

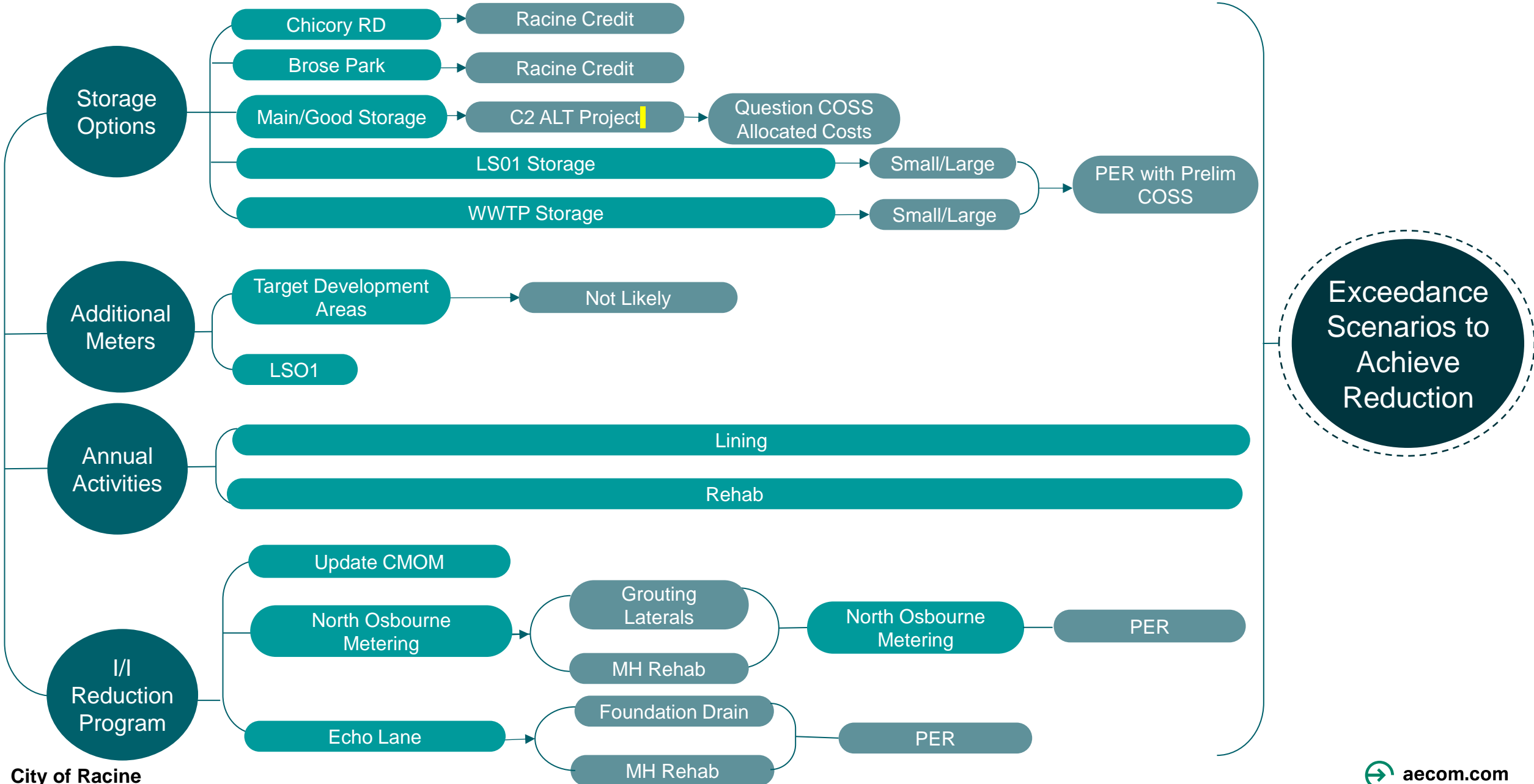
Proposed Peak Flow Mitigation Plan

An Update on Progress by the City of Racine
(Sewer Service Recipient)

October 2022



Prior Menu of Options



Actions towards Compliance to Date

Main and Goold Area Storage Evaluation

PER Cost Benefit Table for Alternative T1

Alternative	Tunnel Diameter (inches)	Cost	Peak Flow Reduction (MGD)	\$/MGD Reduced
T2	104	\$46,957,700	15.1	\$3,354,000
T1	126	\$52,810,700	20.5	\$2,576,000
T1b	144	\$65,074,900	21	\$3,099,000
T1c	180	\$85,247,200	22	\$3,875,000

