

## Thames – Sydenham and Region Drinking Water Source Protection Source Protection Committee Discussion Paper

**Report to** Chair and members  
Thames – Sydenham and Region  
Source Protection Committee

**Agenda #** 2009.06.6.a

**Cc** SP Management Committee

**Date** June 9, 2009

**Prepared By** Chitra Gowda, Technical Coordinator  
and Chris Tasker, Project Manager

**Re:** Issues Evaluation Methodology

### **Background**

- **Rule 114** (Clean Water Act Technical Rules, December 2008) defines a water quality issue as a parameter or pathogen in the raw water source at the intake or well in a concentration that deteriorates or trends towards a deterioration of raw water quality for drinking purposes
- **Rule 115** requires that the issue be described including the area within the vulnerable area it occurs and threat contributing to the issue
- **Rule 116** requires that, if the information required as per Rule 115 cannot be ascertained, a plan to identify them be provided in a subsequent assessment report
- **Rule 117** requires that if a contributing threat is located outside of a source protection area, the SP area where the threat occurs must be identified by the SPC

### **Discussion**

- Water quality issues evaluation methodology was discussed at the SPC meeting on February 13, 2009
- Clarification on the separate consideration of microbial indicators and pathogens was made by the Ministry of Environment in late March 2009
- The proposed issues evaluation methodology flow chart was discussed at the SPC meeting and approved in principle on April 3, 2009
- The proposed issues evaluation methodology discussion paper including the flow chart were provided to municipal technical contacts and consultants on April 17, 2009 to obtain their feedback over a 3 week comment period
- Feedback obtained by email and through telephone discussions were considered in the paper and the finalized issues evaluation methodology was provided on **May 15, 2009** to the consultants as direction for their immediate initiation of this work
- The finalized issues evaluation methodology is attached herein and is comprised of two main steps: an initial screening to flag potential issues, and issues identification where flagged substances are further investigated to identify issues while noting their origin (naturally occurring or anthropogenic)
- Provision has been made to consider 'other' parameters (those not included in Rule 114) by being brought to the attention of the SPC

- Further direction on conducting a microbial risk assessment is required from MOE should an assessment need to be completed, i.e. if a pathogen (other than Schedule 1 microbial indicators) are flagged as potential issues
- An issues evaluation database has been defined by the Thames-Sydenham and Region to collect and store information on flagged potential issues and identified issues

**Thames-Sydenham and Region  
Source Protection Region**

**ISSUES EVALUATION METHODOLOGY**

**Version 2.0  
May 14, 2009**

## Table of Contents

<b>1. INTRODUCTION</b>	<b>3</b>
<b>2. DATA USED IN THE ISSUES EVALUATION PROCESS</b>	<b>5</b>
2.1. <i>Data used for Screening</i>	5
2.1.1. Operating Authority Concerns	5
2.1.2. Thames and St. Clair Watershed Characterization Reports (December 2007)	5
2.1.3. Annual Drinking Water System (DWS) Reports	6
2.1.4. Parameters not listed in Schedules 1, 2, 3 or Table 4	6
2.2. <i>Data used for issues identification</i>	6
2.2.1. Drinking Water Surveillance Program (DWSP)	6
2.2.2. Drinking Water Information System (DWIS)	6
2.2.3. Other water treatment plant data such as laboratory analysis sheets for specific flagged parameters	6
<b>3. ISSUES EVALUATION METHODOLOGY</b>	<b>7</b>
3.1. <i>Pathogens</i>	8
3.1.1. Background	8
3.1.2. Presence in Raw Water	8
3.1.3. Screening	8
3.1.4. Issues Identification	9
3.2. <i>Schedule 1 Parameters</i>	9
3.2.1. Background	9
3.2.2. Presence in Raw Water	9
3.2.3. Screening	10
3.2.4. Issues Identification	10
3.3. <i>Schedule 2 And 3 Parameters</i>	10
3.3.1. Background	10
3.3.2. Presence in Raw Water	11
3.3.3. Screening	11
3.3.4. Issues Identification	11
3.4. <i>Table 4 Parameters</i>	11
3.4.1. Background	11
3.4.2. Presence in Raw Water	12
3.4.3. Screening	12
3.4.4. Issues Identification	12
3.5. <i>Other Parameters</i>	13
3.6. <i>Deliverables</i>	13
<b>Appendix A: Issues Evaluation Database</b>	<b>14</b>

# 1. INTRODUCTION

Under the Clean Water Act (2006) Technical Rules (December 2008), the assessment report must identify and describe drinking water quality issues. Identifying issues is a key step in the overall process of protecting drinking water quality. This is because an activity that may contribute to an identified issue is deemed a significant drinking water threat which must be mitigated, through source protection plans, to no longer be a significant threat.

