



Halton-Hamilton  
Source Protection  
Region

**SPC Meeting September 17, 2019**  
**Section 36 - IPZ Vulnerability Re-assessment**

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# OVERVIEW

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- Section 36 Work Plan
- New Technical Rule
- Vulnerability score calculation method
- Details of vulnerability score calculation
- Preliminary results
- Help needed

# S.36 Work Plan Approved

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- Work Plan submitted to the Province on November 22, 2018
- On March 11, 2019 we received approval to carry out updates to our assessment reports and plan under section 36 from the Province
  - Comply with the amendments made to the Director's Technical Rules (2017), in particular to include assessment of the vulnerability of the Great Lakes intakes: Burlington, Oakville and Woodward

# Technical Rule 95.1

Table 3 - Source Vulnerability Factors

| Intake Type | Source Vulnerability Factor |
|-------------|-----------------------------|
|-------------|-----------------------------|

|               |            |
|---------------|------------|
| type A intake | 0.5 to 0.7 |
|---------------|------------|

|               |            |
|---------------|------------|
| type B intake | 0.7 to 0.9 |
|---------------|------------|

|               |          |
|---------------|----------|
| type C intake | 0.9 or 1 |
|---------------|----------|

|               |          |
|---------------|----------|
| type D intake | 0.8 to 1 |
|---------------|----------|

Rule 95.1 If, in respect of a surface water intake described in rule 68 and having regard to the considerations set out in Rule 95 for assigning a source vulnerability factor for the intake, it is determined that the intake is in shallow waters, is in close proximity to the shoreline or there has been a history of water quality concerns at the surface water intake, the source vulnerability factor may, despite Table 3, vary from 0.5 to 1.

# IPZ Vulnerability Score

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Rule 87. The vulnerability score assigned to each IPZ-1, IPZ-2 and each area of an IPZ-3 associated with a type C or type D intake shall be calculated in accordance with the following formula,

$$B \times C$$

Where,

B = the area vulnerability factor of the area of the surface water intake protection zone determined in accordance with rules 88 to 93; and

C = the source vulnerability factor of the surface water intake determined in accordance with rules 94 to 96.

# Area Vulnerability Factor (B)

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- IPZ-1 area vulnerability factor is always 10
- IPZ-2 area vulnerability factor must be between 7 and 9 and it depends on:
  - % land
  - Land cover
  - Soil type
  - Permeability
  - Slopes
  - Transport pathways
- Area vulnerability factor of 8 was assigned to all our IPZ-2's

# Source Vulnerability Factor (C)

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- Under new technical rule 95.1 a source vulnerability factor can be between 0.5 and 1 (previously between 0.5 and 0.7)
- To determine the source vulnerability factor of a surface water intake the following must be considered:
  1. The depth of the intake from the top of water surface (C1)
  2. The distance of the intake from land (C2)
  3. The history of water quality concerns at the surface water intake (C3)

$$C = \frac{C1 + C2 + C3}{3}$$

# Intake Depth (C1)

| Depth criteria: | Depth [m]              | Factor      |
|-----------------|------------------------|-------------|
|                 | $\geq 10$              | <b>0.5</b>  |
|                 | $\geq 6.1$ and $< 10$  | <b>0.66</b> |
|                 | $\geq 3.0$ and $< 6.1$ | <b>0.83</b> |
|                 | $< 3.0$                | <b>1</b>    |

- No definition in the Technical Rules what is a shallow or a deep intake
- MECP guideline for the Design of Water Treatment Works (MOE, 1982) stated that the preferred submergence of raw water intake is 10m, but 3m or more is satisfactory
- MECP Design Guidelines for Drinking Water Systems (MOE, 2008) state that the minimum depth of an intake should be 3m, wherever possible
- The State of Michigan as part of their source water protection program (Michigan Department Environmental Quality, 20014) used 20ft (6.1m) as a cut-off for shallow intakes vs deep intakes



