



Source Water Protection 101

Nutrient Management Consultants Information Day
April 23, 2018

Ministry of the Environment and Climate Change
Source Protection Programs Branch

Agenda

Source Protection Program – Context

- Justice O'Connor inquiry
- Multi-barrier approach to protecting drinking water
- Clean Water Act and regulations

Source Protection Program – Overview

- Structure and process
- Assessment reports – identifying vulnerable areas and assessing risks to drinking water sources
- Source protection plans and policies – addressing risks to drinking water sources

Source Protection Program Context

- After the Walkerton tragedy in May 2000, Justice Dennis O'Connor was commissioned to lead an inquiry into the contamination of the Walkerton water supply and more broadly, the safety of Ontario's drinking water
 - Walkerton Inquiry Report made 121 recommendations
- *Clean Water Act, 2006* (CWA) came into force July 3rd, 2007
 - Fulfills 12 of Justice O'Connor's recommendations
- First Principle – concept of prevention in the safeguarding of our drinking water for our communities and our health
- Objective is to establish a collaborative, locally driven, science-based, multi-stakeholder process to protect municipal residential drinking water sources

Scope of Clean Water Act, 2006

- The purpose of the CWA is to protect existing and future sources of drinking water from contamination or depletion
- Manages activities that could be a risk to sources of drinking water in Ontario
- Relies on existing legislation, regulations, and processes to manage or eliminate risks
- Does not extend the powers of existing legislation and regulations
- Where there is a conflict between pieces legislation – the one that is more protective of drinking water applies
- Part IV of the CWA provides municipalities with an authority to regulate threat activities that may pose a significant risk to drinking water. It is intended to *address the gaps* where significant drinking water threats cannot be addressed by other existing planning tools or regulatory instruments.

Source Protection Program – Overview

- CWA established 38 source protection areas within the Province generally based on Conservation Authority boundaries under the *Conservation Authorities Act*, 1990.
- Source protection plans are now in place for municipal residential drinking water systems within the 38 source protection areas, representing approximately 90% of the population within those source protection areas
- Other systems (i.e. cluster of private wells/intakes, non-residential systems) may be added by municipal council resolution, or through Minister's Order
- First Nations drinking water systems may be included through an amendment to Regulation 287/07 and a band council resolution
- Moving forward, any new municipal residential drinking water systems will need to be added to existing source protection plans