In order to identify issues, the Thames-Sydenham and Region proposes an issues evaluation methodology with three main stages: screening, issue identification and issue description. The first two stages must be done to satisfy the **Rule 114**. The issues also have to be described according to **Rule 115**. The current document is intended to foster discussion on the proposed issues evaluation methodology. The methodology will be finalized upon consideration of comments from consultants and municipality staff working on technical studies in the Region, as well as conservation authority staff. The finalized methodology will serve as a guideline in the determination and description of drinking water quality issues in the Region for the Assessment Report.

The Rule 114 defines a parameter or pathogen being an issue if it is shown to deteriorate or trends towards a deterioration of raw water quality for the purposes of drinking. Hence assessing for the deterioration of the raw water meant for human consumption is an important step in defining issues, which can be accomplished by using a 'check' to determine whether a parameter is an issue or not. For treated drinking water, the 'check' is a drinking water standard. For the general health of a watershed and aquatic species in the water bodies, the 'check' is an aquatic life water quality objective. Raw water benchmarks for surface and groundwater drinking water sources are yet to be established. While background levels of water constituents may be reviewed, inadequate comprehensive long term (historical) data hinders the assessment of a background level of any contaminant in the raw water. It is important to consult with water treatment plant operating authorities, municipalities, consultants working on the technical studies, conservation authority staff and the Ministry of Environment (MOE) while setting up these 'checks' to identify issues in raw water sources.

**Rule 114.** *Without limiting the generality of subclause 15(2)(f) of the Act, the description of drinking water issues shall include the following drinking water issues in respect of the quality of water in a vulnerable area:*

**Subrule (1)** *the presence of a parameter in water at a surface water intake or in a well, including a monitoring well related to a drinking water system to which clause 15(2)(e) of the Act applies, if the parameter is listed in Schedule 1, 2 or 3 of the Ontario Drinking Water Quality Standards or Table 4 of the Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines and*

*(a) the parameter is present at a concentration that may result in the deterioration of the quality of the water for use as a source of drinking water; or*

*(b) there is a trend of increasing concentrations of the parameter at the surface water intake, well or monitoring well and a continuation of that trend would result in the deterioration of the quality of the water for use as a source of drinking water;*

**Subrule (2)** *the presence of a pathogen in water at a surface water intake or in a well related to a drinking water system to which clause 15(2)(e) of the Act does apply, if a microbial risk assessment undertaken in respect of the pathogen indicates that*

*(a) the pathogen is present at a concentration that may result in the deterioration of the quality of the water for use as a source of drinking water, or*

(b) there is a trend of increasing concentrations of the pathogen at the surface water intake or well and a continuation of that trend would result in the deterioration of the quality of the water for use as a source of drinking water; and

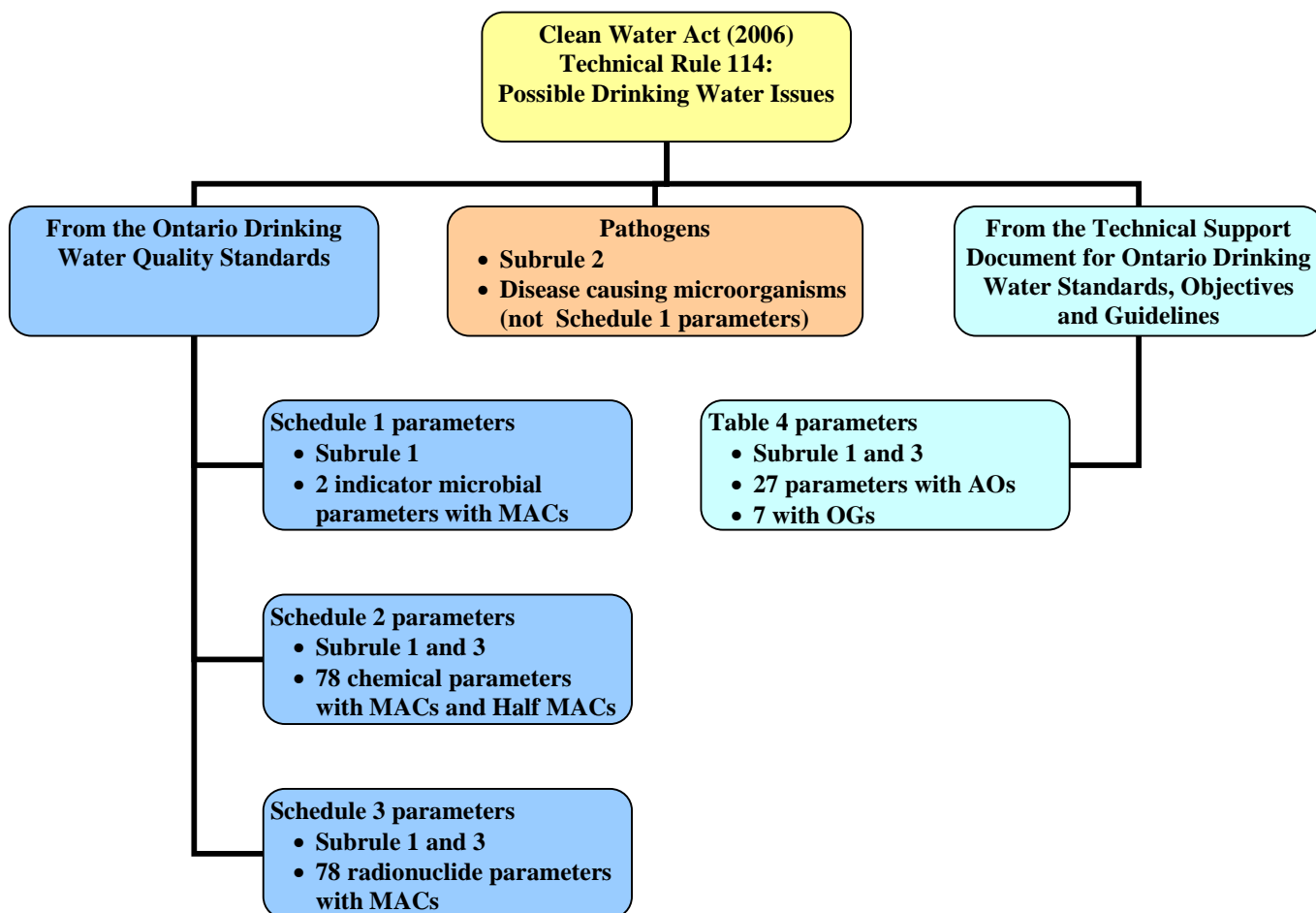
**Subrule (3)** the presence of a parameter in water at a surface water intake or in a well, including a monitoring well related to a drinking water system to which clause 15(2)(e) of the Act does not apply, if the parameter is listed in Schedule 2 or 3 of the Ontario Drinking Water Quality Standards or Table 4 of the Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines and