# Halton and Hamilton Intake Depths

| <b>Depth criteria:</b> | <b>Depth [m]</b>                                       | <b>Factor</b> |
|------------------------|--|---------------|
|                        | <b><math>\geq 10</math></b>                            | <b>0.5</b>    |
|                        | <b><math>\geq 6.1</math> and <math>&lt; 10</math></b>  | <b>0.66</b>   |
|                        | <b><math>\geq 3.0</math> and <math>&lt; 6.1</math></b> | <b>0.83</b>   |
|                        | <b><math>&lt; 3.0</math></b>                           | <b>1</b>      |

| <b>INTAKE</b>            | <b>Depth</b> |
|--------------------------|--------------|
| <b>Burlington - East</b> | <b>6.3</b>   |
| <b>Burlington - West</b> | <b>5.5</b>   |
| <b>Burloak</b>           | <b>17</b>    |
| <b>Oakville</b>          | <b>8.7</b>   |
|                          |              |
| <b>Woodward - Pipe 1</b> | <b>8.5</b>   |
| <b>Woodward - Pipe 2</b> | <b>7.3</b>   |
| <b>Woodward - Pipe 3</b> | <b>8</b>     |

# Intake Offshore Distance (C2)

| Offshore distance criteria: | Distance [m]           | Factor      |
|-----------------------------|------------------------|-------------|
|                             | $\geq 500$             | <b>0.5</b>  |
|                             | $\geq 300$ and $< 500$ | <b>0.75</b> |
|                             | $< 300$                | <b>1</b>    |

- No definition in the Technical Rules what is a near shore or an offshore intake
- The State of Michigan as part of their source water protection program (MDEQ, 2014) used 1000ft (~300m) as a cut-off for near shore vs offshore intakes
- Most SPA's used the distance criteria as presented above

# Halton and Hamilton Intake Distance

| Offshore distance criteria: | Distance [m]           | Factor      |
|-----------------------------|------------------------|-------------|
|                             | $\geq 500$             | <b>0.5</b>  |
|                             | $\geq 300$ and $< 500$ | <b>0.75</b> |
|                             | $< 300$                | <b>1</b>    |

| INTAKE            | Distance [m] |
|-------------------|--------------|
| Burlington - East | 750          |
| Burlington - West | 750          |
| Burloak           | 1350         |
| Oakville          | 858          |
| Woodward - Pipe 1 | 945          |
| Woodward - Pipe 2 | 640          |
| Woodward - Pipe 3 | 915          |

# Water Quality Issues Criteria (C3)

| <b>WQ issues criteria:</b> | WQ issues | Factor      |
|----------------------------|-----------|-------------|
|                            | None      | <b>0.5</b>  |
|                            | Some      | <b>0.75</b> |
|                            | Constant  | <b>1</b>    |

- None: minimal number of parameter results measured above ODWQS and no operator concerns
- Some: some parameter results measured above ODWQS and operator concerns
- Constant: several parameter results measured above ODWQS and operator and/or municipal staff confirm raw water quality concerns

# Water Quality Issues

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- Woodward Pipe 1 - none
- Woodward Pipe 2 - none
- Woodward Pipe 3 - none
  
- Burlington: bromide concern (road salt and dissolution of sedimentary rock in the watershed)
- Burloak: bromide concern
- Oakville: bromide concern; concern with turbidity of source water due to 16 Mile Creek discharge into the lake
- Bromide is most likely associated with road salt. Regional staff believes that managing bromate concentrations in treated water is a treatment challenge rather than source of water