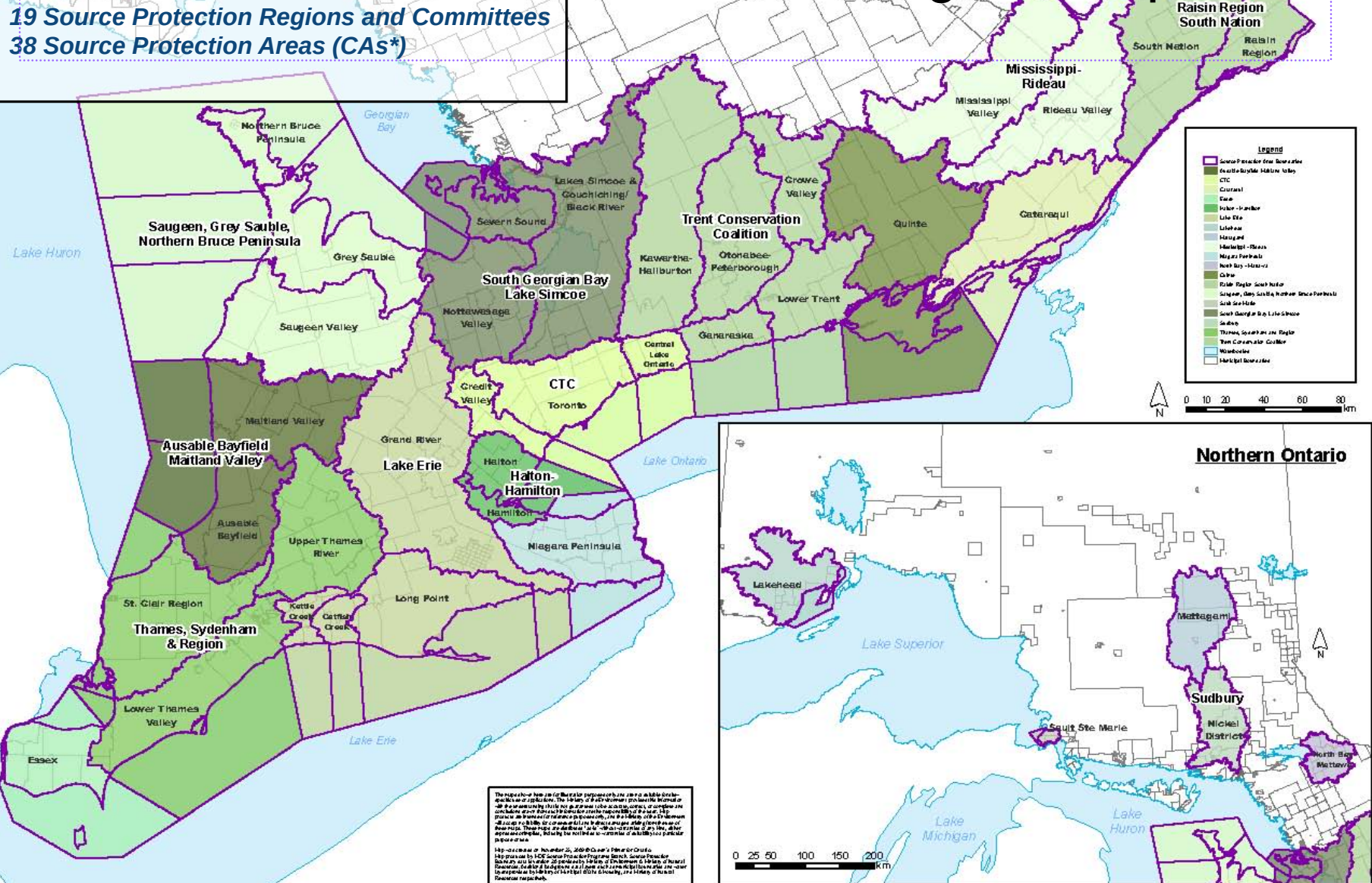
Source Protection Areas & Regions

Regulation 284/07

Source Protection: Scope

19 Source Protection Regions and Committees
38 Source Protection Areas (CAs*)

Source Protection Area and Regions map



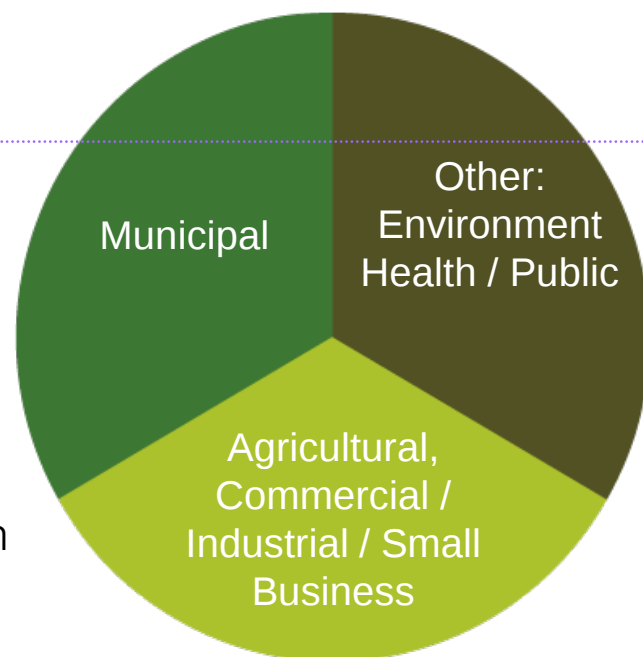
Key Players

Source Protection Committee (SPC)

- Multi-stakeholder committee
- Were responsible for initial terms of reference, assessment report, and source protection plan
- Ongoing role in any revisions of these documents and in review of annual progress on implementation

Source Protection Authority (Conservation Authority)

- Appoints SPC and provides administrative and technical support to the committee
- Supports implementation, and tracks and reports on progress
- Responsible for plan revisions (s.34, 35, 36) and engaging the SPC, municipalities and others in these revisions
- Maintains all records for 15 years



Source Protection Process 2006-2018

Source Protection Committees (SPC)

Assessment Report (AR)

- Identify municipal water systems
- Delineate vulnerable areas associated with those systems
- Identify threat activities that may pose a risk to drinking water

Source Protection Plan (SPP)

- Develop policies to address drinking water threat activities
- Multiple policy tools available to SPCs, eg. prescribed instrument, specify action, research

MOECC

Review and Approval of SPPs

All plans approved and in effect by July 2016.