(a) the parameter is present at a concentration that may result in the deterioration of the water for use as a source of drinking water, or

(b) there is a trend of increasing concentrations of the parameter at the intake, well or monitoring well and a continuation of that trend would result in the deterioration of the quality of the water for use as a source of drinking water.

Rule 115 requires that an identified water quality issue be ‘described’, by listing the parameter or pathogen concerned, the intake or well where it has occurred, areas within vulnerable areas where the drinking water threats due to ‘prescribed’ (see Rule 118) or ‘other’ (see Rule 119) activities contribute to the issue, and lastly, listing activities, conditions (from past activities) and naturally occurring conditions associated with the issue.

**Figure 1 shows** the parameters and pathogens to be considered in the identification of drinking water quality issues under the Clean Water Act. Note that it does not include parameters not in Schedule 1, 2, 3 or Table 4.



**Figure 1: Clean Water Act Technical Rule 114: Possible Drinking Water Quality Issues**

The Ontario Drinking Water Standards are human health based criteria established under the Regulation 169/03 under the Safe Drinking Water Act (2002) and are called Maximum Acceptable Concentrations. The Technical Support Document<sup>1</sup> provides criteria for Table 4 parameters to meet aesthetic objectives and plant operational guidelines. The criteria listed below are used to help flag and identify drinking water quality issues with the exception of the microbial parameters as explained in the relevant section.

**Maximum Acceptable Concentrations (MACs)** are the drinking water standards for chemical, radionuclide and microbial parameters beyond which human health may be adversely affected.

**Half MAC** is that level at which a Schedule 2 (chemical) parameter in the treated water is flagged for increased sampling and testing requirements under Regulation 170/03 - Section 13-5, Safe Drinking Water Act (2002).

**Aesthetic Objectives (AO)** are criteria for certain Table 4 parameters at which parameters such as taste and turbidity that may affect the taste, odour or colour of water or interfere with good water quality control practices.

**Operational Guidelines (OG)** are criteria for certain Table 4 parameters at which parameters such as alkalinity and hardness that may negatively effect the efficient and effective treatment, disinfection and distribution of the water.

## **2. DATA USED IN THE ISSUES EVALUATION PROCESS**

### ***2.1. Data used for Screening***

In the screening step, parameters or pathogens are ‘flagged’ based on certain concerns or previous water quality data review and reports which are described below.

#### **2.1.1. Operating Authority Concerns**

Conduct interviews with drinking water systems (DWS) operating authority to note specific concerns in the raw and treated water quality. The consultant/municipality should interview the operating authority (OA), document the outcomes of the interview and have the OA sign the document to confirm the document is an accurate representation of the OA’s opinions and concerns. Concerns may include parameters or pathogens that persist even after treatment, or which interfere in the treatment process, or parameters due to past activities that have resulted in increased monitoring at the well or intake.

#### **2.1.2. Thames and St. Clair Watershed Characterization Reports (December 2007)**

In the characterization reports, half MAC, MAC, AO and OG were the checks to flag Schedule 2, 3 and Table 4 parameters in raw water to most intakes and some well systems (data from 1990 to 2005, 1 to 12 samples per year). Additional well system data reviewed were annual drinking water system (DWS) reports (data from 2004 to 2006) in which Schedule 2, 3 and Table 4 treated water parameters are checked against the half MAC and parameters flagged. Where data

---

<sup>1</sup> Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Ministry Of Environment, PIBS4449e01 (2003, Revised June 2006)

allowed it, upward trends in some Schedule 2 and 3 and Table 4 parameters are shown in the characterization reports. The weekly raw water microbial indicator data (2003 to 2006) is presented to show ranges of bacteria counts, spikes and seasonal variation and this information must be used as per the issues screening methodology for Schedule 1 parameters.

