Surface Water Quality Analysis

Drinking Water Systems: (existing and planned)
(I): municipal residential
(II): included by a municipal council resolution (registered in the SDWA)
(III): included by the Minister (registered in the SDWA)
If Drinking Water System II or III is not registered under the O.Reg 170/03 or the SDWA O.Reg 318/08, then apply only IPZ-1. If it is registered, then treat it as Drinking Water System I

1- **Intake Protection Zones (IPZs)** (R:61{1,2},62-71): three typical zones based on the intake location.
2- **Transport Pathways** (R:72,73): sewer discharge pipes; trenches; open drainage ditches; gullies; swales.
3- **Vulnerability Score** (R:86-96): depth of water intake; distance of water intake from shoreline; volume of water body; water interaction within each zone.
4- **Uncertainty** (R:13-15): evaluation of vulnerable area; evaluation of vulnerable scores; score/rating of uncertainty (Low/High).
5- **Threats** (R:114-143): identification of threats for areas where vulnerability scoring is completed.

1- Delineation of IPZs

Intake Type (R:55)	Factors	IPZ-1 (no dilution or little + high potential for contaminants) (R:61-64)	IPZ-2 (operator response time) (R:65-67)	IPZ-3	
Great Lakes **(A)**	Wind energy; waves; currents; shoreline movements; Water quality; atmospheric deposition	R=1000m full circle; inland setback 120m along abutted area measured from HWM or regulation limit, whichever is greater.	Minimum time of travel is 2 hours or greater based on the operator response time; setback of 120m or regulation limit, whichever is greater; no need for IPZ-2 if IPZ-2 is smaller than IPZ-1; area may be extended to include transport pathways (natural or manmade).	**Only applies If modelling is completed.** Contaminant reaches intake shown by HD (R:68{1}); modelling is used for extreme events; inland setback 120m along abutted area measured from HWM (R:68{2}) or regulation limit, whichever is greater; IPZ-3 should not exceed the water body contribution for intake (R:69, 70{1}).	
Great Lakes Connecting Channel **(B)**		R=1000m semi circle; shape may vary based on HD with setback of 100m; can be modified based on HD; inland setback 120m along abutted area from HWM or regulation limit, whichever is greater.			
Inland Rivers/Streams **(C)**		R=200m semi-circle; land backflow based on HD plus 10m setback or depends on HD. Full circle of 200m sometimes is required; or up to 1000m based on HD for Rule 62 only; Can be modified based on HD; Inland setback 120m along abutted area from HWM or regulation limit, whichever is greater.		If intake is on Lake St.Clair, Lake Simcoe, Lake Nipissing or Ottawa River, then delineate it as Type A or B intake.	All other types of C&D intakes, the entire water body that contributes to the intake; inland setback 120m along abutted area measured from HWM (R:68{2}) or regulation limit, whichever is greater.
Inland Lakes Intakes **(D)**		R=1000m full circle, includes land and water and can be changed based on HD; inland setback 120m along abutted area from HWM or regulation limit, whichever is greater.			

Note: IPZ-2 should not include an area of land/water of IPZ-1 (R:74).

Note: IPZ-3 should not include an area of land/water of IPZ-1 & IPZ-2 (R:75).

2- Considerations of Transport Pathways

Transport Pathways: it is designed from the HWM. Delineation can be extended to include an area that may contribute to the intake through a pathway that influences travel time to an intake. Consideration of Hydrological and Hydro-geological conditions is required for the pathways design (R:72-75).

3- Vulnerability Score

Vulnerability Scoring (V): No chemical, physical or biological properties are taken into account.
V (R:86-96) = V_{fa} * V_{fs} where V_{fa} is the Area Vulnerability Factor and V_{fs} is the Source Vulnerability Factor.

	V_{fa}			V_{fs}	V		
	IPZ-1	IPZ-2	IPZ-3		IPZ-1	IPZ-2	IPZ-3
Type A	10	7-9	N/A	0.5-0.7	5-7	3.5-6.3	N/A
Type B	10	7-9	N/A	0.7-0.9	7-9	4.9-8.1	N/A
Type C	10	7-9	1-9	0.9-1	9-10	6.3-9	0.9-9
Type D	10	7-9	1-9	0.8-1	8-10	5.6-9	0.8-9

Considerations for V_{fa} Factors (R:88-93):
Rainfall
Land cover
Soil permeability
Slope
Transport pathways
Urban drainage
Open drains ditches, and
Distance of threat source.

Considerations for V_{fs} Factors (R:94-96):
Depth of intake
Length of intake from shoreline
Historical water records, and
Number of past incidents exceeding the WQ standard.

Note: V_{fa} of IPZ-2 ≤ V_{fa} of IPZ-1 and V_{fa} of IPZ-3 ≤ V_{fa} of IPZ-2

5- Overview of Threats Identification

Drinking Water Threat: Activities (R:118-125) or conditions (R:126) that could affect the quality of drinking water. New threats can be added by SPC with approval of the director.

Approaches: Threats Approach (R:127 to 137), i.e. activities in the list of drinking water threats, new drinking water threats/circumstances, can be added by SPC with approval of the director.
Event Based Approach (R:130), i.e. activities where modelling or other methods show activities can cause an issue at an intake.
Issues Approach (R:131), i.e. activities that are located in an issue contributing area and can contribute to that issue.

	Activities	Conditions
Significant	Hazard rating > 4 + Risk Score ≥ 80 (R:128)	Hazard rating =10 + Risk Score ≥ 80 (R:139,140)
Moderate	Hazard rating > 4 + Risk Score ≥ 60 to <80 (R:132)	Risk Score ≥ 60 to < 80 (R:139,142)
Low	Hazard rating > 4 + Risk Score ≥ 40 to <60 (R:136)	Risk Score ≥ 40 to < 60 (R:139,143)

Risk score = Hazard rating * Vulnerability score

DRINKING WATER SOURCE PROTECTION
ACT FOR CLEAN WATER

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Acronyms:
GW: Groundwater
HD: Hydrodynamics
HWM: High Water Mark
RS: Risk Score
SDWA: Safe Drinking Water Act
SPA: Source Protection Area
SPC: Source Protection Committee
ST: Standard
SW: Surface Water
WQ: Water Quality