Changing Trends in Water Use

Managing Impacts on Water and Wastewater Systems

November 21, 2018

CWN Webinars

Connecting water professionals to decision-ready knowledge

Canadian Water Network

Insights for the water sector

helping decision-makers move forward

Canadian Water Network frames what is known and unknown in a way that usefully informs the choices being made.

cwn-rce.ca

Canadian Trends in Water Use

From 2011 to 2015

- The number of people served by WTPs increased by 6% ⬆
- Potable water volume processed by WTPs decreased by 2% ⬇
- Average per capital daily residential water use decreased by 6.5% ⬇

(Statistics Canada)

Potential Drinking Water System Impacts from Decreasing Water Use

Potential Wastewater Collection & Treatment Impacts

Webinar Speakers

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Water Quality Lead
Stantec

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EPCOR

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EPCOR Drainage

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EPCOR

Water Demand and Water Age

How demand affects water quality and what to do about it

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Canadian Water Network
Nov 21, 2018

Agenda

1 Water Age and Water Quality

2 Mitigation

3 Conclusions

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Agenda

1 **Water Age and Water Quality**

2 Mitigation

3 Conclusions

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Water Age and Water Quality

Distribution systems are:

- Biological reactors
- Chemical reactors

Which means…

Water age = reaction time

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Two buckets of reactions….

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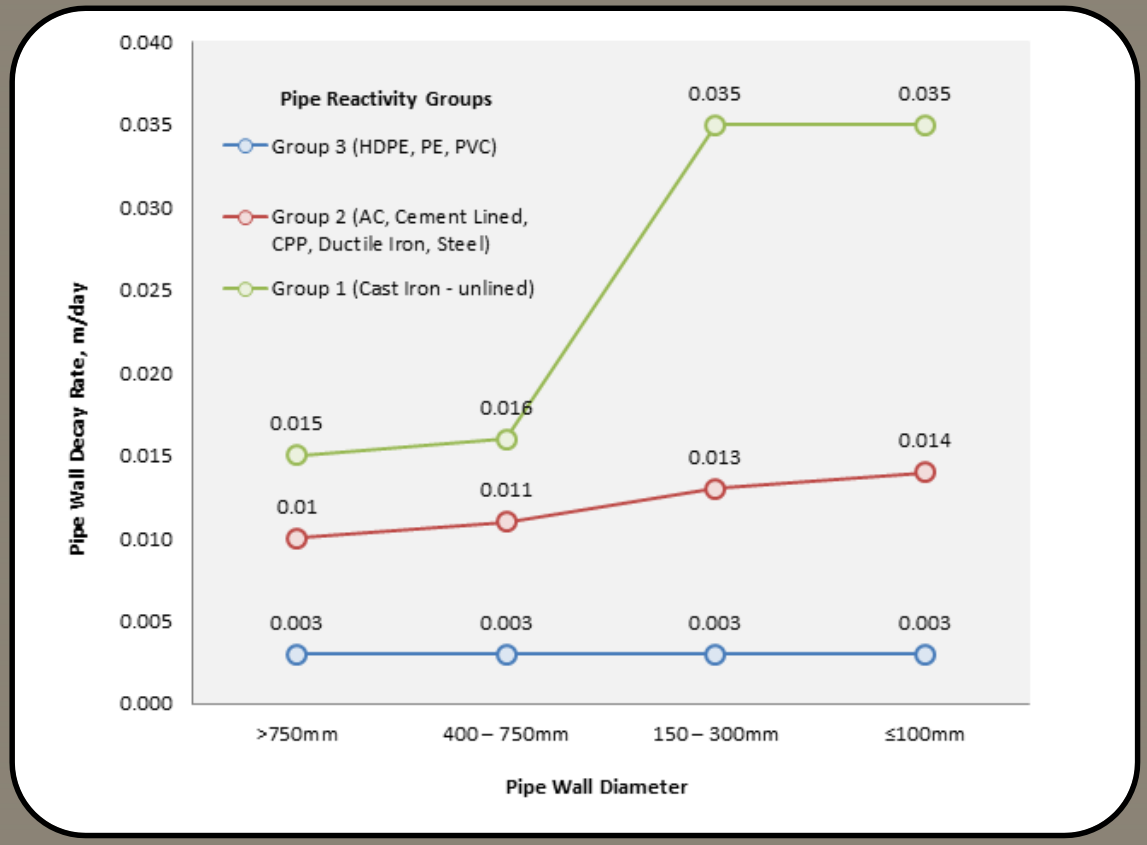
"We hold these truths to be self-evident:

that all pipes are created unequal."

e.g. smaller diameter pipes associated with higher rates of disinfectant decay



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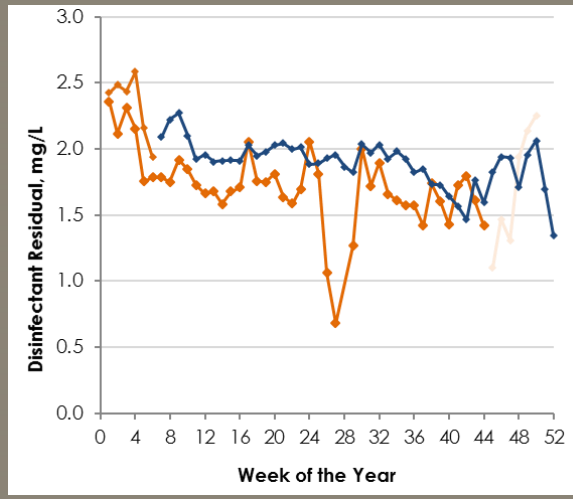
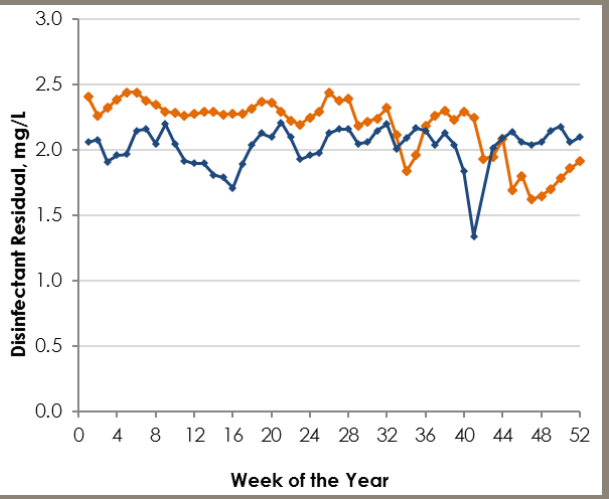
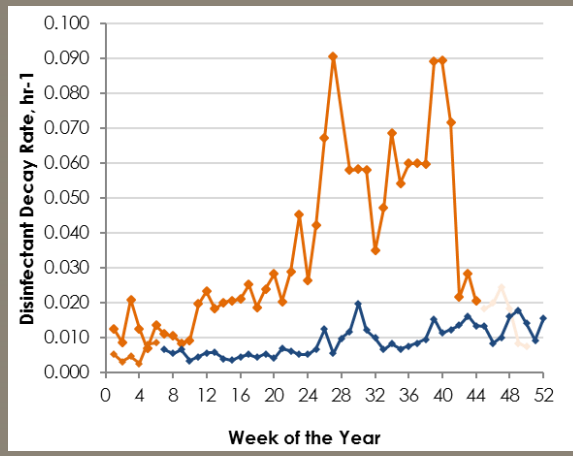
Tanks also provide a place for rxns…

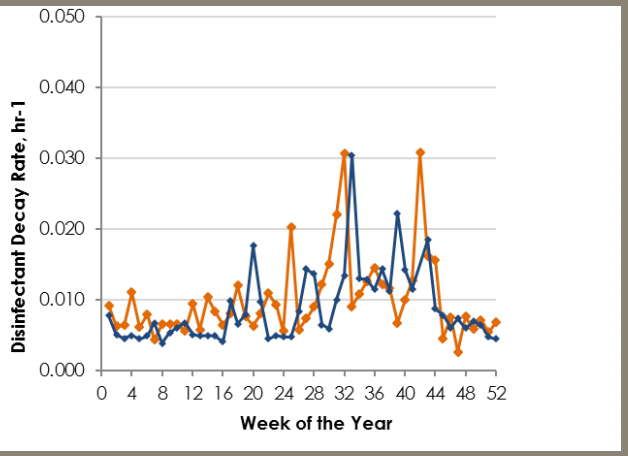
Chlorine residuals





Chlorine decay rates (same data)





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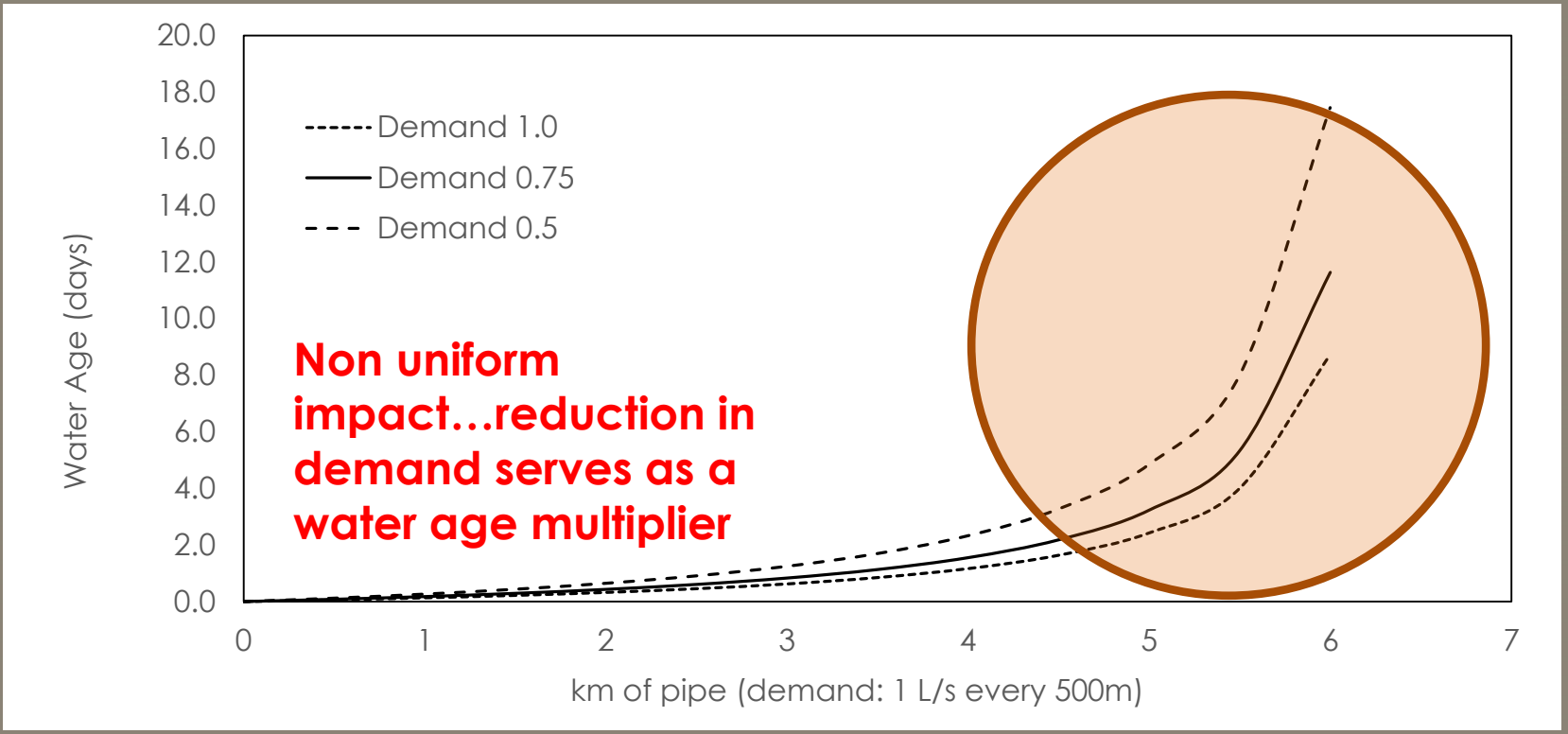
Here's the bad news…