Implementing Bodies

Implementation

Implementing policies, monitoring, reporting

SPC

Review and update of AR and SPP

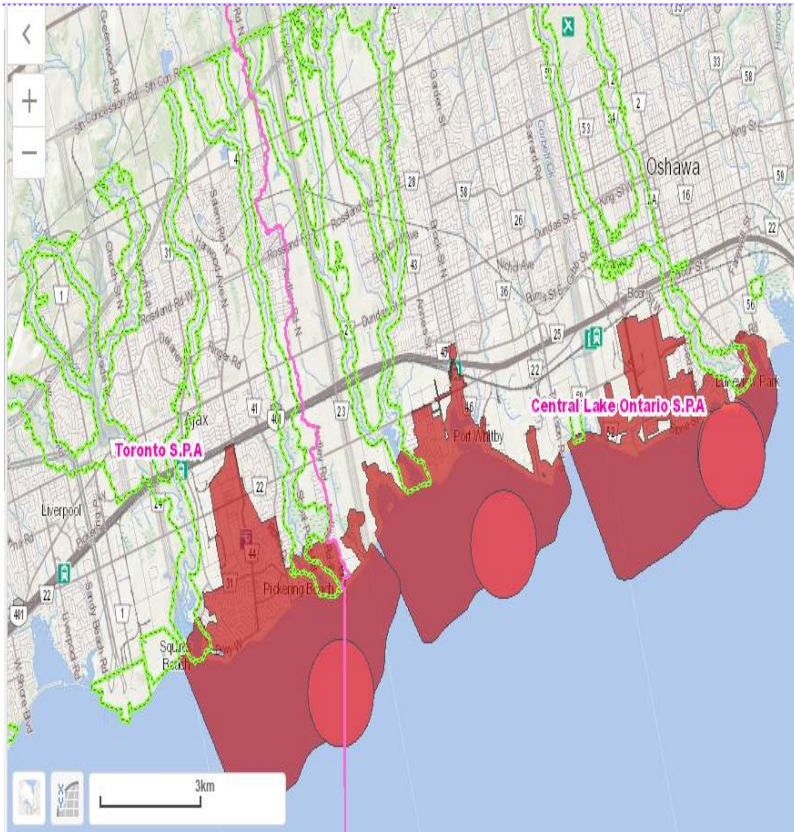
Assessment Report

- Assessment Reports determine the vulnerability of groundwater and surface water within watersheds
- Consist of three main parts:
 - Watershed characterization: an overview of the watershed, location of drinking water systems
 - Vulnerability Assessment: assessing the vulnerability of sources of drinking water to contamination or depletion
 - Threats assessment: identification and enumeration of risks to drinking water in vulnerable areas

Assessment Report – Vulnerability Analysis

- Water quality vulnerability analysis assesses how vulnerable **groundwater** and **surface water** sources are to contamination
- Water quantity vulnerability analysis uses **water budgets** to assess the sustainability of the drinking water sources
- Through these analyses four types of vulnerable areas are delineated:
 - Intake Protection Zone (IPZ) (around municipal intakes)*
 - Wellhead Protection Area (WHPA) (around municipal wells)*
 - Significant Groundwater Recharge Areas (SGRAs)
 - Highly Vulnerable Aquifers (HVAs)
- Within these areas you will often see two other types of areas:
 - Event Based Areas (EBAs)
 - Issue Contributing Areas (ICAs)

Vulnerable Areas – Surface Water (IPZ) (Water Quality)