**Bold text indicates the option with the lowest unit cost (most benefit for the dollars spent)*

Source: Brown and Caldwell PER

Actions towards Compliance to Date

Main and Goold Area Storage Evaluation

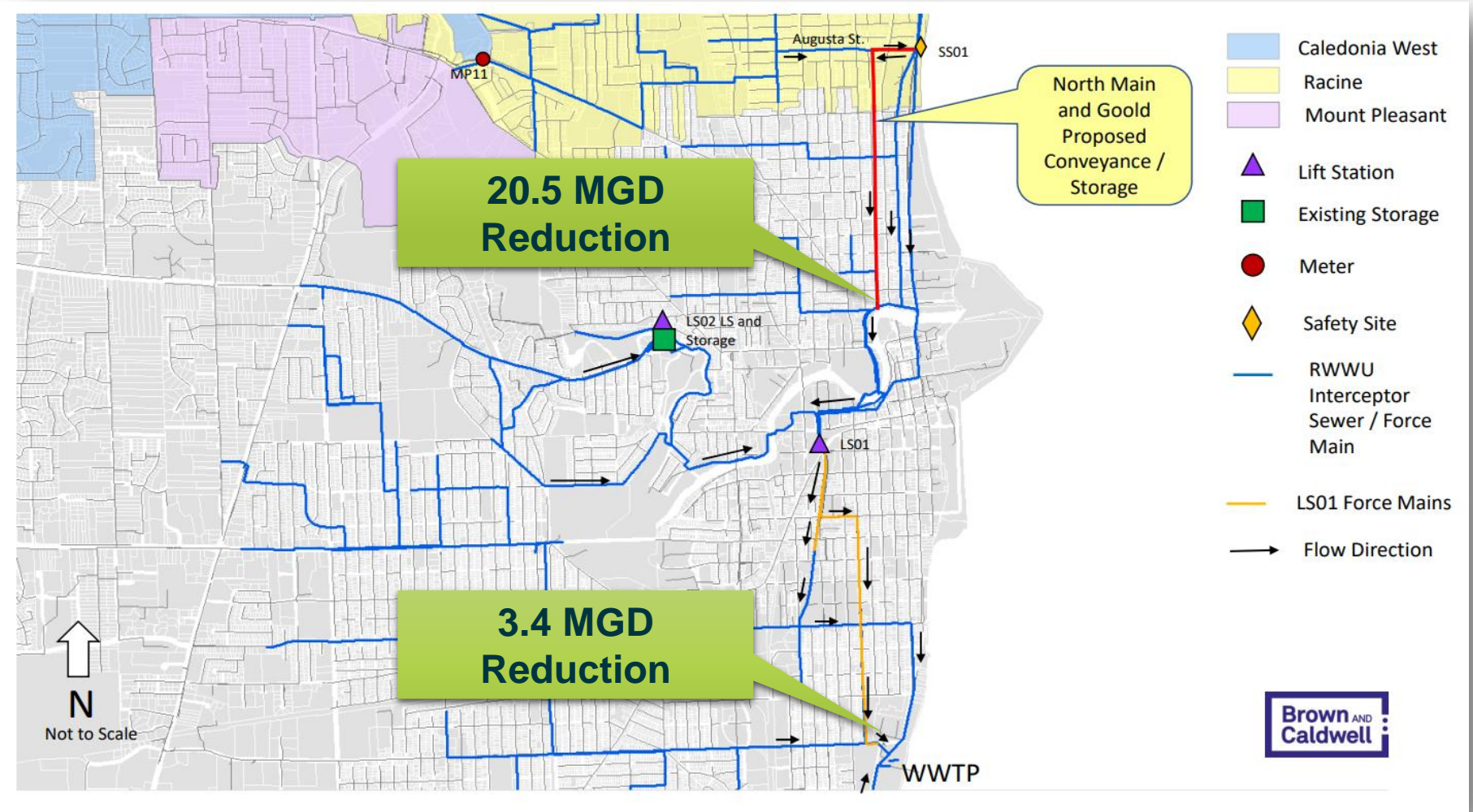
Racine Share	\$44,811,247	84.9%
Mount Pleasant Share	\$7,999,453	15.1%
Caledonia Share	\$0	0%
		Total Cost \$52,810,700