If demand declines, all pipes and tanks are not equally impacted



Problematic, as we treat and operate to manage the oldest 10% of water

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2 Mitigation

3 Conclusions

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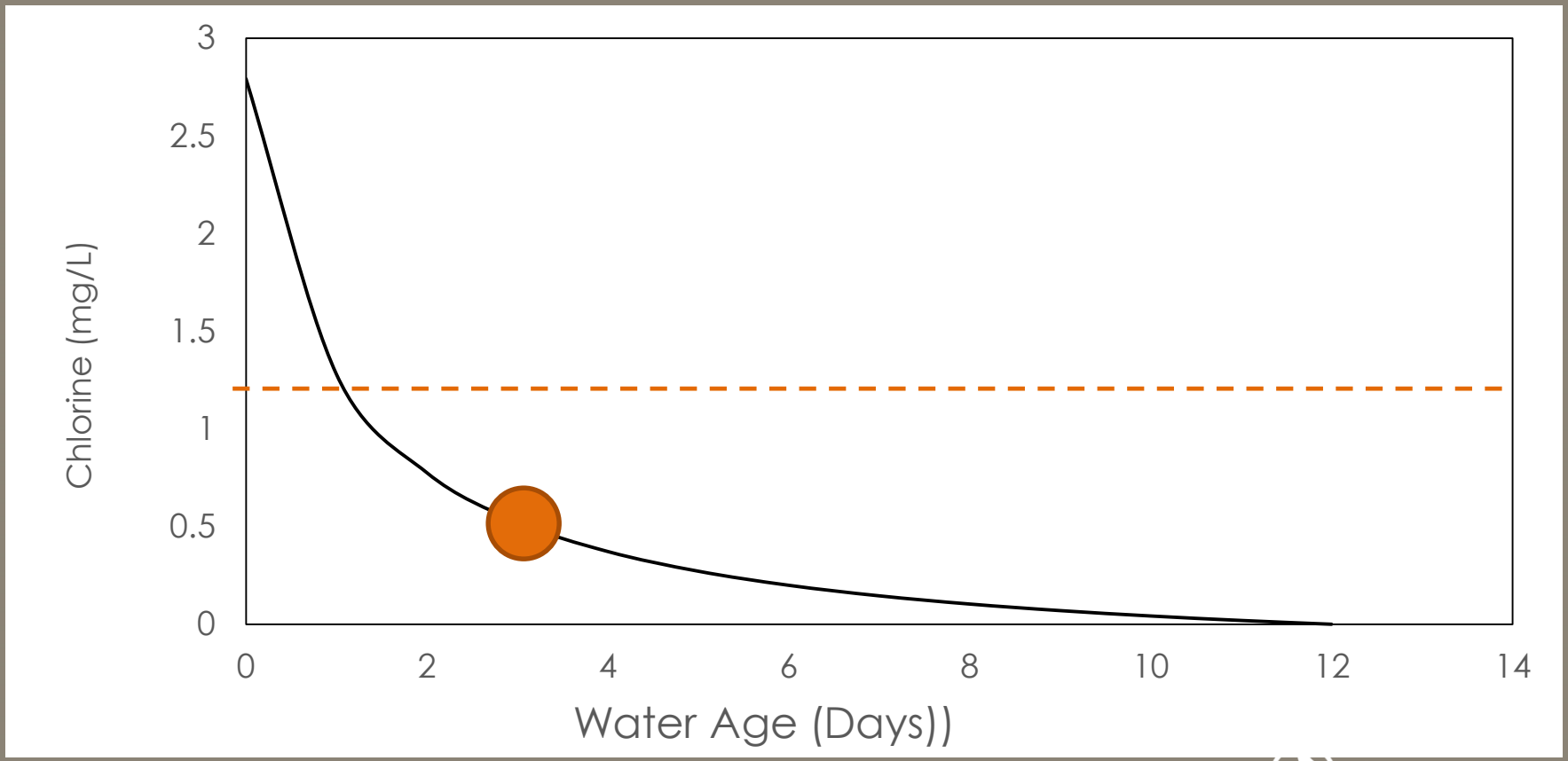
Mitigation

The theory…take chlorine for example. Losses due to bulk + pipe rxns * time…



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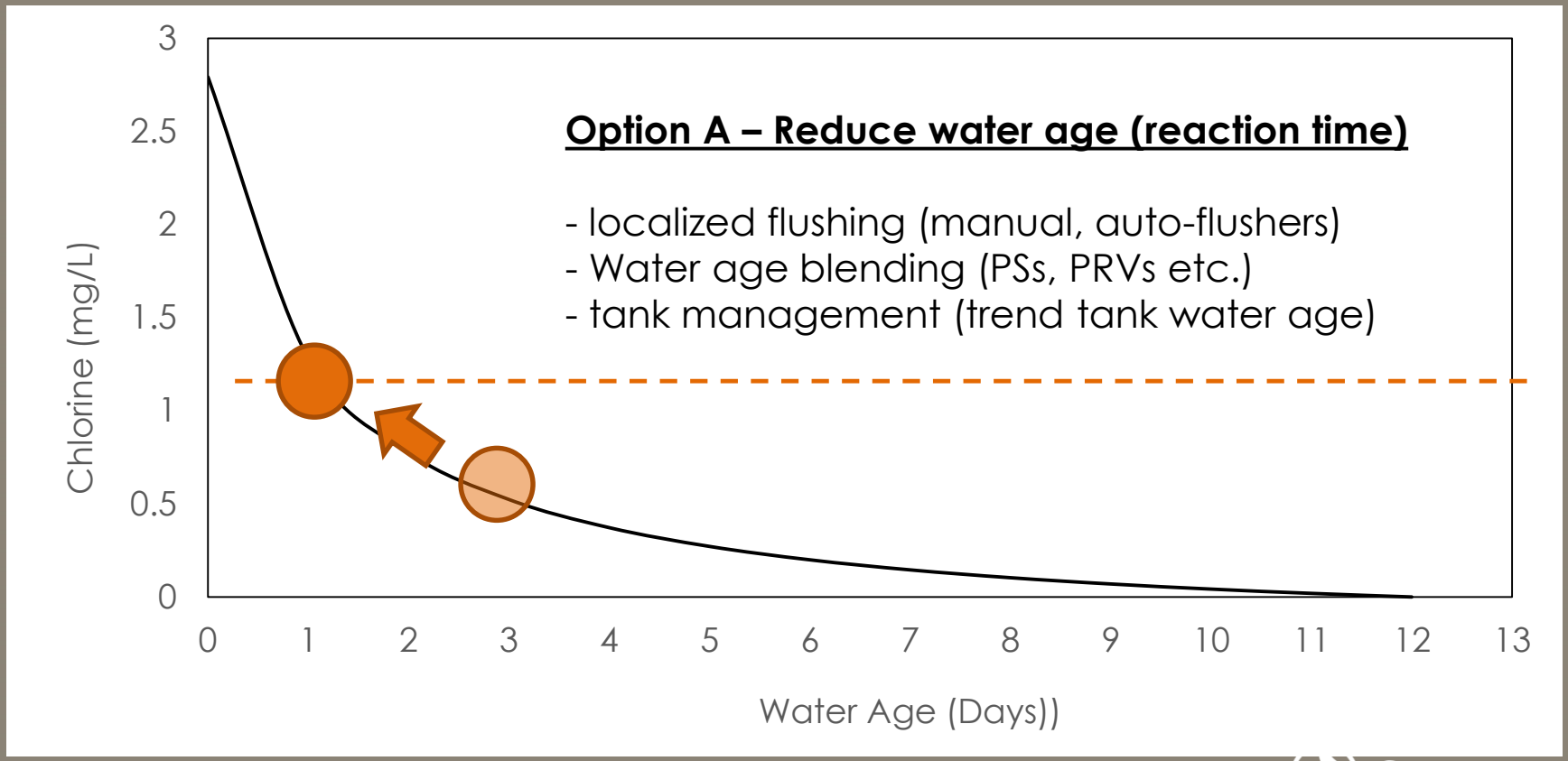