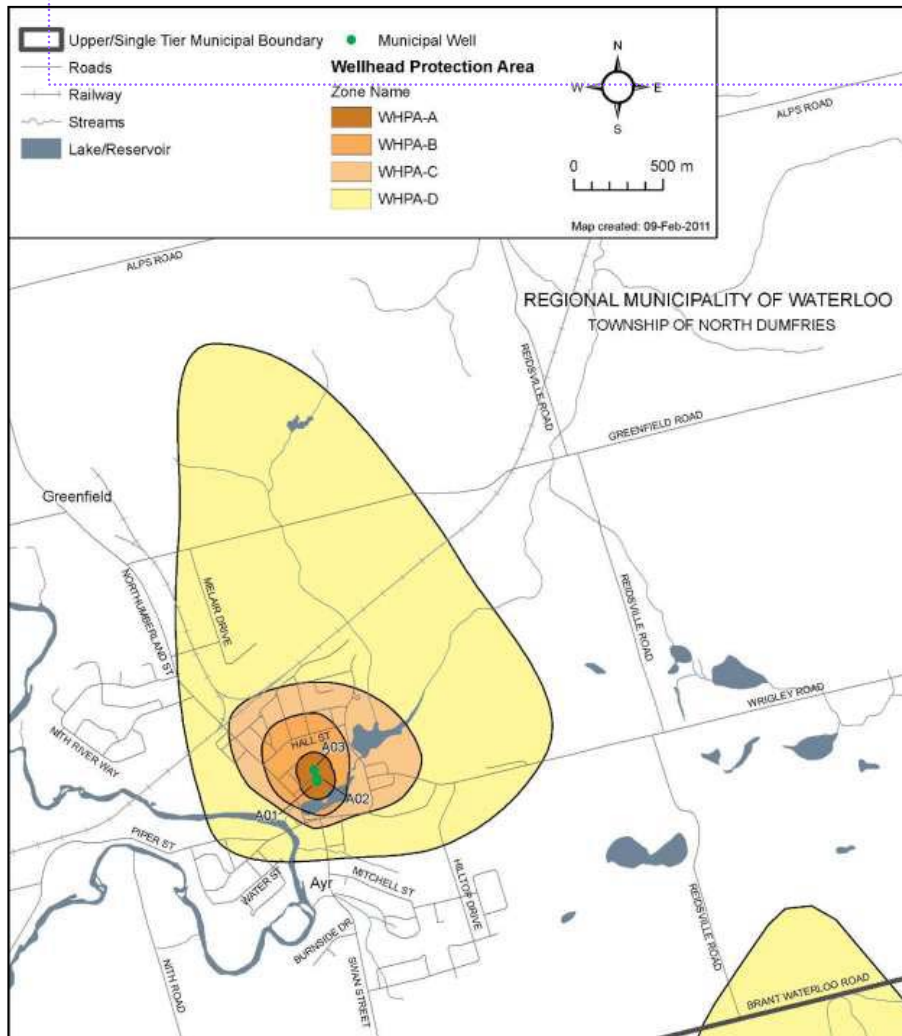


- Vulnerable areas around a surface water intake are known as Intake Protection Zones (IPZs)
- Three sub-areas within the IPZ for water quality:
 - **IPZ-1:** zone closest to intake, most vulnerable, direct and immediate impacts to drinking water source possible; no spill response time
 - **IPZ-2:** zone further upstream from intake, direct impacts to drinking water source possible; limited spill response time
 - **IPZ-3:** zone covers larger portion of watershed; time available to manage spills
- Modelling and local site characteristics are used to delineate these protective zones

Intake Protection Zone (IPZ) Vulnerability Scoring

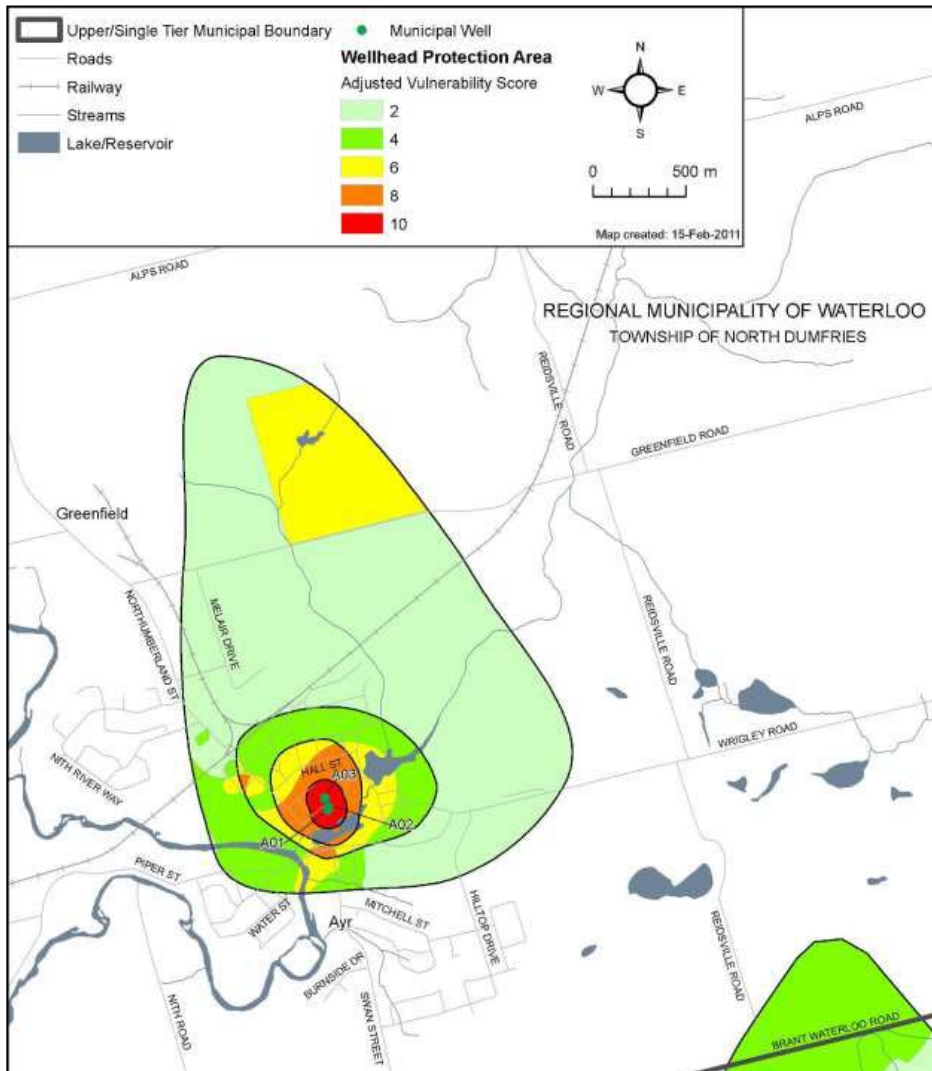
- Each water quality IPZ area is assessed to determine how vulnerable it is to contamination
- A vulnerability score is assigned based on a variety of factors:
 - Area factors such as land cover, rainfall, slope
 - Source factors such as depth of intake, length of intake from shoreline
 - Type of intake such as Great Lakes, Connecting Channel, Inland River, others
- These vulnerability scores are used to determine whether activities pose a risk to the source of drinking water. Depending on their score, risks can be identified as high, medium or low.
- As set out in the Director's Table of Drinking Water Threats, threat activities may pose a significant risk in vulnerable areas scoring 8 or higher (with some exceptions)