Source: Ruekert & Mielke Cost of Service Study, July 13 Revision

Actions towards Compliance to Date

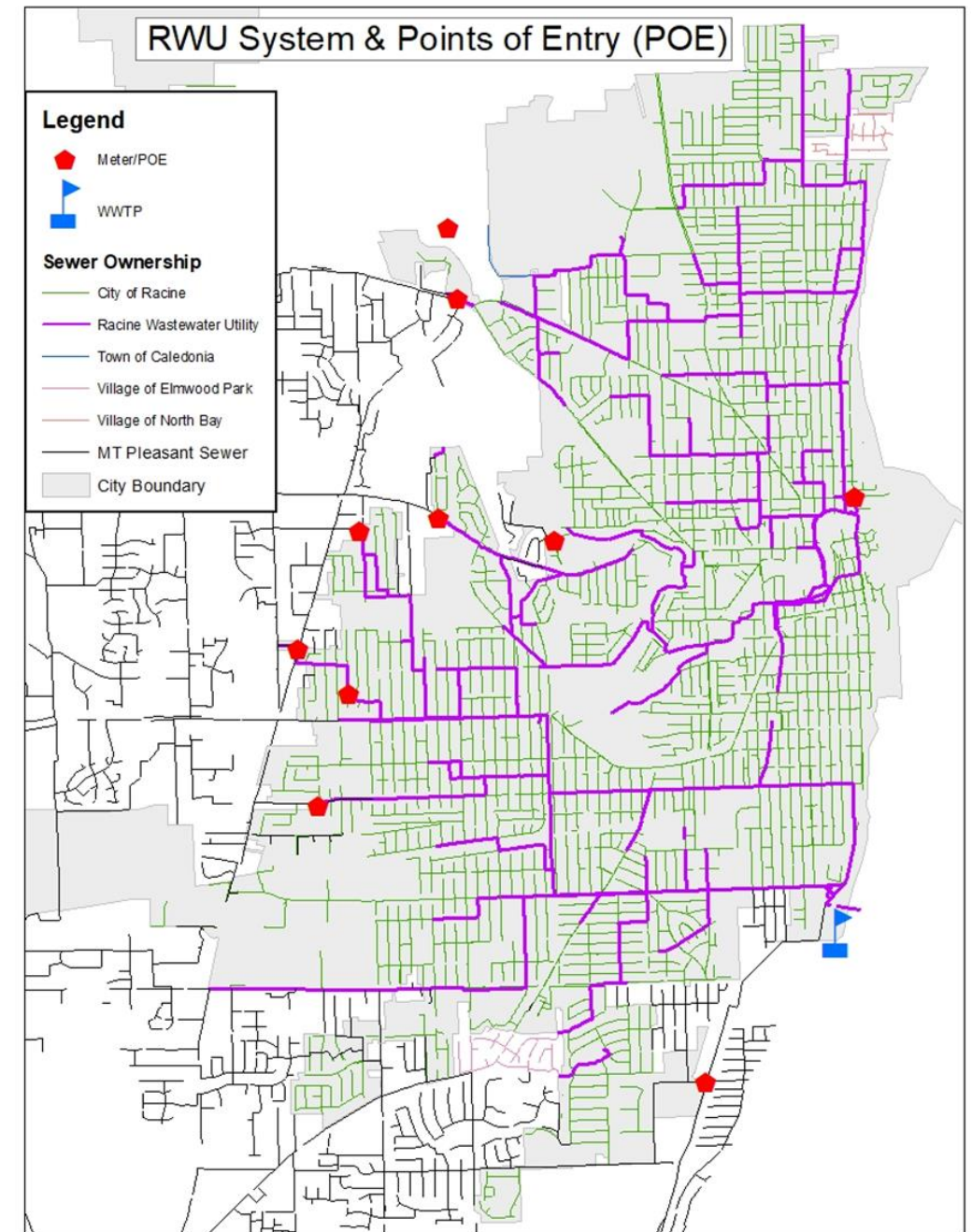
Main and Goold Area Storage Evaluation

Through the process of the COSS the **20.5 MGD** of reduction from Alt T1 was lowered to **3.4 MGD** at the plant for the City.



Is all peak flow coming from the City of Racine?

- The current methodology of subtraction of other SSR parties' meters at RWTP seems to be flawed.
- The City's infrastructure is intertwined with the RWWU infrastructure.
- 651 sanitary sewers connected to RWU infrastructure...all unmetered.
- COSS clearly does not favor or reward the City of Racine for storage options.



Peak Flow Mitigation Approach

- Approve methodology to achieve peak flow reduction credit.
- Evaluate the Exceedance Reduction Activities identified to determine the level of peak flow reduction provided per the cost of activity. This will be done by:
 - Using widely accepted engineering values for peak flow reduction for the I/I reduction activities
 - Demonstrate peak flow reduction credits.

Proposed Peak Flow Mitigation Plan

- Obtain credit for Brose Park and Chicory Road
- I/I Reduction Activities
 - Current Annual Activities
 - Foundation Drain Disconnection/Sump-pump Installations
 - Manhole Lid Replacement/Sealing
 - Lateral Grouting

I/I Peak Flow Reductions Values



Annual Activities

Evaluate the peak flow reduction credits for the annual activities.