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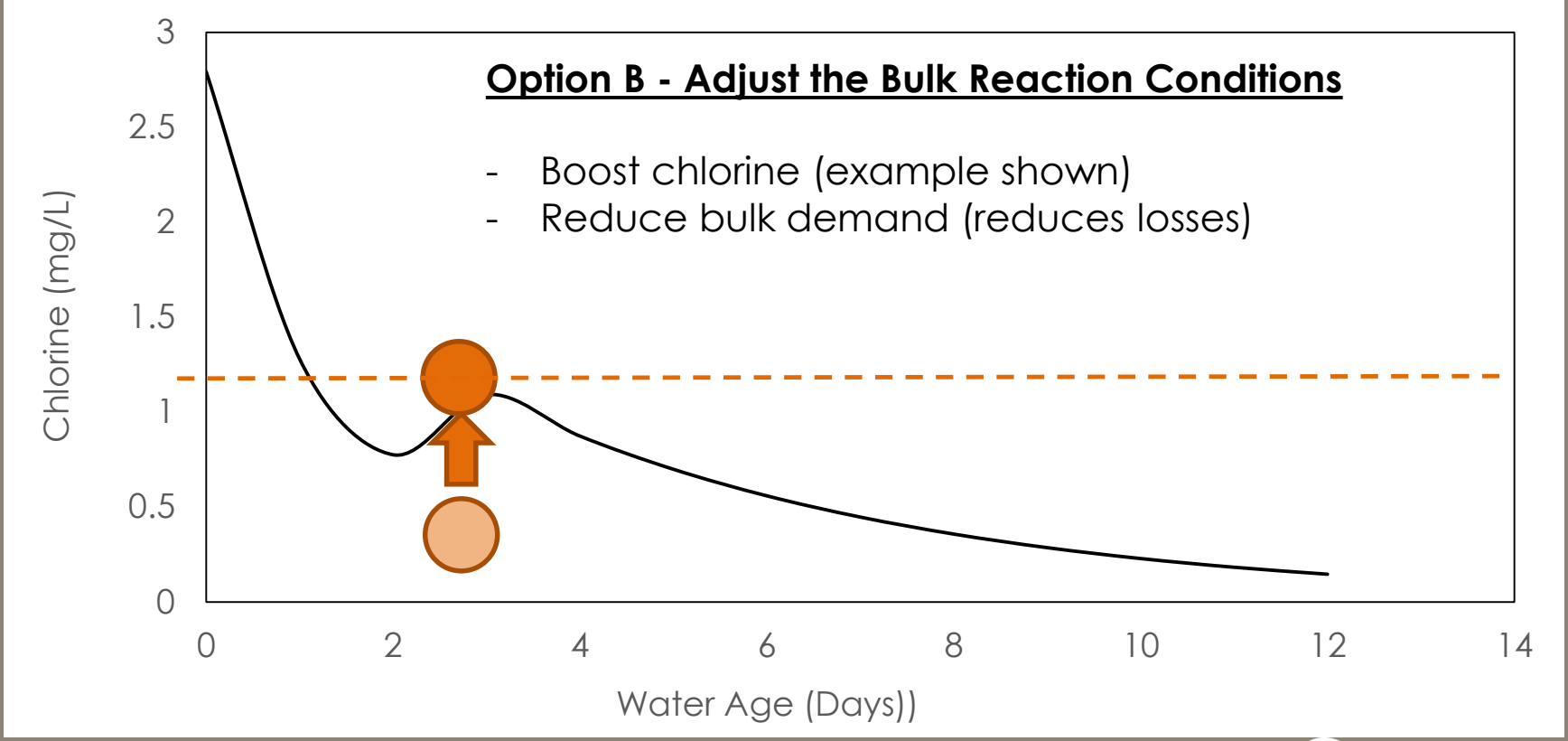

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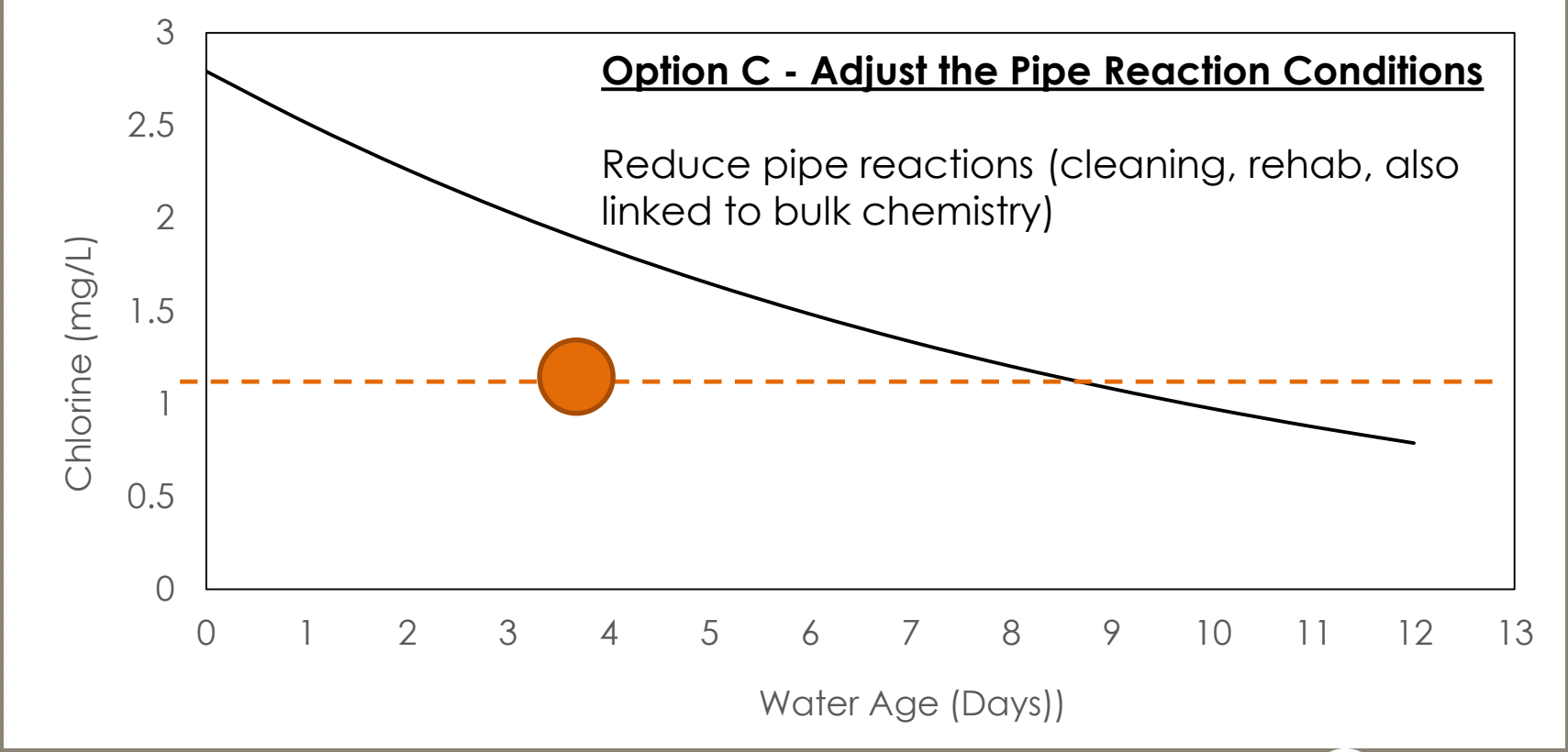

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Mitigation

Water quality models…

…predict, plan, prepare

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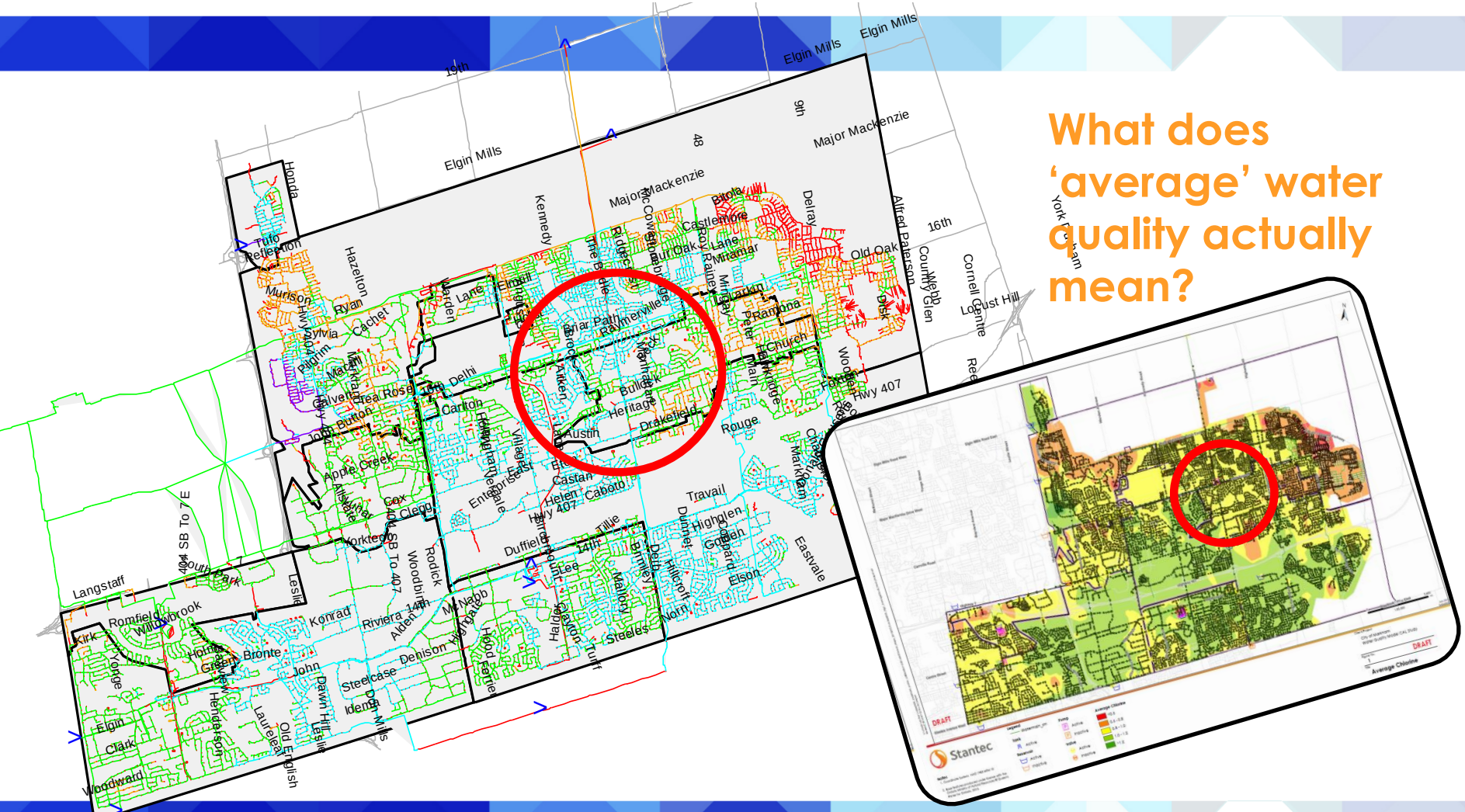
What does ‘average’ water quality actually mean?



