSC, CB1, CHY, CO, IB, IM, AGI, DC
0.95	CB2, CMX

**rate is:** \$ 0.046490

**The Stormwater Utility Charge = A x I x R x rate**

The runoff coefficient "R", the permeability of a residential lot's surface (i.e., grass versus concrete and building surface area) uses a coefficient of 0.50, for all properties zoned as RF1. The RF1, zoning includes all single detached residential property including infill development.

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The Applicant for this Submission learned that the Intensity factor, I, is 1.0 for RF1, residential customers. Unfortunately, RF1 customers are not eligible to apply to have this number lowered even if they are able to demonstrate that they contribute less stormwater runoff.

It is the understanding of the Applicant that the revenue collected from this Stormwater charge is used to replace and upgrade existing stormwater infrastructure. Typically, when an asset (in this case stormwater infrastructure) is installed, and then amortized over a period that would take into consideration the necessary volume capacity based on forecasted data as well as the useful life of the asset. A Utility would then charge its customers a rate that would allow them to recover the costs to replace and upgrade the asset based on the forecasted timeframe. However, with the introduction of infill properties to mature neighborhoods, the capacity of the stormwater infrastructure is inadequate and therefore will need to be replaced, and upgraded, sooner than expected.

Infill properties within a mature neighborhood increase the amount of runoff to the existing storm drains, especially since stormwater ponds do not exist in most older neighborhoods.

Climate change has caused extreme weather events all over the world. Several weather publications strongly suggest that the 1/100-year storms are now occurring more frequently.

The exact storm runoff ratio has several varying factors to calculate. A conservative estimate of runoff volume that is commonly used correlates to a 1 to 1 ratio, or simply speaking for every 1% increase in surface area there is a 1% increase in runoff volume.

Infill residential homes and garages are larger in size with less permeable ground creating more surface area runoff compared to the previous homes and garages with the existing stormwater infrastructure.

*For example, if we just examine the difference with the following homes.*

<b>Old home 1,000 sqft.</b>	<b>Estimated runoff for 1 inch of rain</b>	<b>= 625 gallons</b>
<b>New home 1,280 sqft. (infill property)</b>	<b>Estimated runoff for 1 inch of rain</b>	<b>= 800 gallons</b>

The difference is approximately 175 gallons or 28% more runoff to the existing stormwater drains.

Based on this conservative estimate, the “R” coefficient should be at least 0.65 for infill properties. This promotes a fairer and more equitable stormwater charge to RF1 customers.

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A sample calculation for an increase in R value from 0.50 to 0.65 for infill properties is provided below.

Epcor Water Storm Water Utility Charge					
	A (m2)	I	R	Rate (\$/m2)	Charge
<i>Current R</i>	700.264	1.0	0.50	0.04649	\$ 16.28
<i>Proposed R</i>	700.264	1.0	0.65	0.04649	\$ 21.16
Diff./month					\$ 4.88

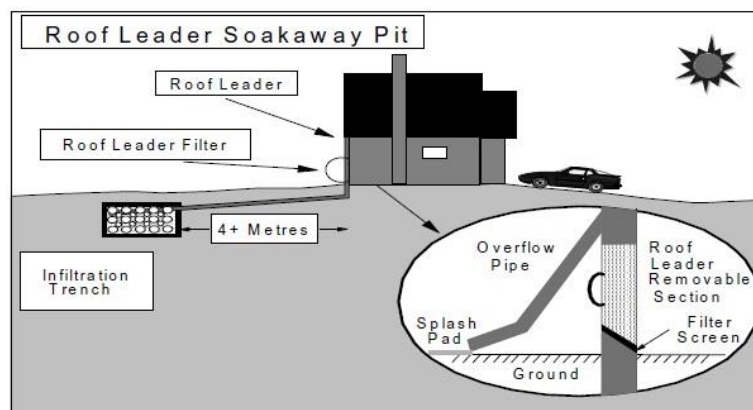
The difference of \$4.88 per month or \$58.56 per year is based on a 700 square meter lot.

The additional revenue collected by Epcor Water, from this recommended change in R value, will provide more of the necessary costs to replace and upgrade the existing stormwater infrastructure and reflects a fairer charge to all RF1 customers. This proposed R value should be introduced and applied to all infill properties reflecting the proposed rates for 2022.

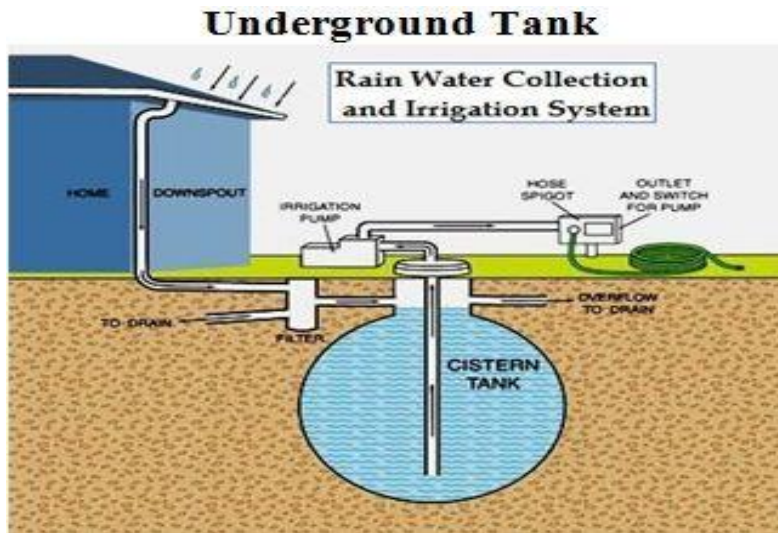
### Reverse Yard Sump (Soakaway Pit)

Another option that some Municipal jurisdictions include with their redevelopment requirements involves having all additional runoff go into a reverse yard sump within the property being redeveloped. In other words, if you refer to the 1:1 ratio comparison mentioned earlier, the additional runoff volume would be expelled into a reverse yard sump instead of flowing into the existing stormwater drains.