Where the data is not adequate for the purposes of screening to flag issues, other data where available may be utilised to flag parameters. For example, data available at the time of water quality review for the characterization reports for the West Elgin and Wheatley intakes were laboratory analysis sheets that were reviewed to provide raw water data for years 2001-2003 (West Elgin), and 2000-2002 (Wheatley) while annual DWS reports provided limited treated water data for 2005 (West Elgin), and 2003-2005 (Wheatley).

### **2.1.3. Annual Drinking Water System (DWS) Reports**

The annual DWS reports flag parameters that persist in treated drinking water and where required, additional sampling and testing of raw water for specific parameters is also reported. Schedule 2 (chemical) parameters in treated water that exceed the half MAC are flagged for increased monitoring, under the Regulation 170/03 - Section 13-5, Safe Drinking Water Act (2002). Exceedances of the MAC for Schedule 1, 2 and 3 and some Table 4 parameters are provided in these reports. Summary of additional testing and sampling carried out in accordance with the requirement of a certificate of approval, order or other legal instrument are also provided in the annual reports (these may also be raw water samples). A review of the reports must be done to flag parameters with exceedances of half MAC, MAC, and parameters that undergo extra testing by legal order.

### **2.1.4. Parameters not listed in Schedules 1, 2, 3 or Table 4**

In other source protection regions, there have been suggestions to consider parameters not included in Rule 114 for issues identification. Further clarification from the Ministry of Environment is requested and required before considering parameters not listed in the schedules and table. Any such parameters should be brought to the attention of the SPC immediately.

## **2.2. Data used for issues identification**

In the issues identification step, data to be used to determine if the screened (flagged) parameters are issues are:

### **2.2.1. Drinking Water Surveillance Program (DWSP)**

DWSP is a voluntary program and not all drinking water systems participate in this. This dataset provides raw water Schedule 2, 3 and Table 4 parameter data. Data on the flagged parameters should be reviewed as per the relevant methodology outlined in this document to confirm issues.

### **2.2.2. Drinking Water Information System (DWIS)**

This dataset provides Schedule 1 (indicator microbial) data and some chemical parameter data. Data on the flagged parameters should be reviewed as per the relevant methodology outlined in this document to confirm issues.

### **2.2.3. Other water treatment plant data for specific flagged parameters**

Where limited data is available on flagged parameters or pathogens, laboratory analysis sheets (usually available from the water treatment plant) may be used to help decide on whether they are issues or not. Any other such reliable raw or treated water data (like grab sample data from MOE inspection reports) may be used to further substantiate that a flagged parameter is an issue.

### 3. ISSUES EVALUATION METHODOLOGY

Figure 2 is a flow chart of the proposed issues evaluation methodology. The data sets are described in the previous section. There are separate screening and issues identification methodologies for pathogens, the different types of parameters grouped as in Rule 114, and parameters not included in Rule 114.