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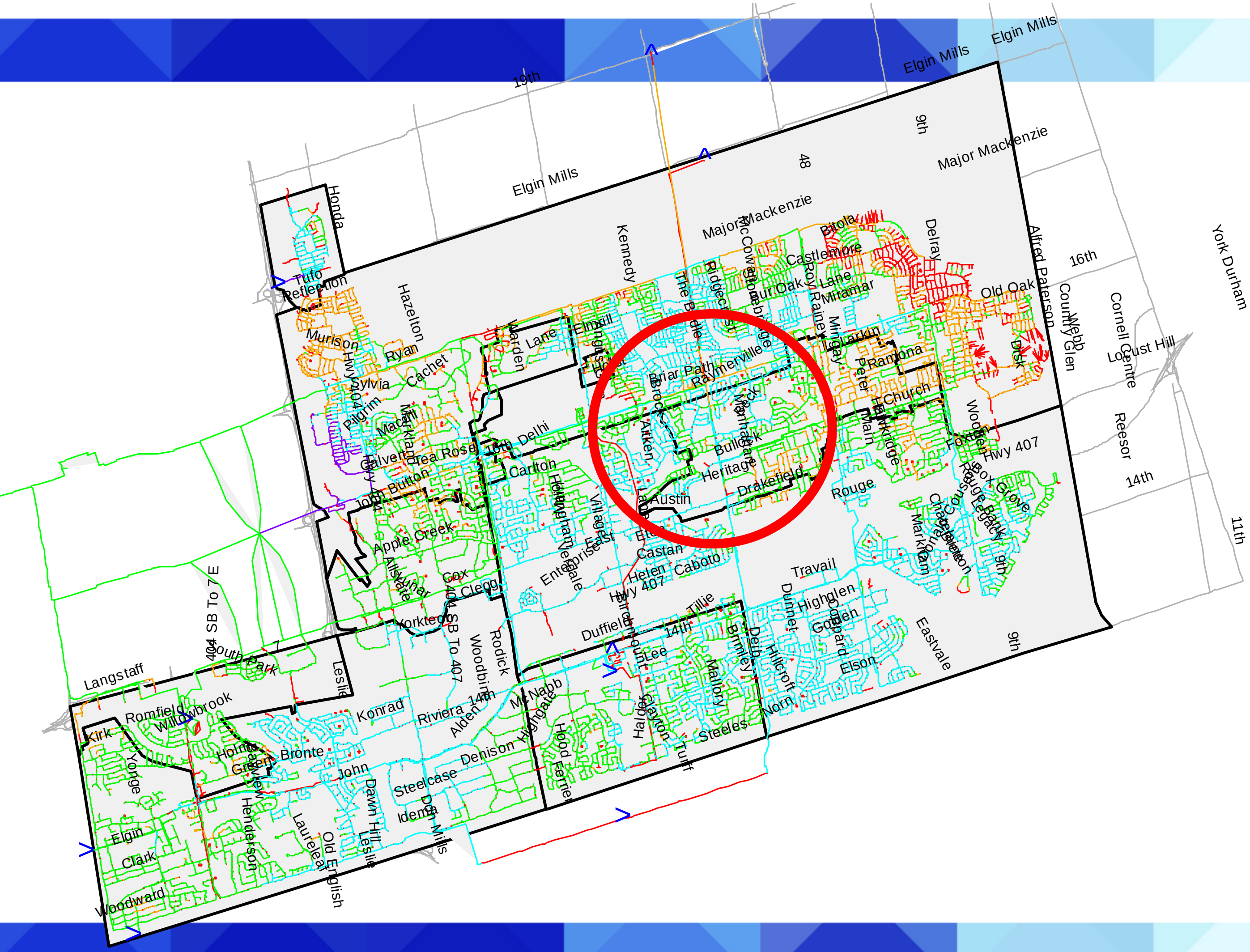
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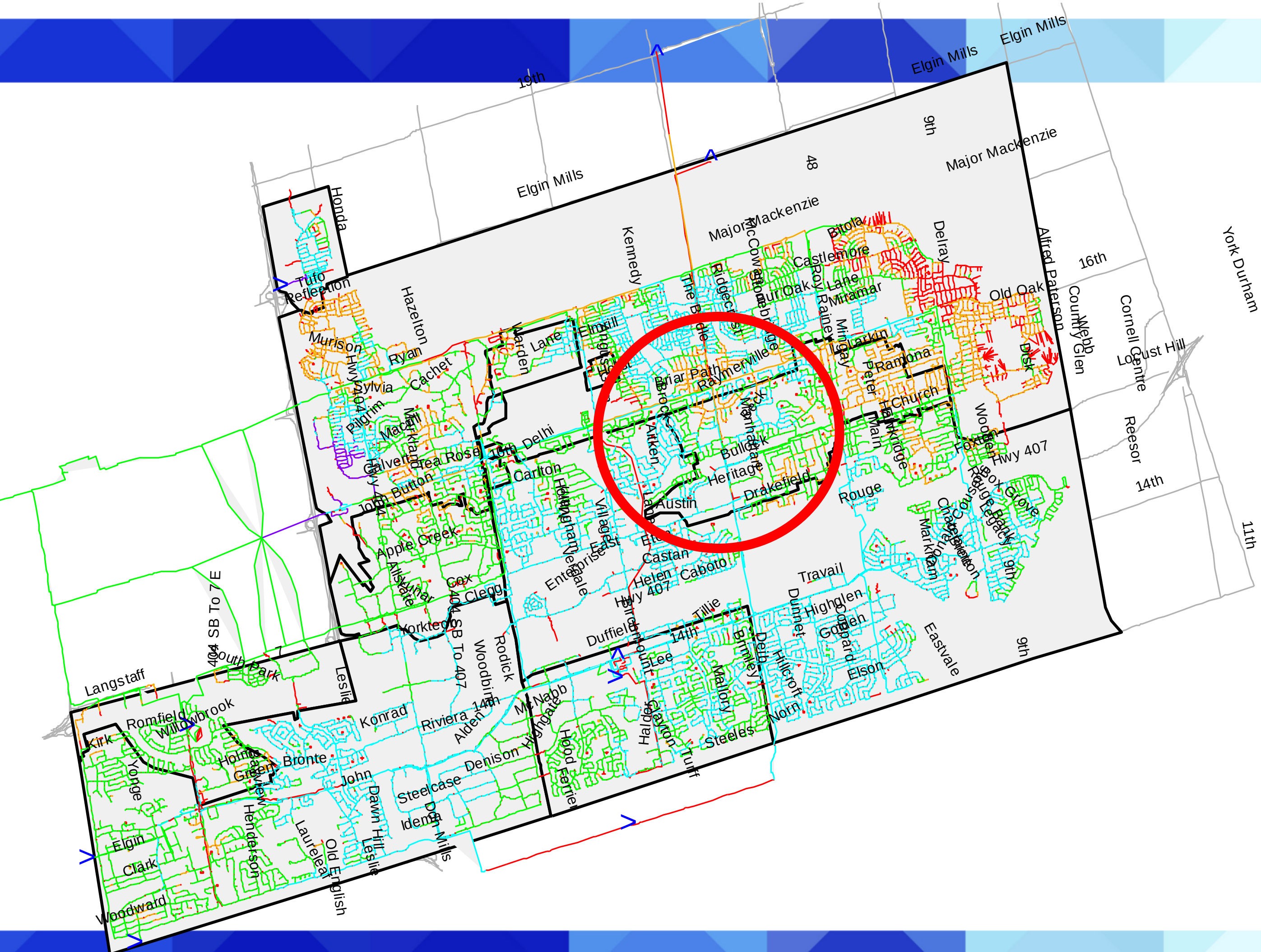

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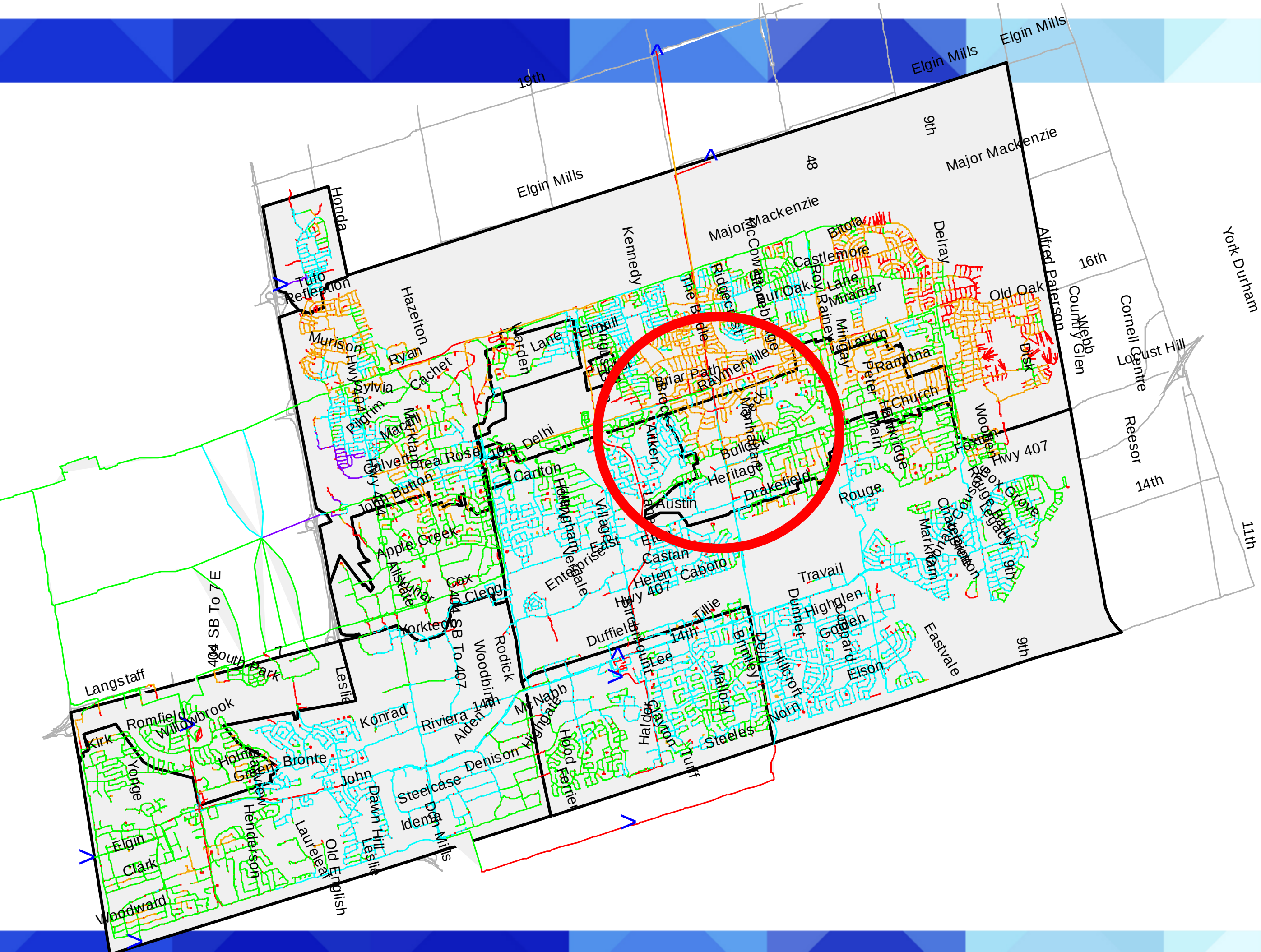