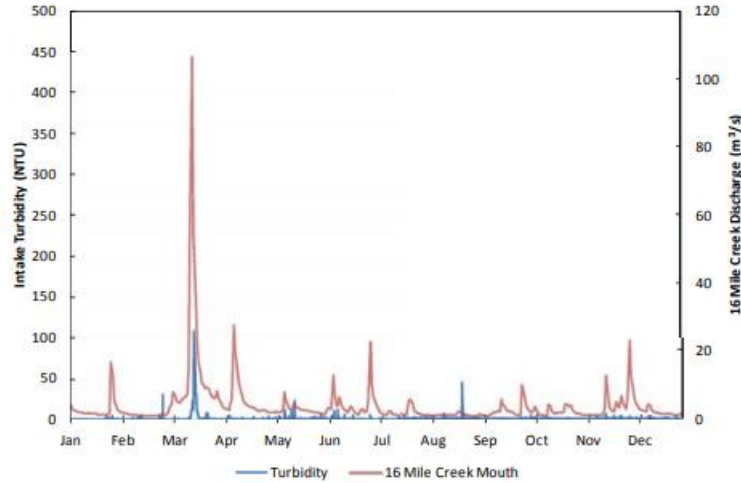
# Oakville Intake WQ: None, Some or Constant

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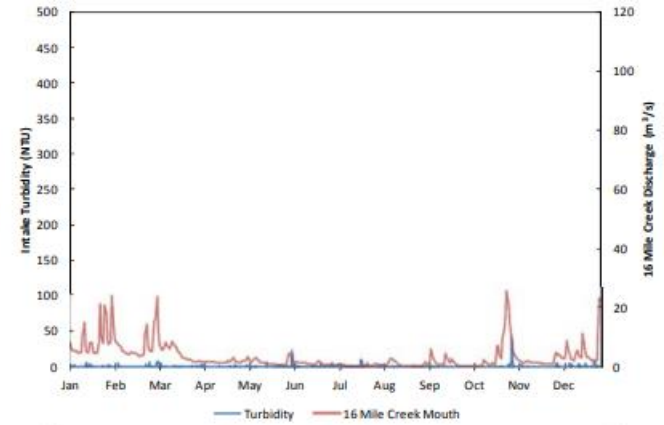
- Historically turbidity levels above the threshold to shut down the intake happen 0 to 4 times a year (for turbidity levels at the intake during shut down: 26 – 100 NTU)
- As part of Class EA for re-rating of the Oakville system Halton Region completed 16Mile Creek Plume Assessment in consideration of extending the intake pipe
- The treatment plant was upgraded to deal with turbidity concentrations up to at least 100 NTU