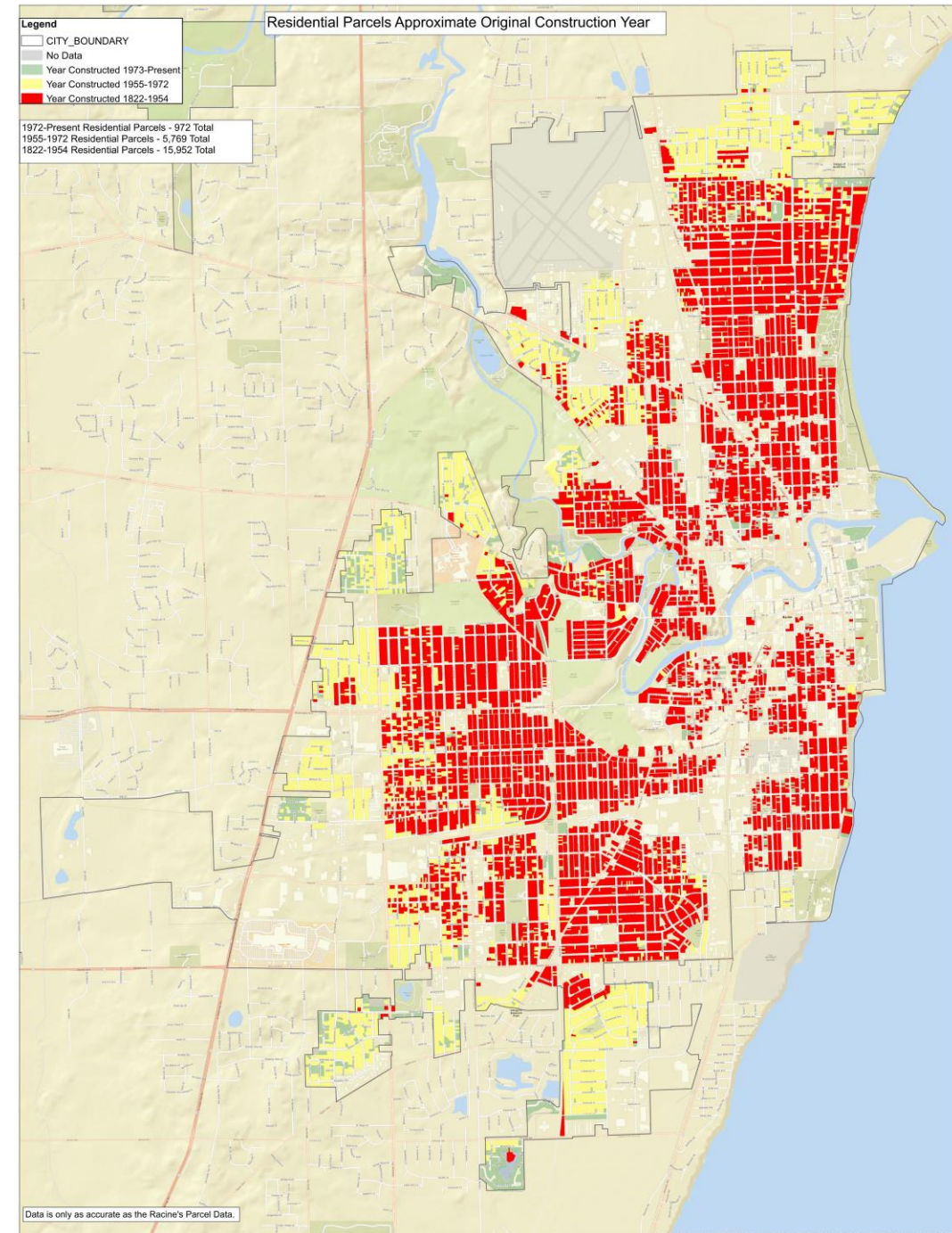
- Mainline and Lateral Replacement
- Mainline and Lateral Lining
- Manhole Replacement with Street Projects



Foundation Drain Disconnection

Evaluate the peak flow reduction credits for a foundation drain disconnect program.