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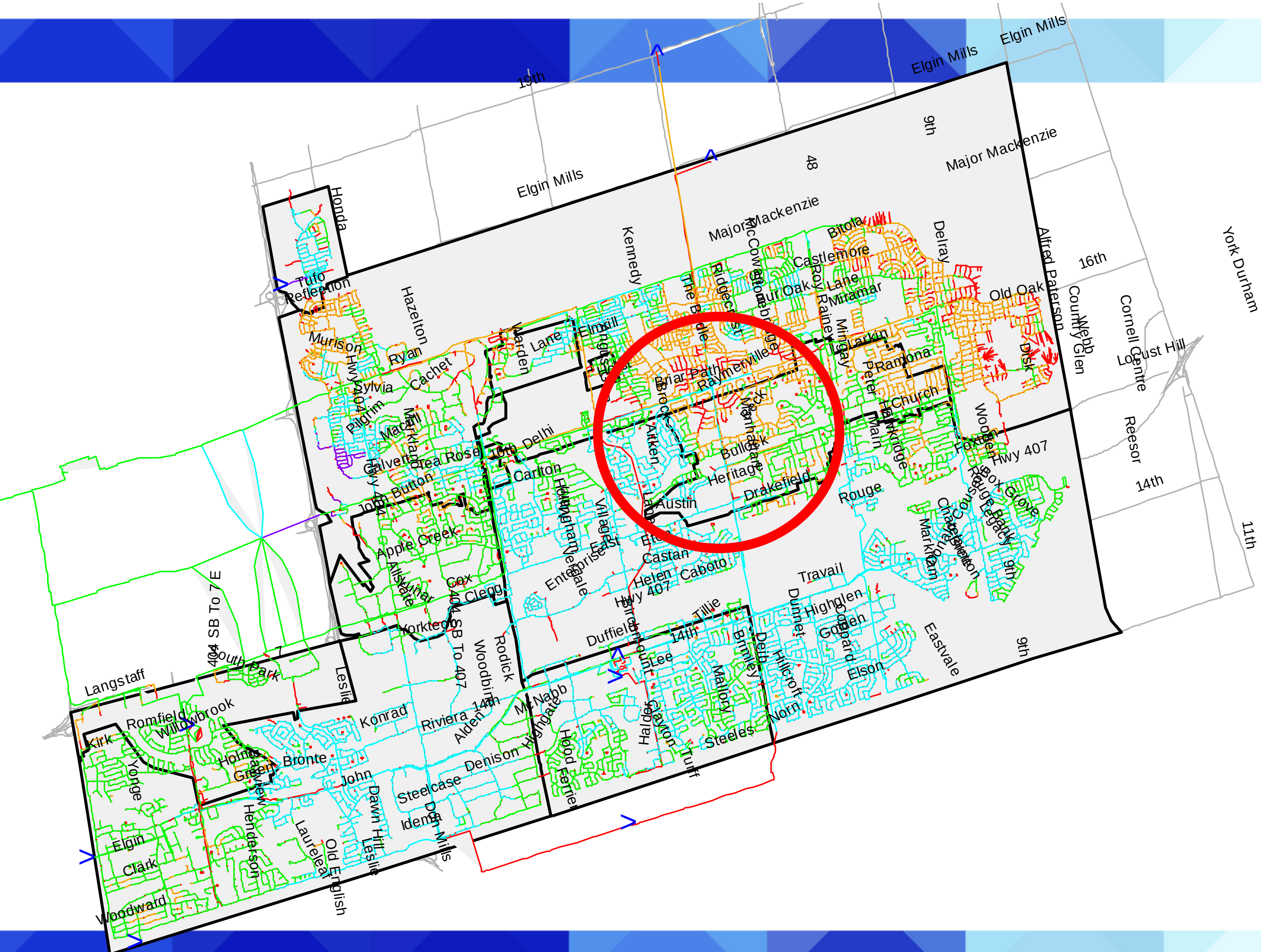

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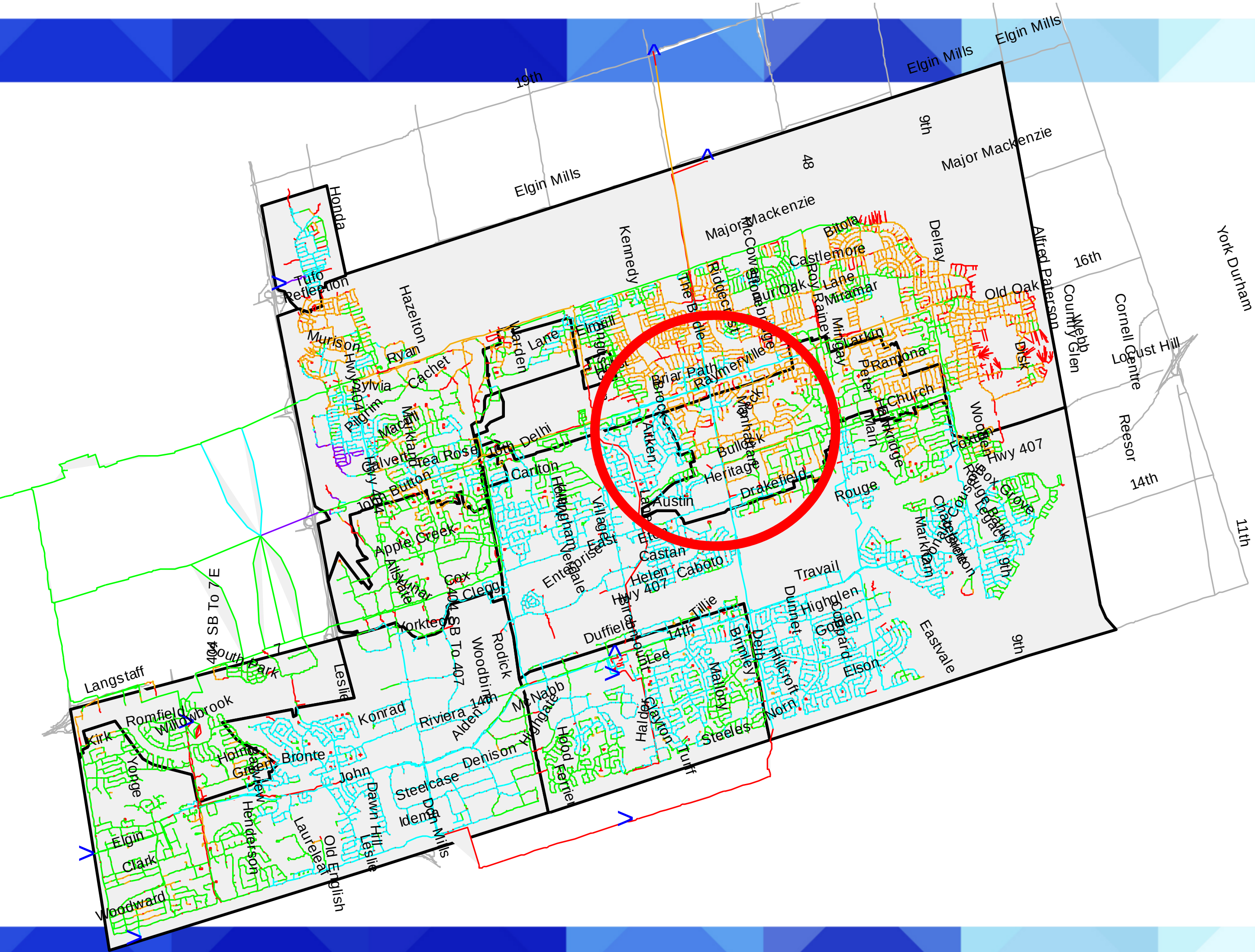

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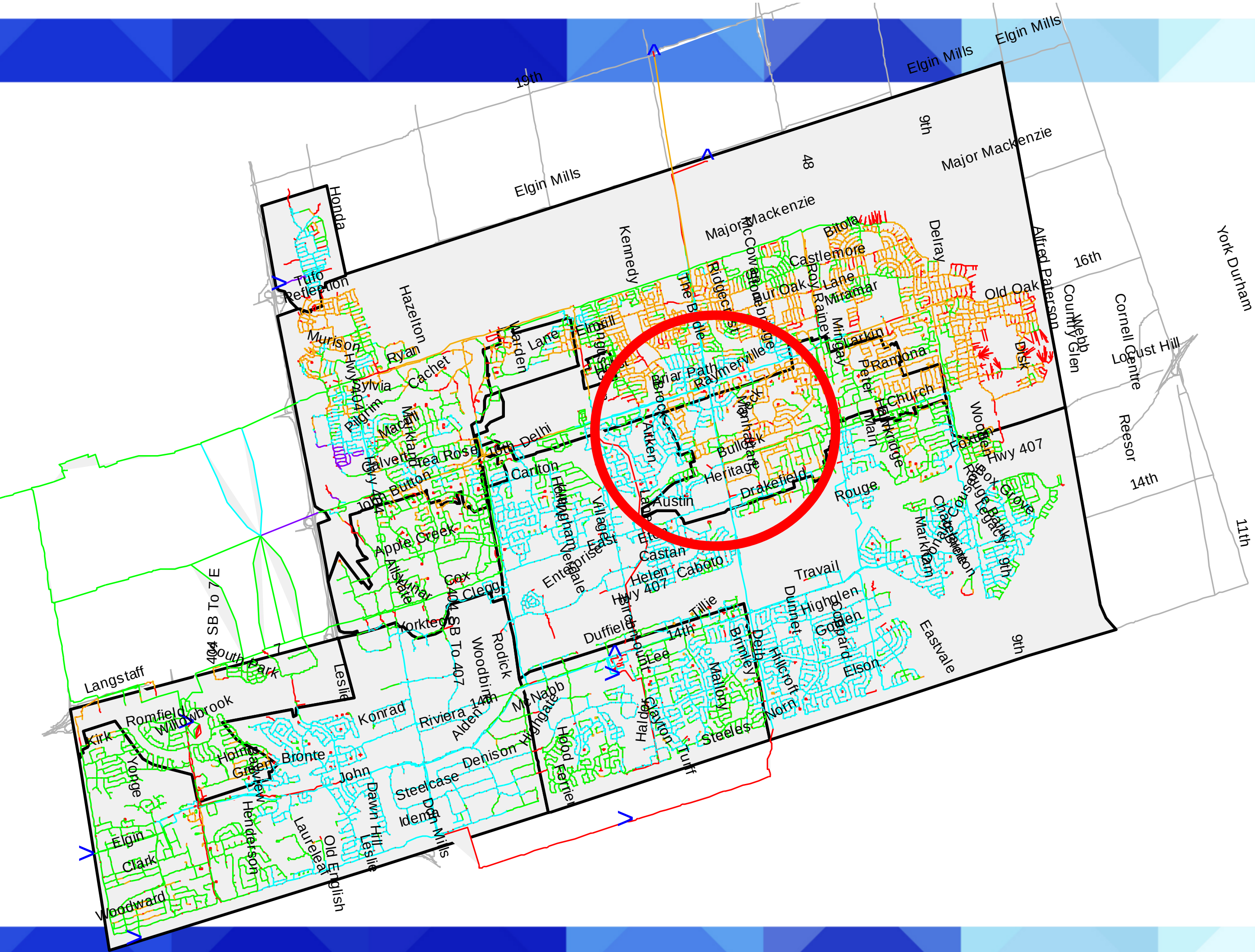