# Intake Turbidity

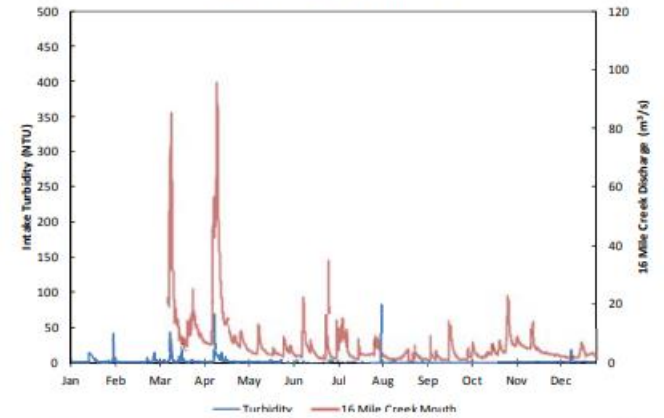
2010



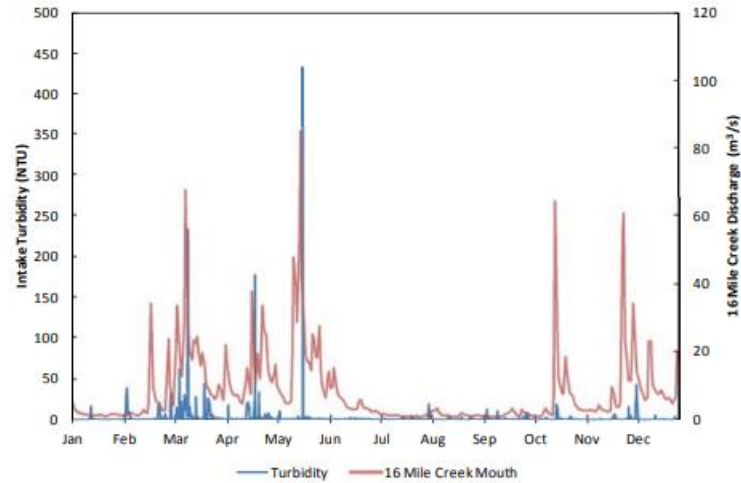
2012



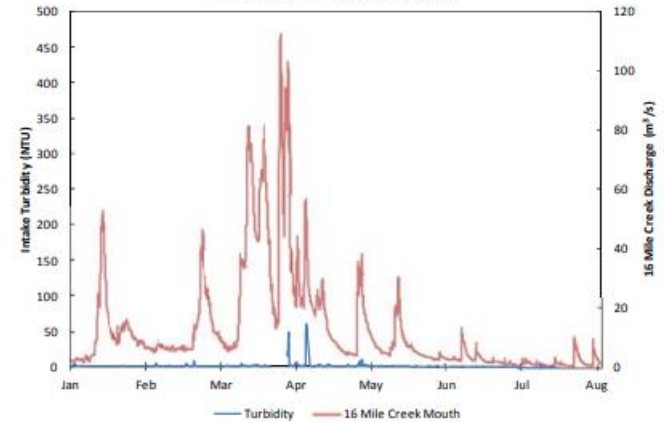
2013



2011



2014



# Suggested vulnerability scores

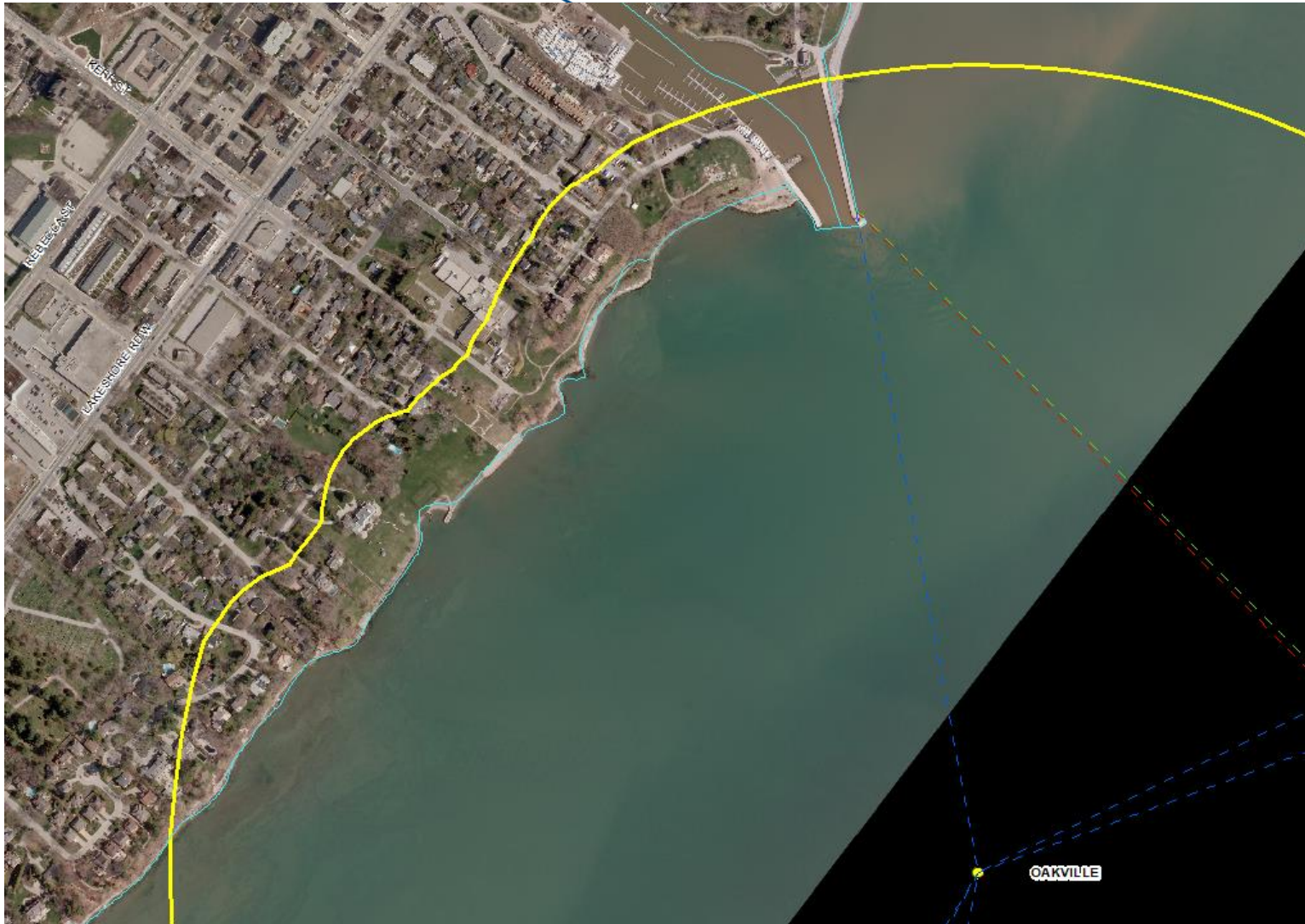
| INTAKE            | Depth [m] | Distance from shore [m] | Historical Water Quality | Depth | Offshore distance | WQ issues | C    | C R-up | IPZ-1 B | IPZ-2 B | IPZ-1 Vulnerability (B * C) | IPZ-2 Vulnerability (B * C) |
|-------------------|-----------|-------------------------|--------------------------|-------|-------------------|-----------|------|--------|---------|---------|-----------------------------|-----------------------------|
| Burlington - East | 6.3       | 750                     | Some                     | 0.66  | 0.5               | 0.75      | 0.64 | 0.7    | 10      | 8       | 7.0                         | 5.6                         |
| Burlington - West | 5.5       | 750                     | Some                     | 0.83  | 0.5               | 0.75      | 0.69 | 0.7    | 10      | 8       | 7.0                         | 5.6                         |
| Burloak           | 17        | 1350                    | Some                     | 0.5   | 0.5               | 0.75      | 0.58 | 0.6    | 10      | 8       | 6.0                         | 4.8                         |
| Oakville          | 8.7       | 858                     | Some                     | 0.66  | 0.5               | 0.75      | 0.64 | 0.7    | 10      | 8       | 7.0                         | 5.6                         |
| Woodward - Pipe 1 | 8.5       | 945                     | None                     | 0.66  | 0.5               | 0.5       | 0.55 | 0.6    | 10      | 8       | 6.0                         | 4.8                         |
| Woodward - Pipe 2 | 7.3       | 640                     | None                     | 0.66  | 0.5               | 0.5       | 0.55 | 0.6    | 10      | 8       | 6.0                         | 4.8                         |
| Woodward - Pipe 3 | 8         | 915                     | None                     | 0.66  | 0.5               | 0.5       | 0.55 | 0.6    | 10      | 8       | 6.0                         | 4.8                         |