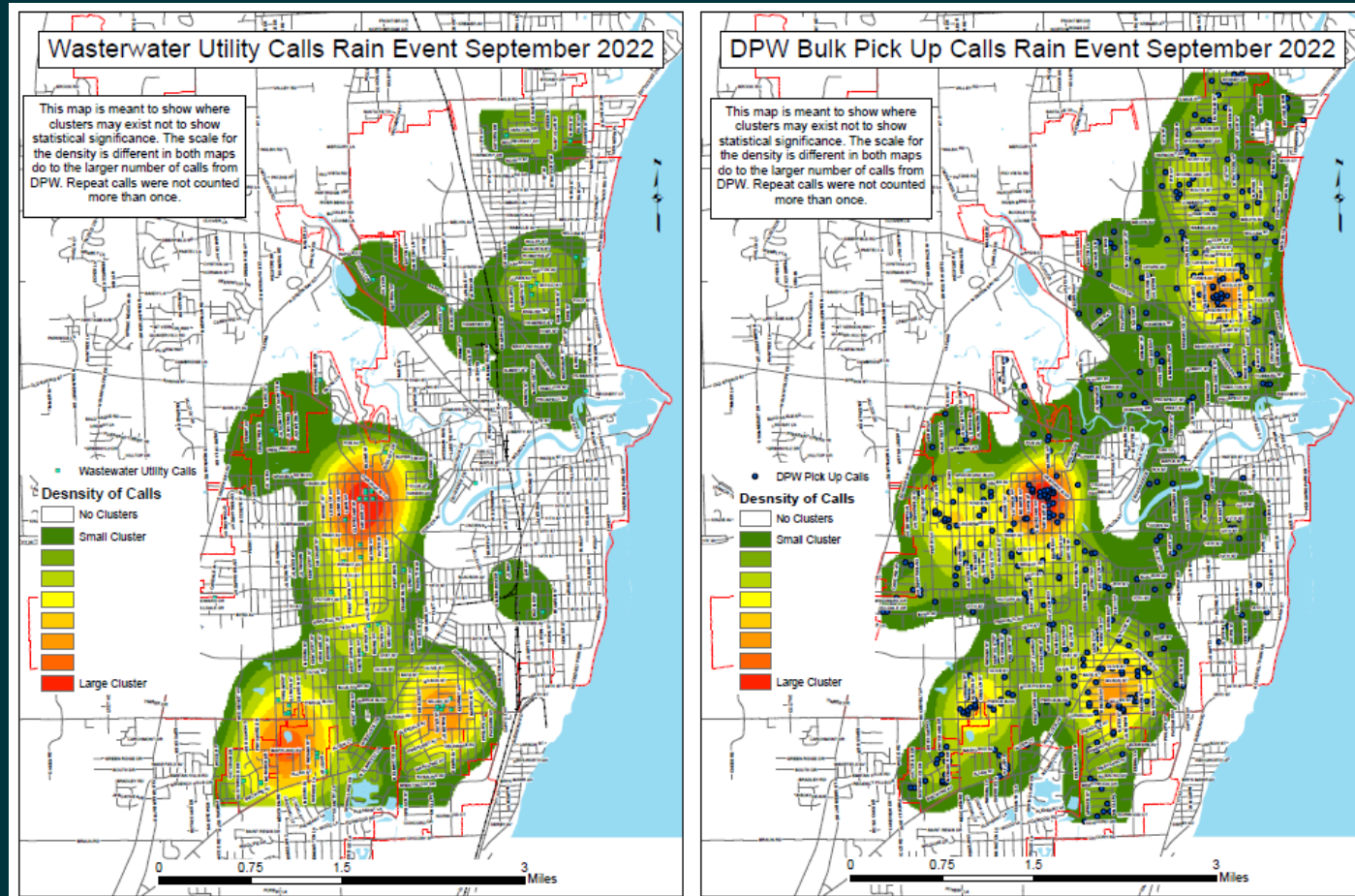
- About 70% of the residential properties in Racine were built prior to 1954. (15,952 homes)
- Most likely have foundation drains directly connected to the sanitary sewer system.
- Disconnecting foundation drains is a very effective strategy for reducing inflow.