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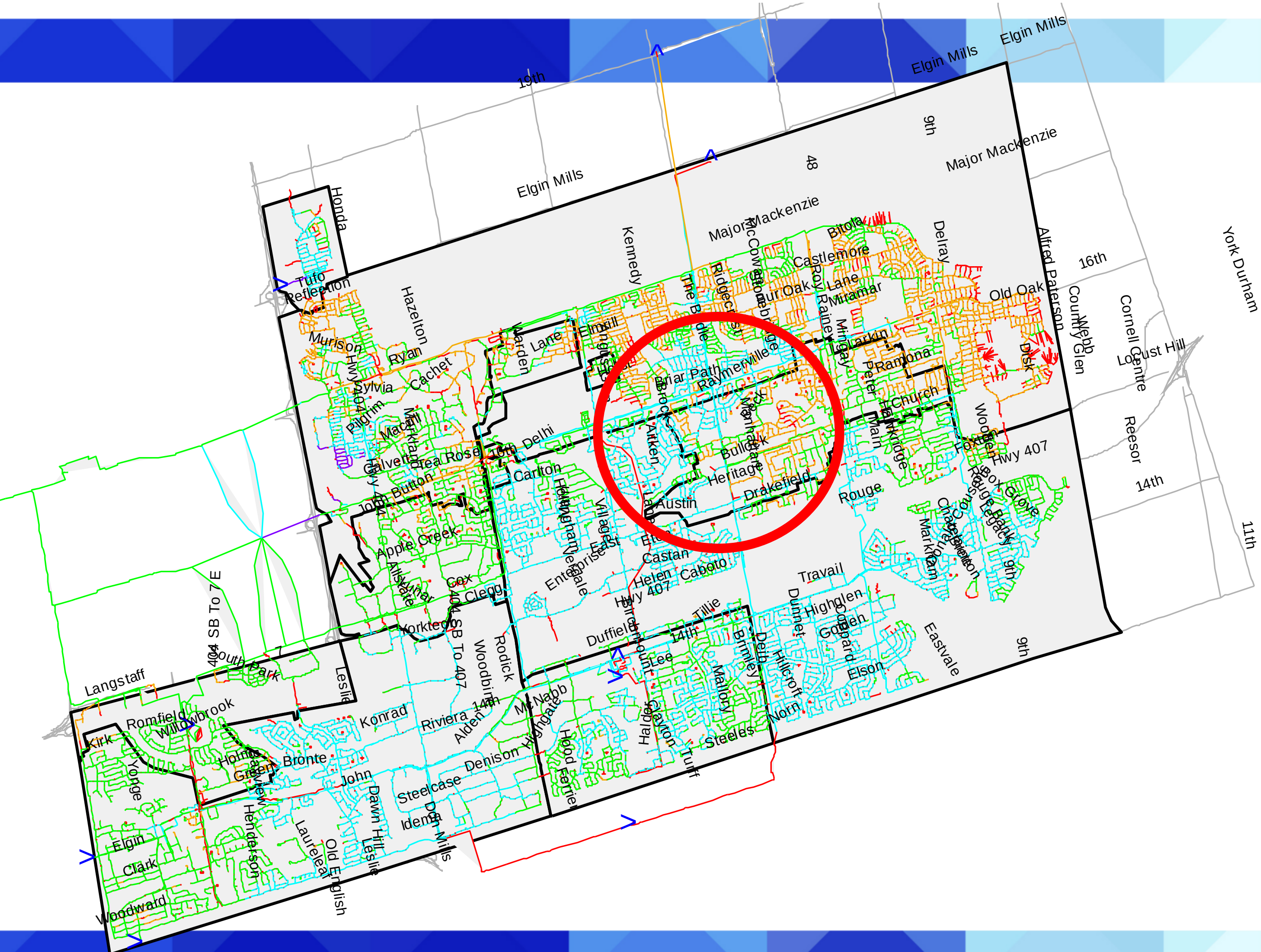
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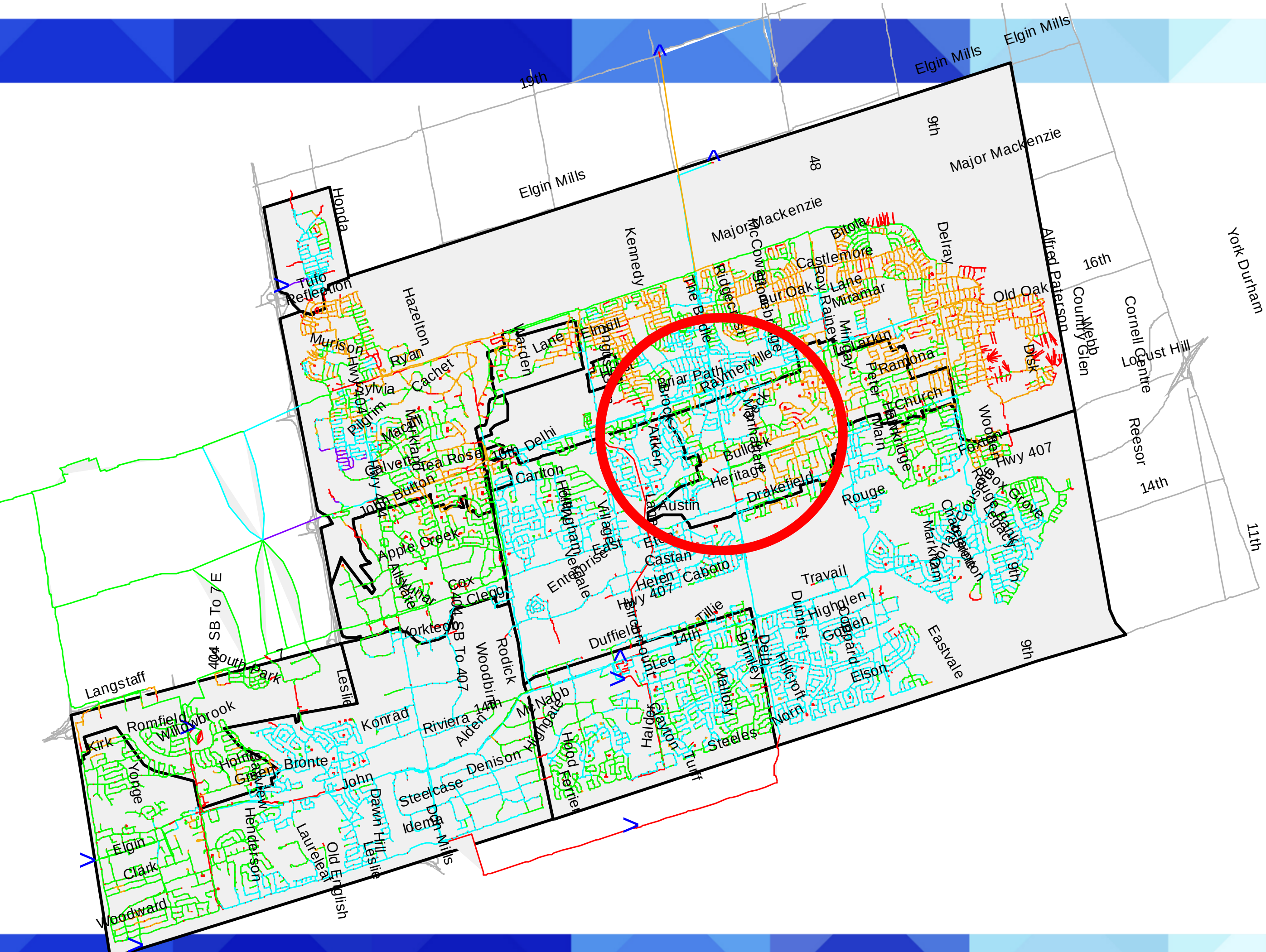
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1 Water Age and Water Quality

2 Mitigation

3 Conclusions

Conclusions

Demand = water age = reaction time

More reaction time = less disinfectant, more biofilm, more DBPs, more corrosion byproducts

System is not uniformly impacted – highest retention times receive highest impact

As we treat and operate to oldest fraction of water, this creates disproportionate challenges

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Conclusions…continued

Mitigation options:

1. Reduce reaction time (water age)
2. Reduce reaction rate (bulk, pipe)
3. Plan and prepare…water quality models are best tool

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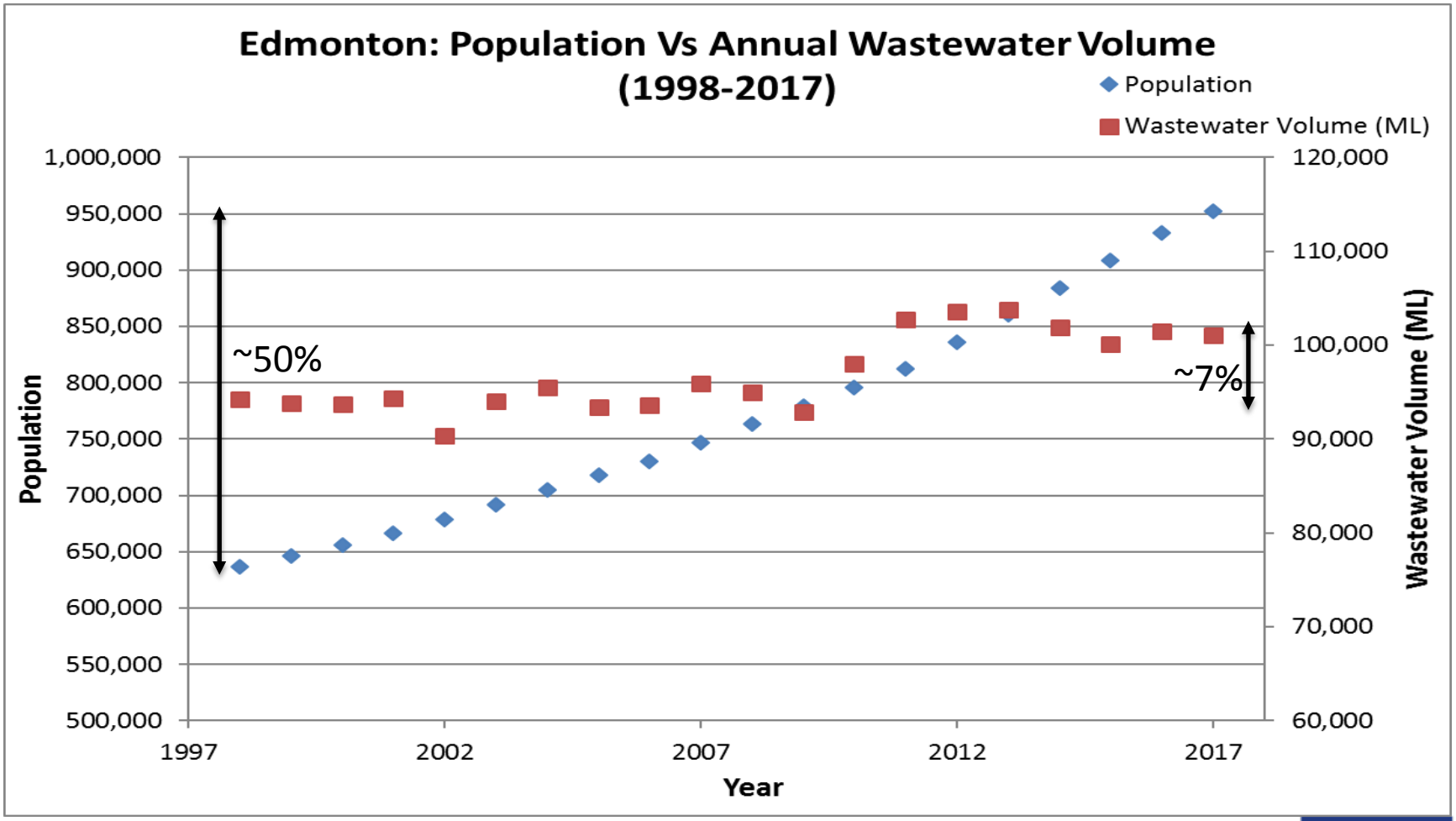
Thanks for tuning in!