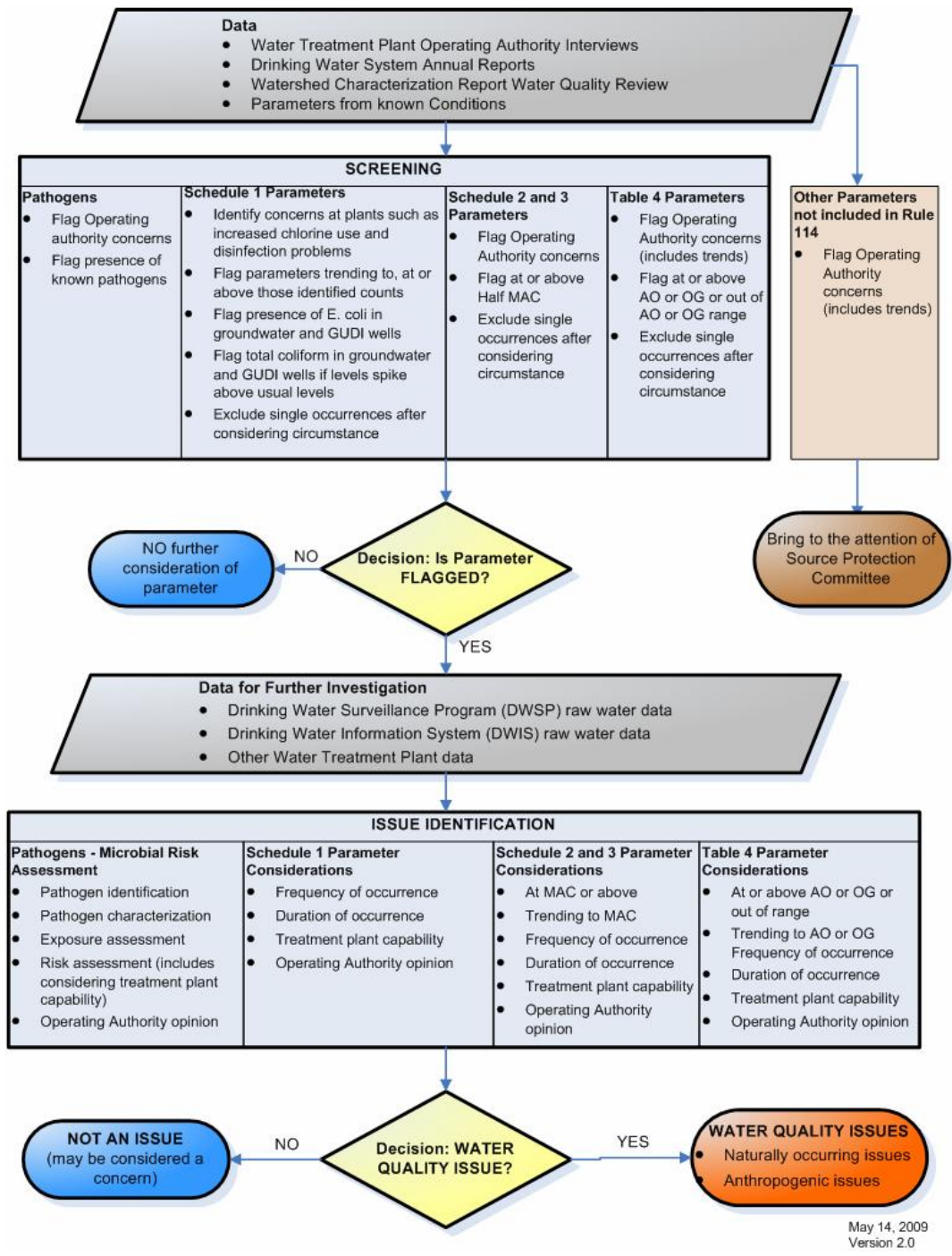


Figure 2: Proposed Issues Evaluation Methodology

## **3.1. Pathogens**

### **3.1.1. Background**

Pathogens are disease-causing bacteria, viruses or protozoa. They can cause severe or fatal waterborne illness in humans. Some are resistant to commonly used disinfectants at water treatment plants. Reliable laboratory detection methods for pathogenic protozoa are yet to be established. There are no established Canadian water quality guidelines for these microbiologic organisms.

It is understood that, under the Clean Water Act (2006), a microbial risk assessment must be done in order to confirm the identification of issues caused by pathogens. The main steps in such a risk assessment are pathogen identification and characterization, exposure assessment and risk characterization<sup>2</sup>.

**Any pathogens flagged through the pathogen screening process must be brought to the attention of the Thames-Sydenham and Region SPC. The Thames-Sydenham and Region is waiting for direction from the MOE on microbial risk assessment and until such direction is provided, it is suggested to complete the screening step only.**

### **3.1.2. Presence in Raw Water**

Pathogens may be found in raw surface water but not in groundwater, unless the groundwater is under the direct influence of surface water sources. Pathogens are not monitored routinely in raw water sources unless a known outbreak of waterborne illness caused by a pathogen or known fecal contamination has occurred. The indicators total coliform and *E. coli* are used to indicate the possible presence of some pathogens.

The presence of the ‘current’ bacterial waterborne pathogens (e.g.: *Salmonella* and *Campylobacter*) may be associated with the presence of *E. coli*, a Schedule 1 parameter, but *E. coli* does not indicate the presence of the ‘emerging’ bacterial waterborne pathogens (e.g.: *Legionella* and *Helicobacter pylori*)<sup>3</sup>. Enteric viruses (such as noroviruses, hepatitis A and rotaviruses) and protozoa (such as *Giardia* and *Cryptosporidium*) cause human waterborne illnesses. The presence of *E. coli* is an indication that enteric viruses or protozoa could also be present; however, because enteric viruses and protozoa are more resistant to disinfection, the absence of *E. coli* does not necessarily mean that they are also absent<sup>4,5</sup>.

### **3.1.3. Screening**

- Operating Authority concerns must be flagged

---

<sup>2</sup> Revised Framework for Microbial Risk Assessment. International Life Sciences Institute. 2000. ILSI Press, Washington, D. C., USA

<sup>3</sup> Health Canada (2006) Guidelines for Canadian Drinking Water Quality: Guideline Technical Document — Bacterial Waterborne Pathogens — Current and Emerging Organisms of Concern. Water Quality and Health Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario.

<sup>4</sup> Health Canada (2004) Guidelines for Canadian Drinking Water Quality: Supporting Documentation — Enteric Viruses. Water Quality and Health Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario.

<sup>5</sup> Health Canada (2004) Guidelines for Canadian Drinking Water Quality: Supporting Documentation — Protozoa: *Giardia* and *Cryptosporidium*. Water Quality and Health Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario.