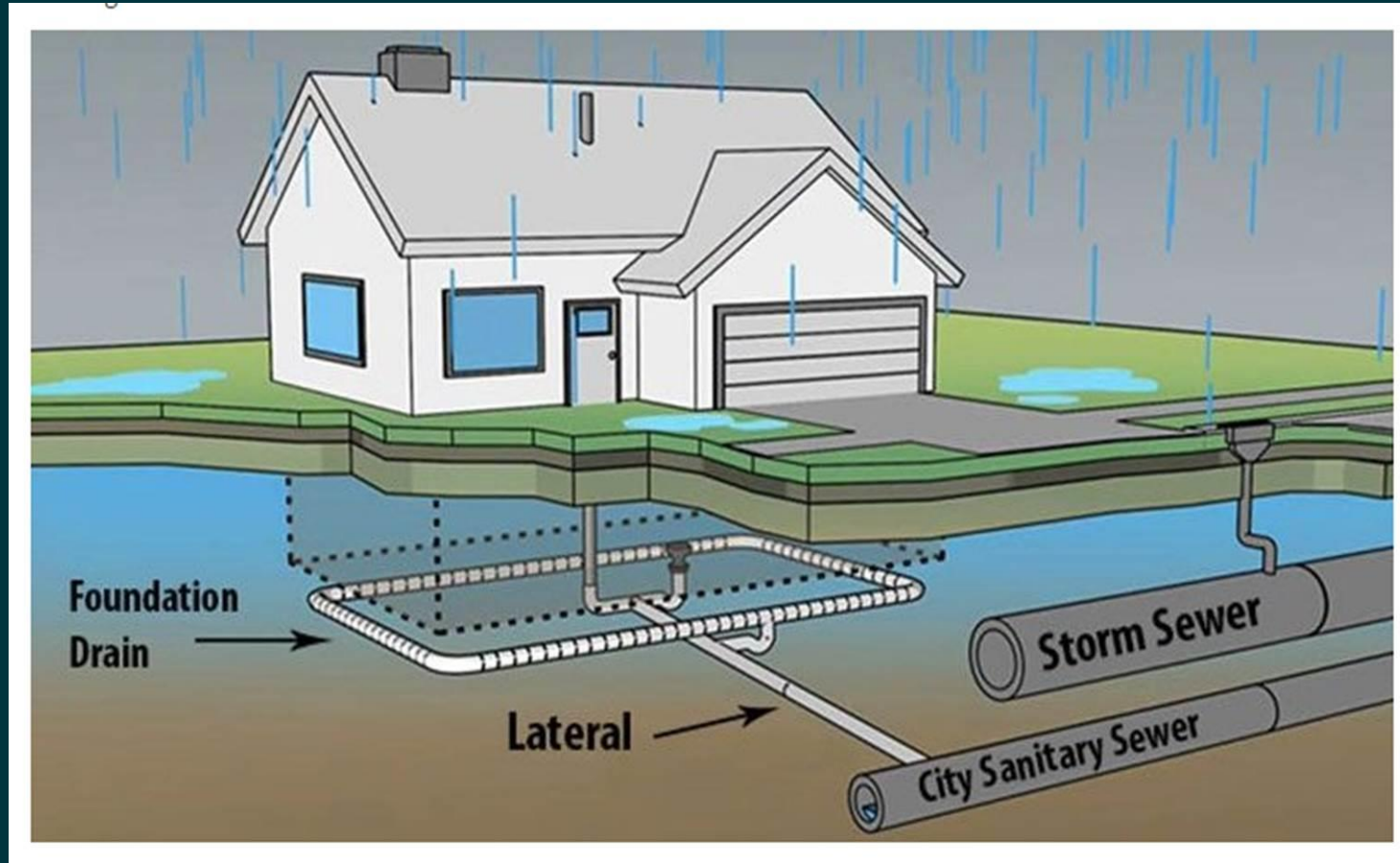
Foundation Drain Disconnection

Evaluate targeted areas that not only reduce peak flow I/I, but also:

- Areas that have historic basement backups and flood damaged property
- Improvements to storm sewer system to capture additional surface runoff from sump-pump discharges



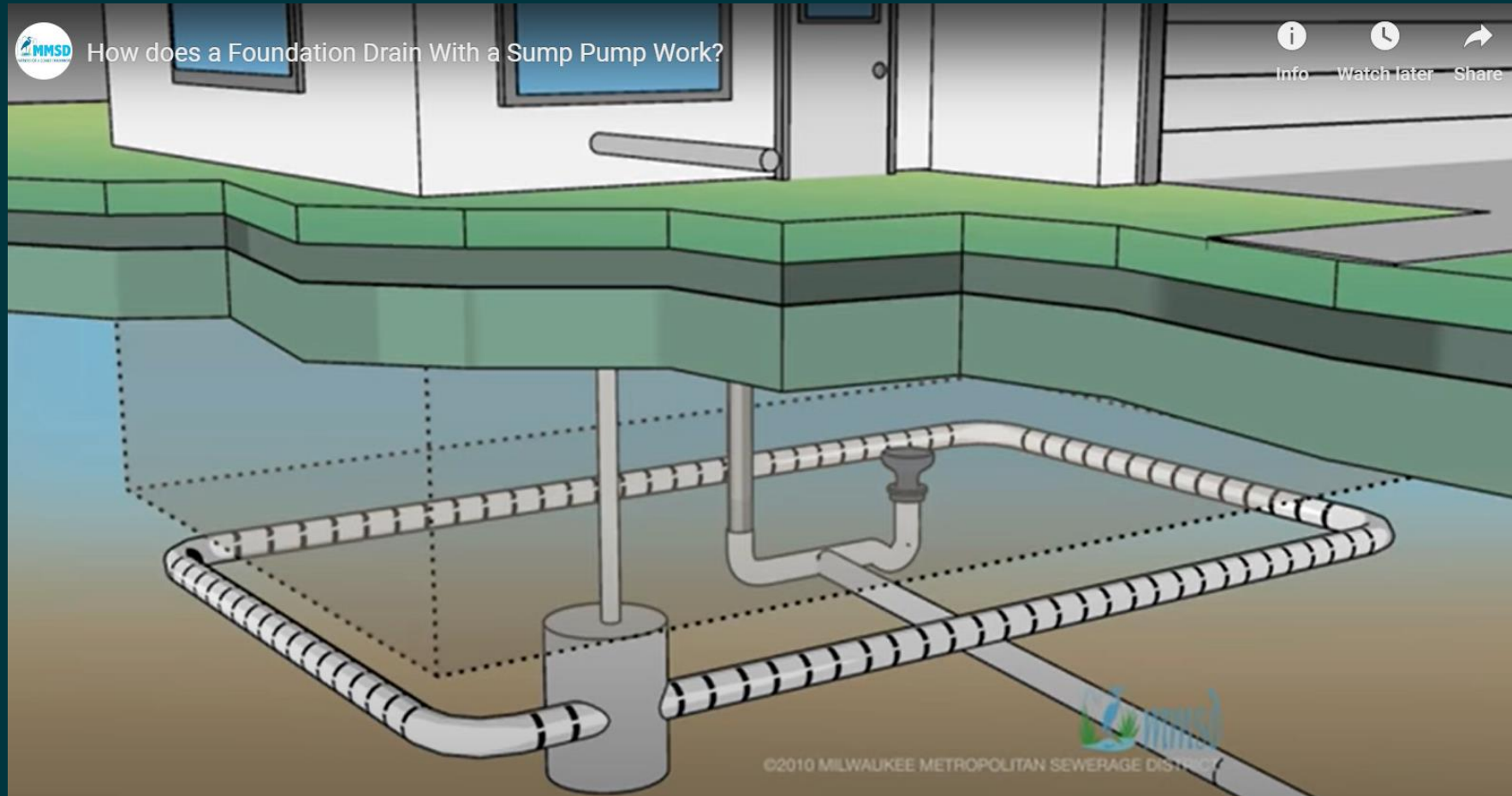
Foundation Drain Disconnection



Foundation Drain that is Connected

Source: [How to Manage Flooding and Water in Your Basement and On Your Property | MMSD](#)