Vulnerable Areas – Groundwater (WHPA)



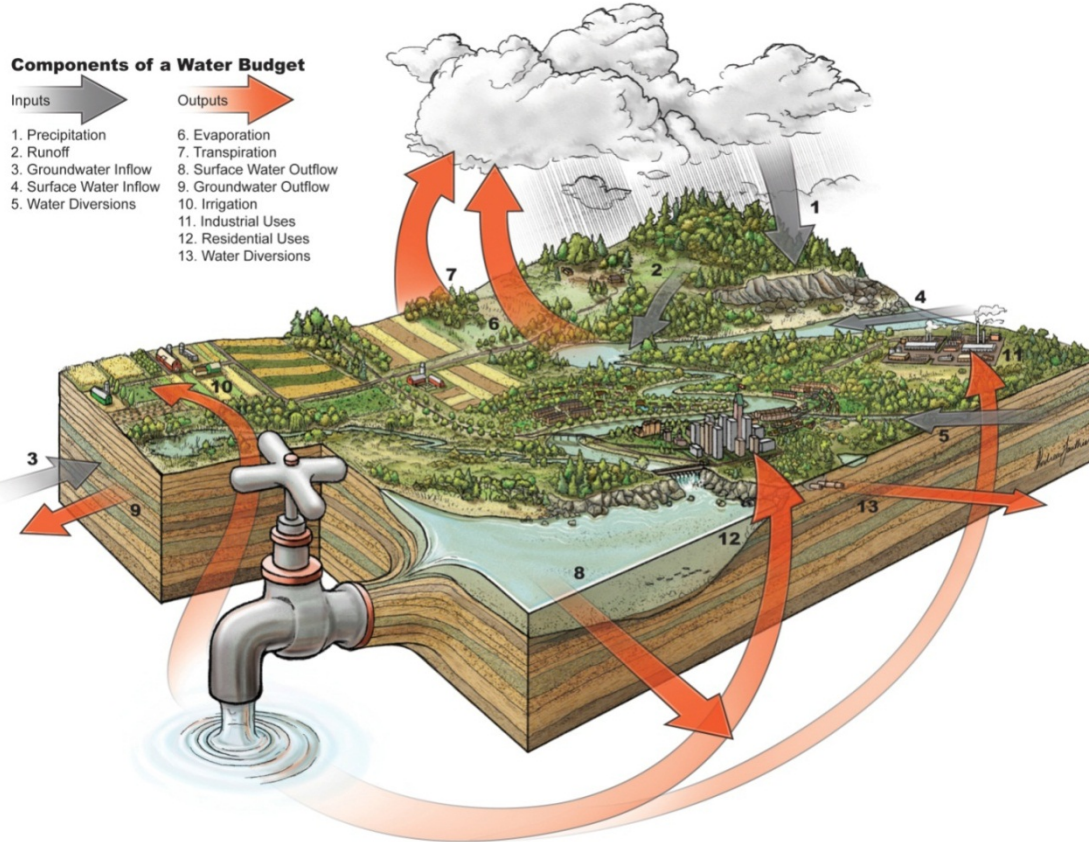
- The WHPA is the area around the well that has the highest probability of impacting the quality of water flowing into the well. Its size is dependent on several factors, including type of aquifer (bedrock, sand) and the direction and speed that groundwater travels.
- Four water quality zones are delineated based on how long it takes water to move underground to the well (the time of travel):
 - WHPA-A: 100m radius (quickest)
 - WHPA-B: 2 yr. Time of Travel (TOT)
 - WHPA-C: 5 yr. TOT
 - WHPA-D: 25 yr. TOT (slowest)