- Known presence of a pathogen at a raw water source must be flagged
- Known presence of a pathogen in treated drinking water (some pathogens resist disinfection) must be flagged
- Pathogen causing a past waterborne outbreak linked to the water supply must be flagged
- Single occurrences of pathogen in water samples due to faulty sampling or false laboratory results must be excluded from consideration

### 3.1.4. Issues Identification

- Microbial risk assessment must be done to confirm that the flagged pathogen is an issue
- The main steps in a microbiological hazard risk assessment are hazard (pathogen) identification, hazard characterization, exposure assessment and risk characterization<sup>6</sup>
- Elements include pathological characteristics, infection mechanisms, resistance to control or treatment, survival, persistence, seasonality, reliability of treatment processes, route of human exposure, exposed population characteristics, treatment, recontamination, infectivity, human dose response data, risk event and magnitude, evaluation of control measures<sup>2</sup>
- The microbial risk assessment takes into consideration the treatment plant disinfection capabilities, i.e. if a pathogen is adequately disinfected at the treatment plant, it may not be considered an issue

## 3.2. Schedule 1 Parameters

### 3.2.1. Background

Total coliform and *Escherichia coli* are the Schedule 1 parameters. They are microbial indicators. Total coliform bacteria are widespread in nature being present in the soil and in the intestines and feces of animals including humans, livestock, poultry and wildlife. For drinking water, total coliform are still the standard test because their presence indicates contamination of a water supply by an outside source. *Escherichia coli* (*E. coli*) is commonly used as an indicator of recent contamination of water by disease-causing bacteria, viruses or protozoa including those that are resistant to commonly used disinfectants. It is found exclusively in the faeces of humans and other animals. A specific strain of *E. coli*, O157:H7, is pathogenic and is not specifically identified while routinely testing water for Schedule 1 parameters. If however the particular strain is identified, it is examined under the pathogen issues identification methodology. The commonly used unit to enumerate coliform bacteria is counts (of coliform) per 100 mL (of water sample).

### 3.2.2. Presence in Raw Water

Total coliform is commonly found in raw surface and groundwater sources, at a few orders of magnitude lower in groundwater due to natural geologic protection. *E. coli* is widely found in surface water sources and rarely present in groundwater. From the municipal raw water quality data review conducted in the Thames-Sydenham and Region watershed characterization report:

- It was observed that the total coliform was present in most raw groundwater sources, ranging from zero to 100 counts/100 mL. Total coliform was also widely present in raw water at surface intakes, ranging from zero to as high as 90,000 counts/100 mL

---

<sup>6</sup> Revised Framework for Microbial Risk Assessment. International Life Sciences Institute. 2000. ILSI Press, Washington, D. C., USA

- E. coli was found to be absent in nearly all raw groundwater well sources, with a highest count of only 3 per 100 mL in one well. E. coli ranged between zero and 2000 counts/100mL in raw surface water at the intakes

### **3.2.3. Screening**

In the Thames and St. Clair watershed characterization reports, the weekly raw water microbial indicator data (2003 to 2006) is presented to show ranges of bacteria counts and seasonal variation and this information as well as a review of data after 2006 must be used to flag potential issues as per the following criteria:

- Flag concerns and problems at plants due to high counts or trends of total coliform and E. coli in raw surface water and total coliform in groundwater that cause increased chlorine consumption or affect the disinfection capability. This is to be done in consultation with operating authority
- Flag the presence of E. coli (>0 counts/100mL) in raw groundwater and groundwater under the direct influence of surface water (GUDI) wells
- Flag total coliform in groundwater and GUDI wells that spike above usual levels
- Exclude single occurrences of total coliform or E. coli due to faulty sampling or false laboratory result

### **3.2.4. Issues Identification**

The following factors must be considered in determining whether the Schedule 1 parameter is an issue or not:

- Flagged Schedule 1 parameters must be examined for frequency and duration of occurrence, including continuous or repeated occurrence, trends, frequency of spikes that interfered in treatment processes (for example, a one time spike over 5 years data may not be an issue)
- Consider treatment plant capabilities recognising the multibarrier approach in source water protection (i.e. a parameter might be an issue even if the plant can typically remove or reduce it to acceptable levels, or a parameter might not be an issue if it is adequately treated and there is no evidence of worsening levels)
- Consult operating authority for their opinion on the identified issue

## **3.3. Schedule 2 And 3 Parameters**

### **3.3.1. Background**

Schedule 2 parameters include organic and inorganic chemicals from industrial and agricultural activities as well as municipal waste and natural decomposition of organic matter. Inorganic chemicals include metals and nitrates. Organic chemicals include pesticides (e.g.: atrazine and DDT), polynuclear aromatic hydrocarbons (e.g.: benzo-a-pyrene, chlordane), chlorophenols (e.g.: 2,4-dichlorophenol), volatile organics (e.g.: benzene, vinyl chloride), dioxins and furans (e.g.: 2,3,7,8 TCDD). Schedule 3 parameters, radionuclides, occur naturally or are released during activities like mining or nuclear energy production. Upon ingestion, they may cause cancer or hereditary genetic changes in children<sup>7</sup>. Examples are radium-224, uranium-235 (both natural) and tritium (artificial).