Foundation Drain Disconnection



Disconnected Foundation Drain

Source: <https://youtu.be/YfuGZ1t2GXA>

Foundation Drain Disconnection

Peak Flow Reduction Range

Peak Foundation Drain Reduction (gpm)	Numbers of Homes ¹	Peak Flow Reduction
10.6 (min)	2,390	36.5 MGD
15 (max)	1,690	36.5 MGD

Notes:

¹ Number of homes is dependent on the home footprint, soil type, and specific site conditions.

Manhole Lid Replacement/Sealing

Evaluate the peak flow reduction credits for the Manhole Lid Replacement/Sealing.

- Up to 43% of the sanitary sewer manholes have pick holes and/or vents.
- Preliminary numbers were found using widely accepted engineering values.
- Potential peak flow reduction is between 1.5 – 26.6 MGD reduction if replaced and/or sealed.
- Field verification would have to be performed to:
 - Determine the number of manhole covers that are in ponding conditions, verses in high spots before knowing the actual peak flow reduction provided.
 - To confirm actual number of manhole lids with holes. Numbers are based on prior inspection data.
 - Finishing Osborne Area Pilot Study to refine values.



Manhole Lid Replacement/Sealing – Estimated Range

All Manholes – Not dependent on Location

Total Number of Manholes with Holes	Type of Hole	Total Number of Hole Type	Peak Flow Reduction Estimate (gpm)	Peak Flow Reduction
1,923	Pick Holes	2,010	7.5	21.7 MGD
	Vent Holes	2,839	1.2	4.9 MGD
Total				26.6 MGD

Manholes Coded as “Depressed”, or in ponding condition (GIS & field analysis will verify).

Total Number of Manholes with Holes	Type of Hole	Total Number of Hole Type	Peak Flow Reduction Estimate (gpm)	Peak Flow Reduction
105	Pick Holes	108	7.5	1.2 MGD
	Vent Holes	199	1.2	0.3 MGD
Total				1.5 MGD

Lateral Grouting

Evaluate the peak flow reduction credits for the lateral grouting.

- Private Property laterals are a significant source of I&I.
- 29,434 – Laterals that are not stubs (excluding abandoned and known lined laterals)
- Potential peak flow reduction is between 2.4 – 8.8 MGD
 - Preliminary numbers were found using widely accepted engineering values. However, these are highly dependent on site specific value dependent on the laterals condition.
 - Need to finish Echo Lane and North Osbourne Area Pilot Studies to validate proper value to use for the City.

Total Number of Laterals	Lateral Grouting Length (ft)	Peak Flow Reduction (gpd/ft)	Peak Flow Reduction
29,434	15	5.5	2.4 MGD
		20.0	8.8 MGD

Notes:

- 1 In Vitrified Sewer Mains it would be ideal to grout or line sewer mains as well.
- 2 Values are highly dependent on site specific value which is dependent on the lateral condition. Will need to use Echo Lane and North Osbourne Area Pilot Studies to refine the values.

Bringing it Together



Proposed Peak Flow Reduction Credits – Credits from Existing Activities

Program	Peak Flow Reduction
Brose Park	6.88 MGD ²
Chicory Road	1.97 MGD ²
2020 Annual Activities	0.16 MGD ¹
2021 Annual Activities	0.17 MGD ¹
2022 Annual Activities	0.17 MGD ³

¹ Annual Activities – Sewer Mainline and Lateral lining and relay, and manhole replacements.

² Based on COSS Exceedance Cost Allocation. To be confirmed.

³ Predicted value based on 2020 and 2021 data.