Questions & Comments?

simon.horsley@stantec.com

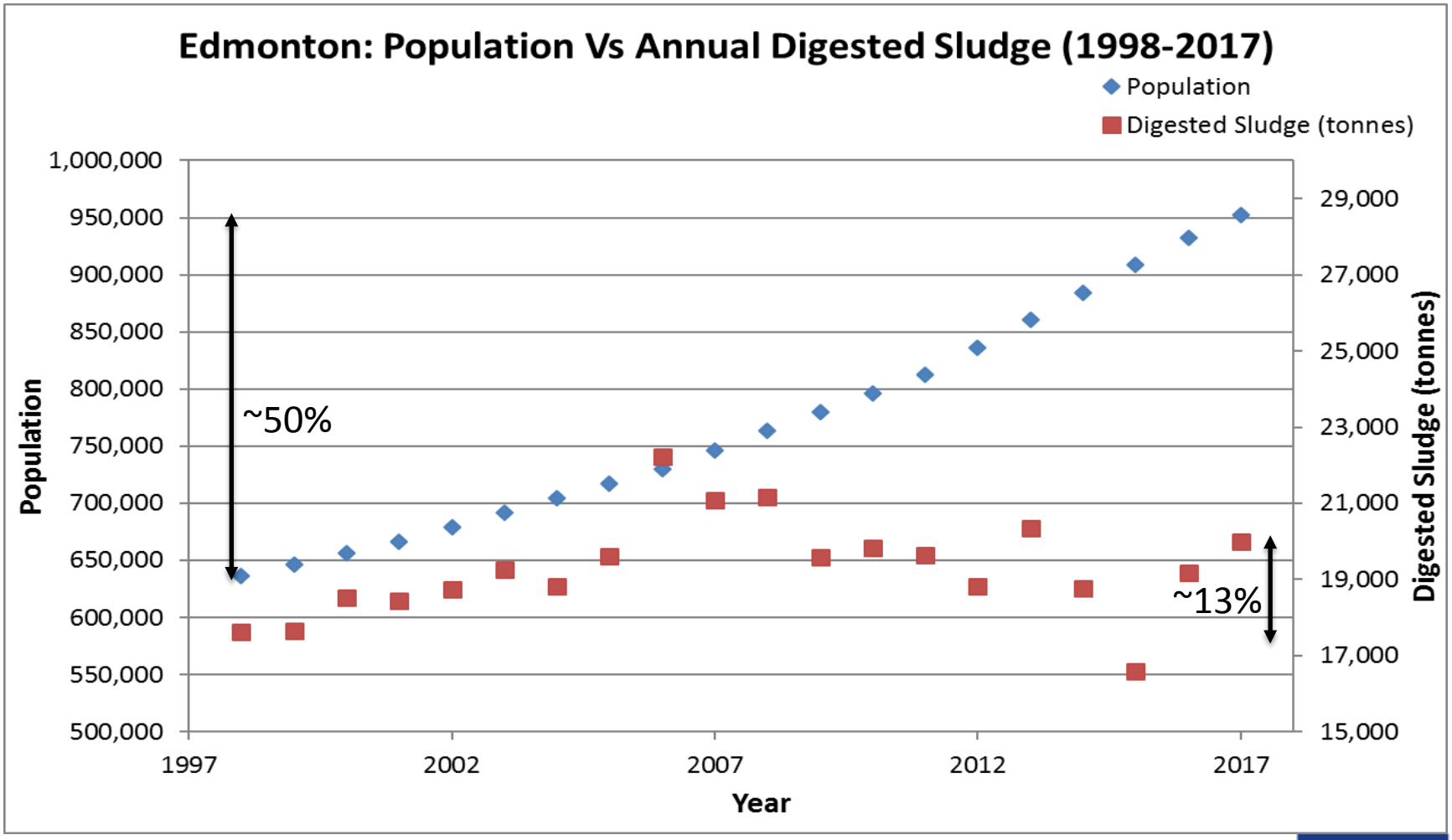
Water Quality Lead

Edmonton: Population and Wastewater



Population Source: City Of Edmonton Growth Study (Aug 2017); Data points used 1996,2001, 2006, 2011 and 2016

Edmonton: Population and Solids



Corrosion Issues

Luke Kurach, P.Eng
Manager, System Condition Assessment
EPCOR Drainage

Corrosion Issues

- Drainage System
- Issues
- Mitigation

Drainage System

SANITARY

PIPES
Local Sewer
Small Trunk Sewer
Large Trunk Sewer
Force Main
Service Connections

OTHER
Storage Tank & Pipes
Pump Stations
Manholes

COMBINED

PIPES
Local Sewer
Small Trunk Sewer
Large Trunk Sewer
Force Main

OTHER
Storage Pipes
Pump Stations
Manholes
Catchbasin Manholes

STORM

PIPES
Local Sewer
Small Trunk Sewer
Large Trunk Sewer
Force Main
Foundation Drain
Service Connections

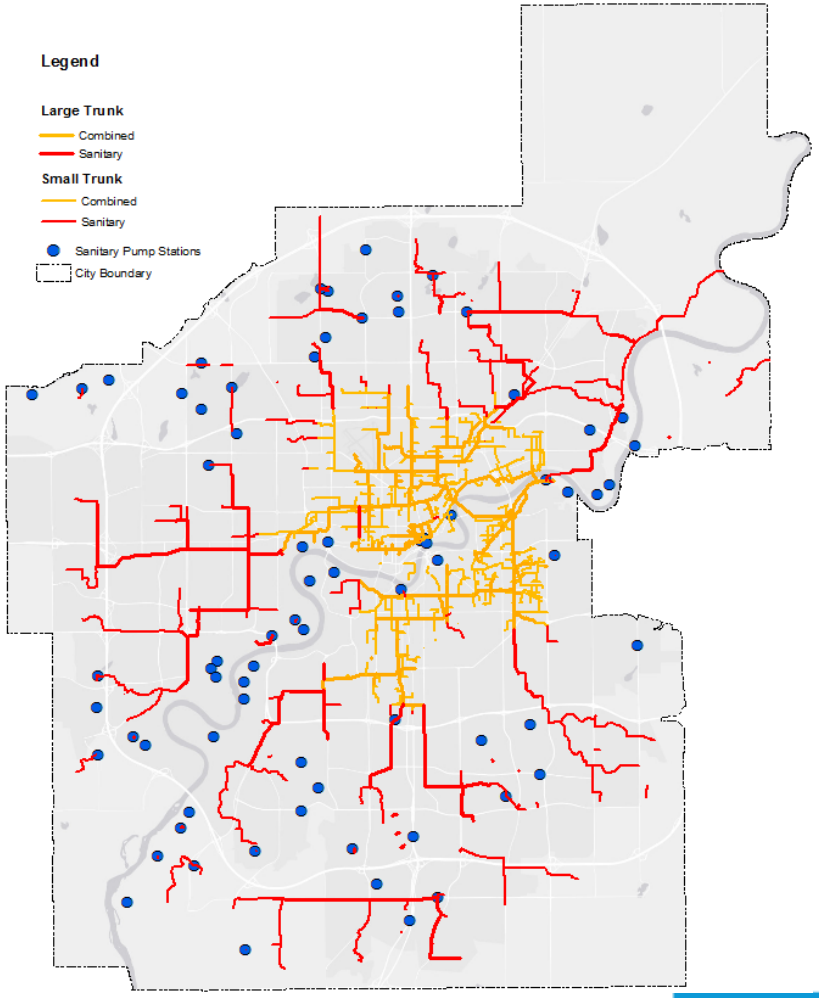
OTHER
Storage Tank & Pipes
Pump Stations
Manholes
Catchbasin Manholes
Catchbasin Leads
Catchbasins
Wet Lakes
Constructed Wetlands
Dry Ponds
Outfalls
Swales
Culverts

Local Sewer	*<600mm Diameter*
Small Trunk Sewer	*600mm <1200mm Diameter*
Large Trunk Sewer	*>=1200mm Diameter*

Drainage System

- Sanitary and Combined System

Asset Type	Sanitary	Combined
Large Trunks (Km)	74	92
Small Trunks (Km)	133	129
Storage Tanks (cu.m)	22,329	
Storage Pipes (cu.m)	27,436	460
Pump Stations (ea.)	72	3

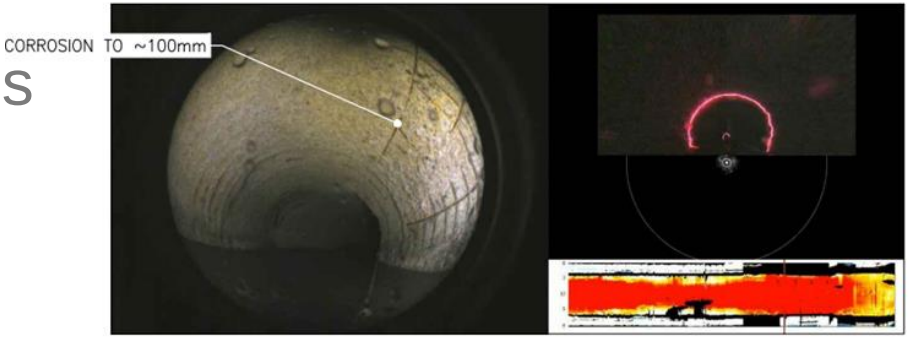


Issues

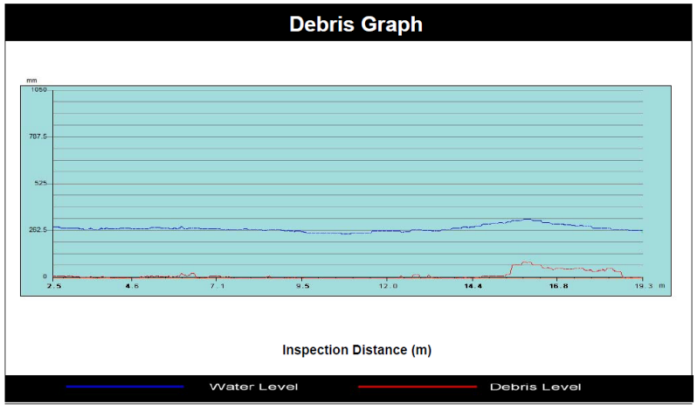
- Hydrogen Sulfide Corrosion
  - Costly premature replacement or rehabilitation of assets
  - Social Costs
- Trunk Sewers, Storage Tanks and Pipes, Pump Stations, Manholes, Chambers
- Varying degrees of severity
- Age and locations vary