---

<sup>7</sup> Technical Support Document for the Ontario Drinking Water Standards, Objectives and Guidelines, June 2003 (revised June 2006)

### 3.3.2. Presence in Raw Water

From the municipal raw water quality data review conducted in the Thames-Sydenham and Region watershed characterization report, certain Schedule 1 inorganic chemicals in the raw source water were found to be close to or above levels at which they could pose a risk to human health. Some of these inorganic chemicals are naturally occurring. In general, Schedule 2 organic chemicals as well as Schedule 3 radionuclides were either detected (and at levels not posing a risk to human health), or below detection levels.

### 3.3.3. Screening

- Flag operating authority concerns by conducting interviews with drinking water systems (DWS) operating authority to note specific parameters of concern to them in the raw and treated water, including qualitative concerns like nuisance plant growth (algae) at or near the intake (which may lead to flagging a nutrient parameter)
- A review of the annual drinking water system reports must be done to flag parameters with exceedances of half MAC as well as flag parameters that undergo extra testing by legal order
- Use the watershed characterization reports to flag schedule 2 and 3 parameters in raw and treated water at or above the Half MAC
- Make mention of those flagged that are naturally occurring or due to known past activities (conditions)
- A single instance of a parameter at or above Half MAC that is an isolated occurrence, faulty sampling or false laboratory result should be excluded from consideration as an issue

### 3.3.4. Issues Identification

- Identify, from flagged parameters, those trending to MAC levels and those at MAC levels
- Consider frequency of occurrence (a few times a year, seasonal, continuous presence, etc.) and further upward trending of identified parameters
- Consider treatment plant capabilities recognising the multibarrier approach in source water protection (i.e. a parameter might be an issue even if the plant can typically remove or reduce it to acceptable levels, or a parameter might not be an issue if it is adequately treated and there is no evidence of worsening levels)
- Identify parameters in spills that may have caused the water treatment plant to be shut down
- Obtain operating authority's opinion on identified issues

**Note:**

**Maximum Acceptable Concentrations (MACs):** Ontario drinking water standards for chemical, radionuclide and microbial parameters beyond which human health may be adversely affected

**Half MAC:** The level at which a Schedule 2 (chemical) parameter in the treated water is flagged for increased sampling and testing requirements (under Regulation 170/03 - Section 13-5, Safe Drinking Water Act, 2002)

## 3.4. Table 4 Parameters

### 3.4.1. Background

The Table 4 parameters are physical and chemical parameters such as taste and turbidity that may affect the taste, odour or colour of water or interfere with good water quality control practices. Also included are parameters such as alkalinity and aluminum may negatively effect the efficient and effective treatment, disinfection and distribution of the water.

### 3.4.2. Presence in Raw Water

From the municipal raw water quality data review conducted in the Thames-Sydenham and Region watershed characterization report, certain Table 4 parameters in the raw source water were found to be close to or above levels at which they could affect the aesthetic quality of water or the operation of the water treatment plant. Some of these are naturally occurring.

### 3.4.3. Screening

- Flag operating authority concerns by conducting interviews with drinking water systems (DWS) operating authority to note specific parameters of concern to them in the raw and treated water, trends of those parameters, and qualitative concerns like taste and odour
- Flag all Table 4 parameters in raw and treated water at or above the respective AO or OG
- A single instance of a parameter above AO or OG should be further checked for isolated occurrence, faulty sampling or false laboratory result
- Flag certain parameters differently
  - The AO of sodium is 200 mg/L, but the local Medical Officer of Health should be notified when sodium exceeds 20 mg/L to inform patients on sodium restricted diets. Flag sodium levels at or above 20 mg/L
  - The parameters 1,2-dichlorobenzene, 1,4-dichlorobenzene, 2,4-dichlorophenol, 2,3,4,6-tetrachlorophenol, 2,4,6-trichlorophenol, 2,4,5-trichlorophenoxy acetic acid, monochlorobenzene and pentachlorophenol have both AOs and MACs; these would be considered under the issues identification process for Schedule 2 parameters using the half MAC (half Ontario treated drinking water standard) and not under the AO
  - Flag parameters pH, alkalinity and hardness at levels outside the OG range
- Flag qualitative and contributing parameters
  - Flag qualitative parameters like taste and odour based on operating authority interview information. Flag parameters that contribute to the Table 4 parameters even if they are not included in Rule 114; for example increased phosphorus levels may have caused algal growth which in turn may cause taste and odour problems at the intake, so flag the parameters of taste and odour and the contributing parameter phosphorus
  - Flag turbidity at or above AO levels for further investigation. Turbidity can significantly interfere with disinfection, be a source of disease-causing organisms and shield pathogenic organisms from the disinfection process; it is also an indicator of treatment efficiency (particularly filters)<sup>8</sup>.
  - If trihalomethanes (THMs) are flagged (under the methodology for Schedule 2 parameters), then flag contributing raw water parameters of dissolved organic carbon (DOC) and turbidity, which are Table 4 parameters. Raw water DOC and the organic content in turbidity combine with chlorine disinfectants at the treatment plant to form trihalomethanes (THMs), a by product that deteriorates the quality of drinking water