Proposed Peak Flow Reduction Plan Options - Matrix

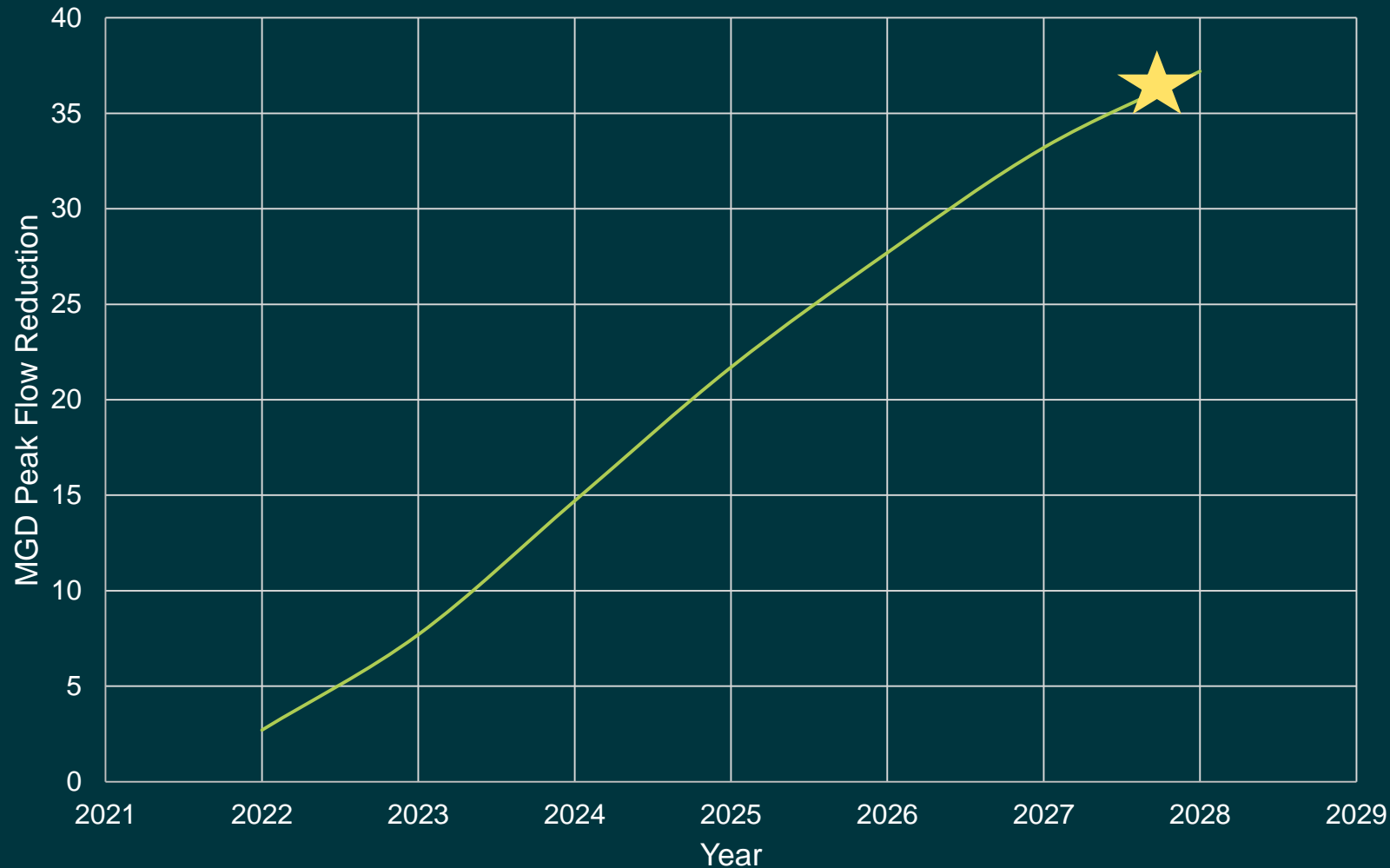
Program	Unit Cost	Numbers of Units	Peak Flow Reduction	Estimated Cost
Foundation Drain Disconnection	\$10,000 ¹	1,690 - 2,390 ²	25.8 – 36.5 MGD	\$16,900,000- \$23,900,000
Manhole Lid Replacement	\$1,000	105 - 1,923 ²	1.5 – 26.6 MGD	\$105,000- \$1,923,000
Lateral Grouting	\$1,000	29,434	2.4 - 8.8 MGD ²	\$29,434,000

¹ Subject to Plumbing Contractor Cost Estimate

² Subject to change after evaluations are completed.

Timeline

- 4 - 7 Years to Achieve 90% Peak Flow Reduction
- Target 5 - 7 MGD / Year of Peak Flow Reduction



Short-Term Timeline

October 2022

- Continue Annual Lateral Lining and Replacement
- Finish Echo Lane and North Osbourne Area Metering and Start Evaluation
- Commence Manhole Lid Modifications
- Commence Lateral Grouting

March 2023

- Initiate Foundation Drain Removal Program

October 2023

- Present Update of the Progress

Summary



Peak Flow Mitigation Plan - Recap

- Obtain credit for Brose Park and Chicory Road
- I/I Reduction Activities
 - Current Annual Activities
 - Foundation Drain Disconnection
 - Manhole Lid Replacement/Sealing
 - Lateral Grouting

Identified a range of widely accepted engineering values and options to potentially achieve required flow reduction.

This plan includes detailed evaluation of values, updates and follow-up reporting.

Peak Flow Mitigation Plan

- Evaluate the Exceedance Reduction Activities identified to determine the level of peak flow reduction provided per the cost of activity. This will be done by:
 - Using approximated and widely accepted engineering values for peak flow reduction for the I/I reduction activities.
 - Demonstrate peak flow reduction credits.

City of Racine SSR Request

- Lift the moratorium regarding peak flow reduction for the City of Racine as an SSR Party
- Approve the credits for Brose Park and Chicory Road facilities as presented
- Approve the strategy and timeline for flow reduction as presented
- Require an update annually at October meetings to demonstrate the approved strategy peak flow requirements