Issues

- Visual Inspection
- Multi-Sensor Inspections
- Core Samples



Observations	
Average Debris Depth	15 mm
Average Water Level	278 mm
Debris Volume	0.1 cubic m



Issues

- Sanitary and Combined System

Location	Corrosion Severity	Odour Complaints	Low Slope/ Velocities	Long Retention Time/ Storage	Drop Structures, Forcemain Discharge	High Turbulence
1	High	High	✔			✔
2	High			✔	✔	
3	High	High				
4	Med-High			✔		
5	Med-High		✔			
6	High	High		✔		
7	High			✔		
8	High	Low				

Mitigation

- Trunk Inspections and Odour Mitigation synergy
  - Identify locations with high likelihood of failure
    - Pipe attributes
    - Odour Complaints
- Inspections
  - Multi Sensor Inspection (MSI)
    - CCTV, LiDAR, Sonar, Gas + Temperature
  - Visual Walk-Through
- Monitoring
- New construction to consider corrosion potential and mitigation measures
- Rehabilitation to consider corrosion resistant materials

Mitigation

- Design considerations should be made specifically to address the potential for corrosion.
- Corrosion problems should be identified early.
- Conduct Inspections, as part, or supplementary to proactive trunk inspection program. This will provide necessary information to better understand and predict corrosion.
- Cleaning of trunk sewers to remove accumulation of debris, as this can be an effective deterrent to the corrosion process. Again, inspection data (sonar) can provide some quantification of debris for planning and implementation.
- Mitigate or slow down the potential for corrosion by providing corrosion resistant liners at time of constructing trunks, or considered when rehabilitating existing ones.
- Develop and maintain a sewer map with odour complaints, sewer inspection data, gas monitoring.
- Consider other possible corrosion control methods:
  - Reduce the dissolved sulfide content of the wastewater
  - Provide ventilation of the enclosed area or sewer

EPCOR

- Thanks

Odour Mitigation in Edmonton

Fernando Sacluti, P.Eng
General Supervisor, Infrastructure Planning
Drainage Services - Planning & Engineering
November 21, 2018

Odourous Locations

- Catch basins
- Manholes
- Pumpstations
- Real time control units
- Combined sewer outfalls

Ongoing Activities

- Improve Odour Database
  - Monitors/sensors to measure sewer air composition and pressure
  - Water meter readers has “sniffers”
- Continue work on projects in impacted neighbourhoods
  - Deep trunk sewer inspection
  - Manhole sealing and flap installation
  - Drop structure design
- Improve design standards for new construction
- Research & Development with academia and industry

Current Assessment

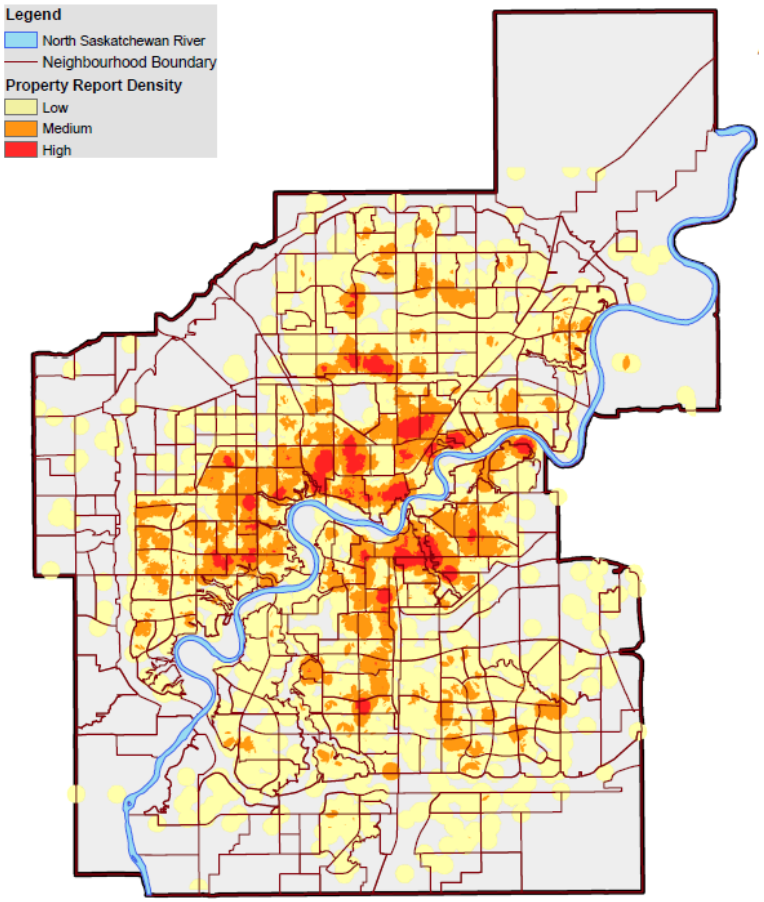
- Identified 1,100 potential odour projects in 157 neighbourhoods.
- Preliminary prioritization to estimate investment requirements and rate impact.
- Approximately $460M required:
  - Capital: $370M
  - Operation & Maintenance: $90M
- Identified two implementation options and time frames

Proposed Implementation Options

- Implementation Plans:
  - Systematic Approach
  - Primary Hotspot Priority Approach
- Delivery Time Frames:
  - 10-year
  - 20-year
  - 25-year

Systematic Plan

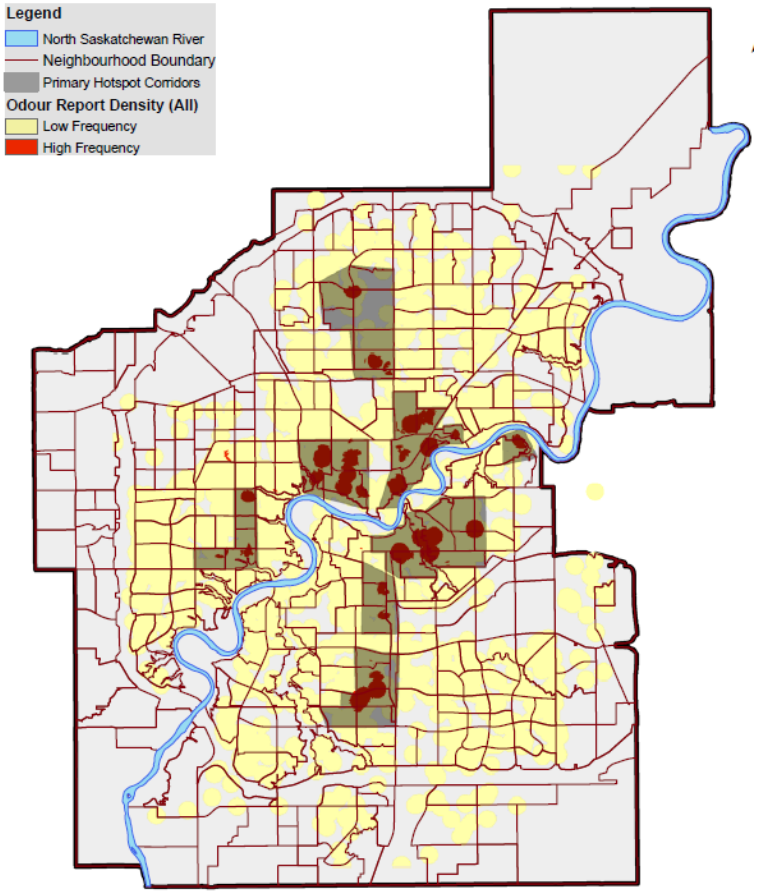
- Widespread initial benefits across the city
- Optimize allocation of construction resources across the city
- Improved synergy with other street level construction projects
- Frequency of odour reporting is not a factor.



Odour reduction in 9 to 25 years in primary hotspots.

Primary Hotspot Priority Option

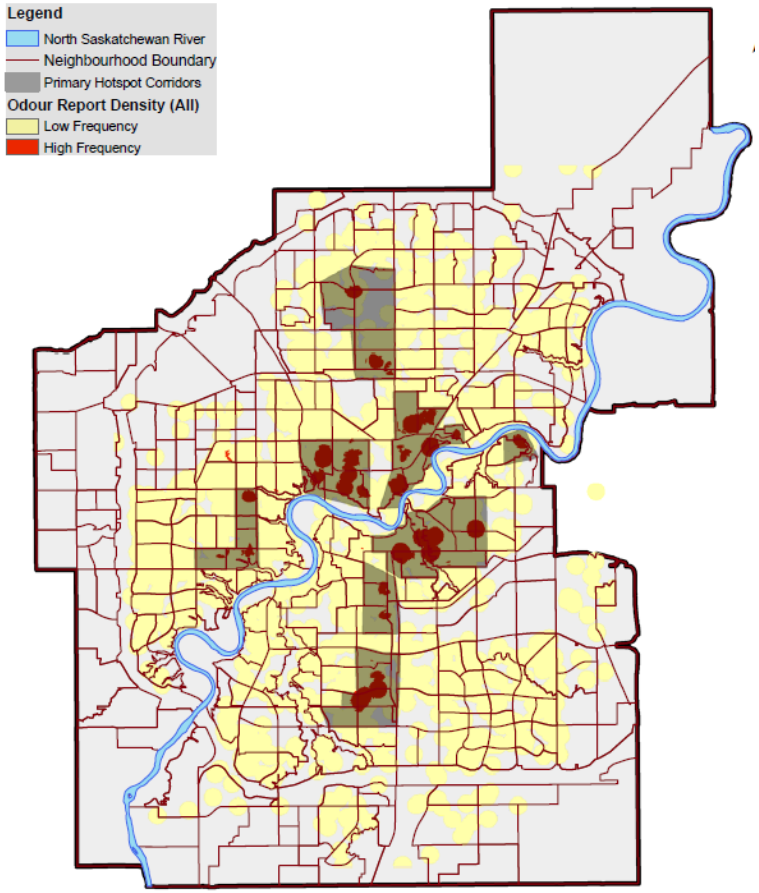
- Odour reduction occurs first in areas with greatest customer report frequency
- Public engagement is concentrated and streamlined
- Fewer construction disruptions in certain neighbourhoods



Odour reduction in 5 to 11 years in primary hotspots.

Primary Hotspot Only Option

- Odour reduction occurs in areas with greatest customer report frequency
- Allows time to proactively gather more data from across the city
- Approximately $310M
  - South of the river: $200M
  - North of the river: $110M



Strategy Implementation Considerations

- Preference for moderate changes in customer rates
- Meaningful public engagement on individual projects
- Coordination with other projects across the city
- Meaningful performance metrics

Next Steps

- Public engagement starting late 2018 to early 2019
- Present a detailed business case to the rate regulator in Q2 2019

Thank You

PROVIDING MORE EPCOR