# Would Be Vulnerability Scores

| INTAKE            | Depth [m] | Distance from shore [m] | Historical Water Quality | Depth | Offshore distance | WQ issues | C    | C R-up | IPZ-1 B | IPZ-2 B | IPZ-1 Vulnerability (B * C) | IPZ-2 Vulnerability (B * C) |
|-------------------|-----------|-------------------------|--------------------------|-------|-------------------|-----------|------|--------|---------|---------|-----------------------------|-----------------------------|
| Burlington - East | 6.3       | 750                     | Some                     | 0.66  | 0.5               | 0.75      | 0.64 | 0.7    | 10      | 8       | 7.0                         | 5.6                         |
| Burlington - West | 5.5       | 750                     | Some                     | 0.83  | 0.5               | 0.75      | 0.69 | 0.7    | 10      | 8       | 7.0                         | 5.6                         |
| Burloak           | 17        | 1350                    | Some                     | 0.5   | 0.5               | 0.75      | 0.58 | 0.6    | 10      | 8       | 6.0                         | 4.8                         |
| Oakville          | 8.7       | 858                     | Constant                 | 0.66  | 0.5               | 1         | 0.72 | 0.8    | 10      | 8       | 8.0                         | 6.4                         |
| Woodward - Pipe 1 | 8.5       | 945                     | None                     | 0.66  | 0.5               | 0.5       | 0.55 | 0.6    | 10      | 8       | 6.0                         | 4.8                         |
| Woodward - Pipe 2 | 7.3       | 640                     | None                     | 0.66  | 0.5               | 0.5       | 0.55 | 0.6    | 10      | 8       | 6.0                         | 4.8                         |
| Woodward - Pipe 3 | 8         | 915                     | None                     | 0.66  | 0.5               | 0.5       | 0.55 | 0.6    | 10      | 8       | 6.0                         | 4.8                         |

# OAKVILLE IPZ-1 Would Be Vulnerability 8 Area



# IPZ-1 Would Be Significant Threat Activities

| Threat Sub Category  | Risk        | Vulnerable Area / Score | Parameter of Concern |
|--|-------------|-------------------------|----------------------|
| The Application of Hauled Sewage to Land   | Significant | 1 (8)                   | Pathogen             |
| Sewage System Or Sewage Works - Combined Sewer discharge from a stormwater outlet to surface water                             | Significant | 1 (8)                   | Chemical             |
| Sewage System Or Sewage Works - Combined Sewer discharge from a stormwater outlet to surface water                             | Significant | 1 (8)                   | Pathogen             |
| Sewage System or Sewage Works - Stormwater Management Facility   | Significant | 1 (8)                   | Chemical             |
| Sewage System Or Sewage Works - Industrial Effluent Discharges   | Significant | 1 (8)                   | Chemical             |
| Sewage System Or Sewage Works - Industrial Effluent Discharges   | Significant | 1 (8)                   | Pathogen             |
| Sewage System Or Sewage Works - Sewage treatment plant bypass discharge to surface water                                       | Significant | 1 (8)                   | Chemical             |
| Sewage System Or Sewage Works - Sewage treatment plant bypass discharge to surface water                                       | Significant | 1 (8)                   | Pathogen             |
| Sewage System Or Sewage Works - Sewage Treatment Plant Effluent Discharges (Includes Lagoons)                                  | Significant | 1 (8)                   | Chemical             |
| Sewage System Or Sewage Works - Sewage Treatment Plant Effluent Discharges (Includes Lagoons)                                  | Significant | 1 (8)                   | Pathogen             |
| Application Of Agricultural Source Material (ASM) To Land  | Significant | 1 (8)                   | Pathogen             |
| Storage Of Agricultural Source Material (ASM)  | Significant | 1 (8)                   | Pathogen             |
| Application of Non-Agricultural Source Material (NASM) or Biosolids to Land  | Significant | 1 (8)                   | Pathogen             |
| Storage of Non-Agricultural Source Material (NASM)   | Significant | 1 (8)                   | Pathogen             |
| Management Or Handling Of Agricultural Source Material - Agricultural Source Material (ASM) Generation (Grazing and pasturing) | Significant | 1 (8)                   | Pathogen             |
| Management Or Handling Of Agricultural Source Material - Agricultural Source Material (ASM) Generation (Yards or confinement)  | Significant | 1 (8)                   | Pathogen             |

# HELP NEEDED

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- Source Vulnerability Factor: do we bump up Water Quality indicator to “constant” for Oakville
- Discussion

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**Thank you**