### 3.4.4. Issues Identification

- Further investigate flagged parameters for levels or trending to AO or OG levels and their interferences with proper treatment, for example, investigate flagged turbidity for interference with proper disinfection or filtration, or for contributing to flagged levels of THMs

---

<sup>8</sup> Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines. MOE PIBS 4449e01, June 2003, revised June 2006

- Consider parameters (including those not identified in Rule 114) contributing to flagged Table 4 parameters
- Consider frequency of occurrence (a few times a year, seasonal, continuous presence, etc.) and further upward trending of identified parameters
- Consider treatment plant capabilities recognising the multibarrier approach in source water protection (i.e. a parameter might be an issue even if the plant can typically remove or reduce it to acceptable levels, or a parameter might not be an issue if it is adequately treated and there is no evidence of worsening levels)
- Identify parameters in spills that may have caused the water treatment plant to be shut down
- Obtain operating authority opinion on list of issues

**Note:**

**Aesthetic Objectives (AO):** The level at which parameters such as taste and turbidity that may affect the taste, odour or colour of water or interfere with good water quality control practices.

**Operational Guidelines (OG):** The level at which parameters such as alkalinity and hardness that may negatively effect the efficient and effective treatment, disinfection and distribution of the water.

### **3.5. Other Parameters**

In other source protection regions, there have been suggestions to consider parameters not included in Rule 114 for issues identification. Further clarification from the Ministry of Environment on the consideration of issues arising due to parameters not listed in Rule 114 is requested and required before considering parameters not listed in the schedules and table. Any such ‘other’ parameters should be brought to the attention of the SPC immediately.

### **3.6. Deliverables**

The deliverables expected upon completion of the issues evaluation methodology are:

1. List of flagged parameters per intake or well or well system (if individual well data is unavailable, report flagged parameters for the well system), identifying those believed to be naturally occurring
2. List of issues with detailed justification for the identification of each issue, noting those believed to be naturally occurring
3. Supporting items, where it is possible, for issue identification such as tables (showing exceedances above the relevant criteria, ranges of flagged parameters), scatter plots (for schedule 1 parameters, can be obtained from watershed characterization report) and time series graphs (showing trends with or without linear regression depending on number of data points)
4. Completed **Appendix A: Issues Evaluation Database**

While the issues evaluation database summarizes the issues evaluation, it is still required to provide deliverables 1, 2 and 3 in a document separate from the completed Appendix A.

## Appendix A: Issues Evaluation Database

Field Name	Rule Reference	Description of contents	Field Type	Field Size	Choices
Issue_ID	114 & 115(1), (2)	<i>A unique identifier of the issue</i>	AutoNumber	Single (Integer)	N/A
DWS_no	114 & 115(1), (2)	<i>Drinking Water System number for the well, intake or system</i>	Text	10	N/A
Intake_Well_Name	114 & 115(1), (2)	<i>Identify the name or number of the well or intake</i>	Text	50	N/A
Intake_Well_Desc	114 & 115(1), (2)	<i>Include a brief description of the well or intake location and identify whether emergency intake or backup well</i>	Text	250	N/A
Pa_Name	114 & 115(1), (2)	<i>Name of parameter (e.g.: trichloroethylene) or pathogen (e.g.: Cryptosporidium)</i>	Text	50	N/A
Type	114 & 115(1), (2)	<i>Schedule 1, 2, 3 or Table 4 parameter OR pathogen OR 'Other' (not listed in rule 114)</i>	Text	10	Sched1 Sched2 Sched3 Table4 Pathogen Other
Natural	114 & 115(1), (2)	<i>Identify whether the parameter is believed to be naturally occurring</i>	Text	15	Natural Anthropogenic Both?
Description	114 & 115(1), (2)	<i>Describe briefly the nature of the issue and why it was identified as an issue - E.g.: exceeded drinking water standard several times in past 10 years</i>	Text	250	N/A
Issue_Status		<i>Identify whether the parameter was flagged only or has further been identified as an issue</i>	Text	10	Flagged Issue
Contrib_Area	115 (3)	<i>Provide a brief description of the area within vulnerable areas thought to be contributing to the issue</i>	Text	100	N/A
Threat_ID_Plan	116	<i>If information as per rule 115 (3) and (4) cannot be ascertained, a plan needs to be provided to obtain this information in a subsequent Assessment report. Provide a brief description of how you would propose to identify the area and threats which are contributing to this issue</i>	Text	250	N/A
SP_Area	117	<i>Identify the SP Area or areas (outside the SP Area where the issue occurs) in which contributing threats are believed to be located</i>	Text	20	LTV SCR UTR ER ABMV Other (specify)