WHPA Vulnerability Scoring



- Vulnerability scores are created by overlapping the groundwater vulnerability with the time of travel areas.
- Scoring increases closer to the well and with increasing aquifer vulnerability
 - Always score 10 in WHPA-A
 - WHPA-B can have a score of 10, 8 and 6 with high, medium and low groundwater vulnerability, respectively
 - WHPA-C scores 8, 6 and 4
 - WHPA-D scores 6, 4 and 2

Water Quantity Vulnerability Analysis: Water Budgets



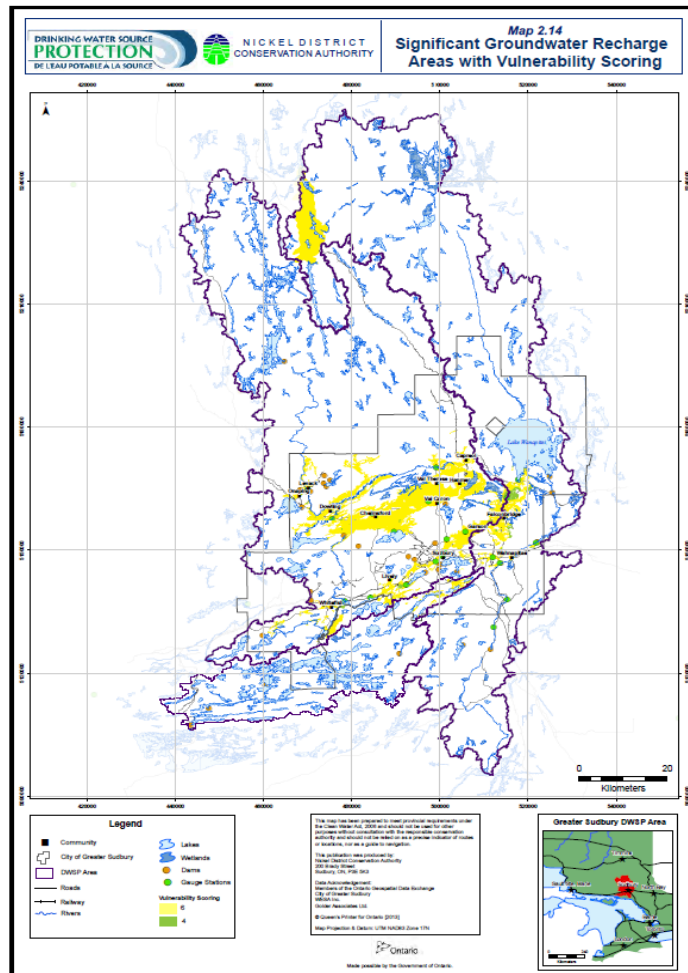
(Conservation Ontario, 2009)

- Water budgets focus on water quantity – the amount of water available
- By analyzing how much water enters a watershed, how much is stored and how much leaves, this information is used to balance needs between human uses and natural processes.
- The water budget process can include up to four levels of analysis, with the technical analysis becoming more complex if concerns about water quantity arise.