This option could be considered as part of the City of Edmonton redevelopment requirements for infill developments which in turn would assist Epcor Water with managing stormwater infrastructure replacement and upgrade. This also promotes water conservation, as the runoff can be utilized for irrigation or other household purposes.



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### Stormwater Maintenance

A recent webinar by Pasquale Napolitano, the Stormwater Maintenance Specialist at Hydro International, presented interesting information on stormwater maintenance. Two topics that are relevant to this submission include the cleaning costs of storm drains and the possible installation of catch basin screens. Construction projects are usually the biggest contributor of debris in catch basins. This includes dirt, mud, paper cups, water bottles, polystyrene foam pellets, and other building materials. An environmental levy could be charged to all construction projects to help offset the cost of stormwater maintenance. The other suggestion would be to implement catch basin screens to help prevent catch basin overflow.

*The following pictures are courtesy of the above-mentioned webinar.*



**Debris found in Stormwater pipes.**

- Screened Separators



*Screens for catch basins.*

## Lot Grading

Although lot grading is under the City of Edmonton for redevelopment requirements, the Applicant found that it is essential that all infill properties have approved lot grading to mitigate overland flooding.

*The following except is from the City of Edmonton Website for “Lot grading”.*

Infill development often presents unique challenges when building in a mature neighbourhood.

When applying for an infill development permit you must include a proposed lot grading plan if an approved lot grading plan does not already exist.

Lot grading plans must be approved by the City before starting construction of any buildings, additions to buildings, or alterations of surface drainage. See sections 4(1) of [Drainage Bylaw 18903](#), and 14.10 of [Zoning Bylaw 12800](#).

When formulating your lot grading design plans, working with adjoining property owners could minimize costs associated with stormwater control. *Create a lot grading plan that defines how your lot will convey surface runoff to a City right-of-way without flowing into adjacent private properties.*

Research for this Submission, uncovered that two redeveloped properties on the same street (built in 2014 and 2015), had not yet received lot grading approval. That represents about 20% of the infill properties on that street. This could suggest an disappointing trend with potential flooding issues for mature neighborhoods in Edmonton.

Drainage services, lot grading, property redevelopment and roadways need to have a working collaboration to mitigate overland flooding in Edmonton’s mature neighborhoods. This collaboration would be another tool to mitigate residential flooding and assist Epcor Water with their Capital Planning of Stormwater Infrastructure in mature neighborhoods. This

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collaboration would also help City of Edmonton citizens when they call to report issues such as, overland flooding, catch basins overflowing, water pooling at the end of driveways, etc. rather than be referred between the various departments.

Further research determined that the Bylaw Penalty for not complying with lot grading requirements is \$1,000. For an infill property valued at \$1,000,000, that represents a fee rather than a fine. The penalty could be a percentage of the assessed value of the new infill property. As an example, a 1% penalty on a home assessed at \$1,000,000 would be \$10,000. This change could provide the necessary tool to assist lot grading inspectors to ensure timely compliance.

*Another excerpt from the City of Edmonton Website for “Lot Grading”*

**Note:** When purchasing a home, you should check that the lot grading meets approval. City of Edmonton Development Services will only release this information upon receiving a written request from a law or realty firm. This information is collected under the [Freedom of Information and Protection of Privacy Act \(FOIP\)](#), and used only to maintain business practices for lot grading purposes.

Although the City of Edmonton appears to be willing to provide information regarding grading approval to potential homebuyers of infill property, it should be more transparent and allow the release of that information to adjacent homeowners and community members that could be negatively impacted by the infill property in question.

Citizens want and need to trust that all the City of Edmonton lot grading requirements for infill development are being followed and enforced in a timely fashion.

**Note:** Responses to FOIP requests could take months, this hinders liability claims and property repairs.

### Recommendations

Revise the “R” (runoff) coefficient for infill properties used in the formula “stormwater utility charge = A x I x R x rate” should be R = 0.65.

Consider a Reverse Yard Sump (Soakaway pit) as a City of Edmonton redevelopment requirement for new infill developments to assist with managing stormwater infrastructure replacements and upgrades.

Introduce an environmental levy for all construction projects to help offset the cost of stormwater maintenance. Implement catch basin screens, where possible, to help prevent catch basin overflow.

Ensure that all infill properties have approved lot grading to prevent overland flooding. Ensure that infill developers create a lot grading plan that defines how the lot will convey surface runoff to a City right-of-way without flowing into adjacent private properties, that they build according to the plan, and that they complete the lot grading in a timely manner.

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Revise the penalty for non-compliance with lot grading rules to 1% of the assessed value of the property. A 1% penalty on a home assessed at \$1,000,000 would be \$10,000. This change could provide the necessary tool to assist lot grading inspectors to ensure timely compliance.

Ensure that drainage services, lot grading, property redevelopment and roadways have an effective working collaboration to mitigate overland flooding in Edmonton' mature neighborhoods.

Allow the release of lot grading approval status and related information to the surrounding homeowners and the community members that could be negatively impacted by the infill property in question.

These recommendations should be implemented for the proposed test years (2022 – 2026) respectively.

The contents of this Submission were compiled through research, consultation with several Civil and environmental engineers, concerned citizens and the Insurance Bureau of Canada.