Vulnerable Areas: WHPA Q1, WHPA Q2 , IPZ-Q

- The water budgets are used to define areas where water quantity is at risk.
- Where a tier 3 water budget shows a system is vulnerable to depletion the following areas are defined:
 - WHPA Q1 – areas around a well where consumptive water takings can pose a risk
 - WHPA Q2 – areas around a well where reductions in recharges can pose a risk
 - IPZ-Q – areas around an intake where consumptive water takings or reduction in recharge can pose a risk

Vulnerable Areas – Significant Groundwater Recharge Areas (SGRAs)



- A recharge area is the area of land where rain or snow seeps into the ground and flows into an aquifer.
- A recharge area is considered 'significant' when it supplies more water to an aquifer used for drinking water than the land around it.
- These SGRAs often have more permeable soil, such as sand or gravel, and allow the water to seep more easily into the ground.
- SGRAs are delineated as part of the water budget analysis

Note – cannot have a Significant Drinking Water Threats in an SGRA

Mississippi-Rideau
Source Protection Region

- Mississippi-Rideau
Source Protection Region
- Highly Vulnerable
Aquifers (HVAs)
- Figure 5-1d

Identifying Drinking Water Threats

- The CWA prescribes 22 (as of July 1st, 2018) activities that pose a potential risk to drinking water and need to be addressed through source protection policies
 - 20 prescribed activities are risks to water quality
 - 2 prescribed activities are risks to water quantity

Water Quality

- Prescribed threats are categorized into threat subcategories in the Tables of Drinking Water Threats
 - Tables set out circumstances and vulnerable area scores where activities pose a risk to drinking water
- Two types of water quality drinking water threats are not prescribed by regulation:
 - Conditions and local threats; risk is calculated using assigned hazard ratings and vulnerability scores

Water Quantity

- The prescribed activities (water takings and reduction in recharge) become significant risks in the WHPA-Qs and IPZ-Qs depending on tier 3 stress levels

Prescribed Drinking Water Threat Activities

1 – **waste** disposal

2 – **sewage**

Agricultural

3 – application of agricultural source materials

4 – storage of agricultural source materials

5 – management of agricultural source materials

6 – application of non-agricultural source materials

7 – handling and storage of non-agricultural source materials

8 – application of commercial fertilizer

9 – handling and storage of commercial fertilizer

10 – application of pesticide

11 – handling and storage of pesticide

21 – livestock grazing or pasturing, outdoor confinement area, or farm animal yard

12 – application of **road salt**

13 – handling and storage of **road salt**

14 – storage of **snow**

Industrial

15 – handling and storage of **fuel**

16 – handling and storage of dense non-aqueous phase liquid (**DNAPL**)

17 – handling and storage of an **organic solvent**

22 - establishment and operation of a **liquid hydrocarbon pipeline**

18 – chemicals used in the de-icing of aircraft

Water Quantity

19 – consumptive water taking

20 – activity that reduces the recharge of an aquifer

Assessment Reports – Conditions and Local Threats

- Under CWA, conditions and local threats can also be identified as risks to drinking water
- **Condition** = Contamination related to historical activities
 - May be impacted soil, groundwater, or sediment (e.g., contaminated site)
 - The hazard rating for a condition is either 10 or 6 depending on the presence of off-site impacts
- **Local threat** = Request by SPC/SPA to address unique local situation (e.g., nuclear plant – tritium)
 - Request must be approved by Source Protection Program Branch Director and, if approved, the Director establishes the associated hazard rating

Assessing Risk: Threats Approach

- Threats approach uses formula to assess risk:

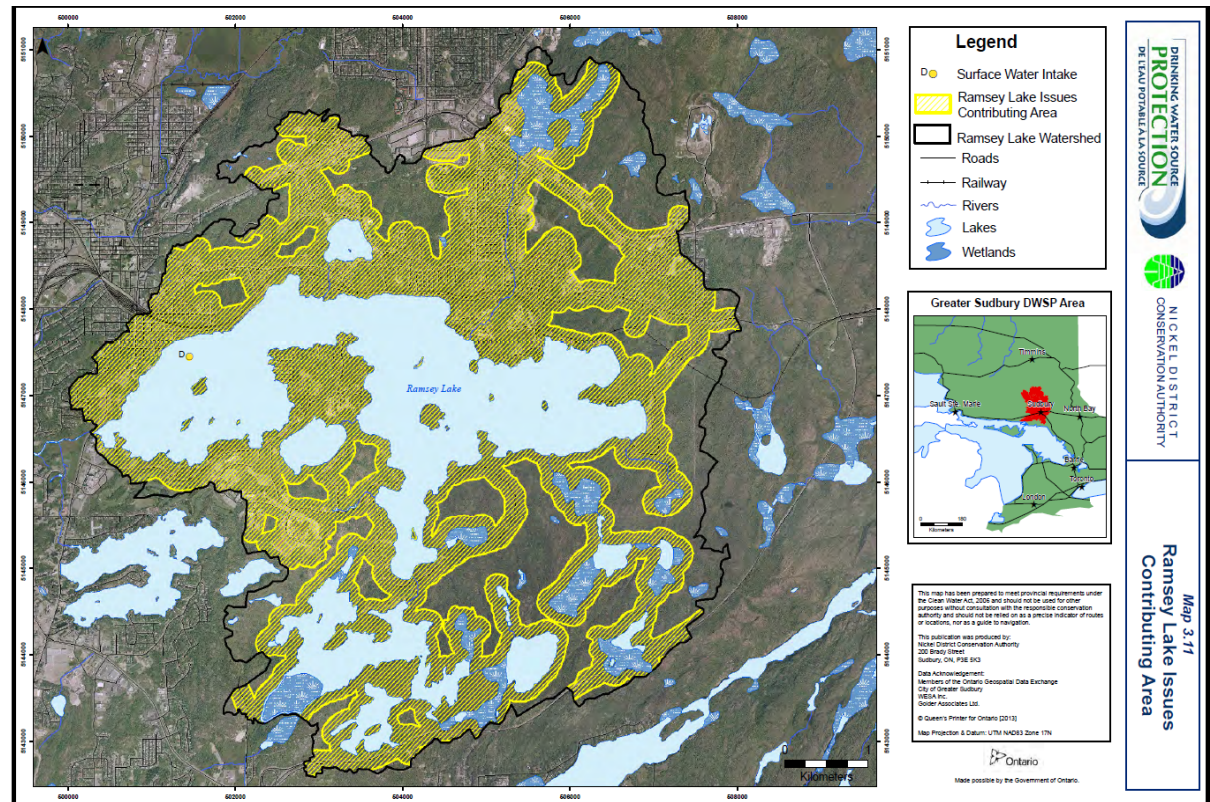
$$\text{RISK SCORE} = \text{VULNERABILITY SCORE} \times \text{HAZARD SCORE}$$

- Risk scores form basis of Tables of Drinking Water Threats, which summarizes where activities pose a risk to drinking water
- Vulnerability score indicates how vulnerable the source of drinking water is to contamination and is based on a number of factors (e.g. land cover, rainfall, type of intake, well depth etc.)
- The hazard score is assigned to each type of threat and is based on a number of factors (e.g. toxicity, release to the environment etc.)

Assessing Risk: Issues Approach

Issue = deterioration in source water quality (anthropogenic)

Issue Contributing Area = the geographic area within existing vulnerable areas where activities and conditions may contribute to the parameter/pathogen of concern identified in the source water



Assessing Risk: Event Based Areas (EBA) Approach

- Introduced to assess situations where vulnerability scoring approach did not adequately address the risk of spills in certain protection zones
- Applicable only to surface water intakes located in large water bodies such as Great Lakes, Connecting Channels, Lake St. Clair, Lake Simcoe and Ottawa River
- EBAs can be used to identify areas where the release and transport of contaminants to surface water under extreme weather events pose a risk to a drinking water system
- Where EBAs are located outside an IPZ-1 or 2, an IPZ-3 is delineated to capture the EBA

Addressing Risk – Source Protection Plans

- Local source protection plans contain policies to protect existing and future sources of drinking water
- Plans must include policies to address both existing and future threat activities
- Mandatory: policies to either manage or prohibit significant drinking water threats
- Optional: policies to manage moderate or low drinking water threats
- Legal effect of policies dependent on risk level, policy tool, and implementing body

Source Protection Plan Policy Tools

- Committees first determined desired outcome, i.e., manage or prohibit, then chose the specific tool(s) to achieve this
- Objective of significant threat policies: Activity ceases to be / does not become significant



Source Protection Plan Policy Tools

- **Risk Management Plans** (section 58): Negotiated, site specific documents that outline required actions to address activities posing significant risk
 - Risk Management Officials (appointed by municipality) negotiate with person engaged in activity to develop risk management plan
- **Prohibition** (section 57): Policies designate activities that cannot be engaged in at specified locations
- **Restricted land uses** (section 59): Process for “catching” or “flagging” development applications and building permits related to activities that would pose a significant risk to drinking water
- **Prescribed instruments**: policies that affect decisions to issue or otherwise create, amend or revoke a prescribed instrument
- **Land use planning**: policies that affect land use planning decisions under the Planning Act and Condominium Act, 1998
- **Education/outreach and incentive programs**
- **“Other” approaches**: policies that call for stewardship or pilot programs, best management practices, research, and other specified actions