Niagara Peninsula Source Protection Area

Explanatory Document

APPENDICES

December 2013

DRINKING WATER SOURCE PROTECTION
Niagara Peninsula Source Protection Area

NIAGARA PENINSULA CONSERVATION AUTHORITY

Drinking Water Source Protection Background Document

Prescribed Drinking Water Threat 1A
The establishment, operation or maintenance of a waste disposal site
Sub-threat: The Application of Hauled Sewage to Land
May 11, 2011

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Note: We would like to thank Cataraqui Region Conservation Authority and Conservation Ontario for the use of their background research documents in preparing these reports.

1. Definition

This paper provides background information for **prescribed drinking water threat 1A – The establishment, operation or maintenance of a waste disposal site, subthreat: application of hauled sewage to land.**

The primary consideration for reducing or eliminating drinking water threats related to the application of hauled sewage to land is to make sure hauled sewage does not enter surface water and/or groundwater.

Hauled sewage, known informally as septage, consists of the raw, untreated liquids and solids that are pumped out of septic tanks and holding tanks. These tanks can be found on residential, commercial and industrial properties. Septage that has not been treated to reduce pathogens is therefore considered waste.

Legal Significance

The application of untreated septage to land is banned in British Columbia, Quebec, Newfoundland and Labrador, and New Brunswick. While approximately 50% of hauled sewage generated in Ontario is disposed of at municipal sewage treatment plants, land application is the predominant method of disposal for the remainder. The land application of hauled sewage is regulated as a waste under Part V of the Environmental Protection Act. Certificates of approval from the Ministry of the Environment are required for the transportation, storage and land application of hauled sewage.

Currently, MOE is exploring policy options towards ending the land application of untreated hauled sewage. The MOE recommends the handling of this septage in municipal sewage treatment plants or other treatment facilities (e.g. composting, gasification, anaerobic digestion, dewatering, alkaline stabilization). However, the local capacity to treat septage must be available. The MOE has indicated that while applications for hauled sewage can be submitted they won't be approved in Niagara Region as there is sufficient capacity at the Niagara Region wastewater treatment plants.

> *"Based on the analysis of … sewage flow data over the past five (5) years and projected population growth over the next ten (10) years in accordance with the Region's Growth Management Strategy (Niagara 2031), there presently appears to be sufficient reserve capacity, from a hydraulic perspective…at ten (10) of the eleven (11) wastewater treatment facilities. The Niagara-on-the-Lake Lagoon has approximately seven (7) years of reserve capacity remaining…." (Niagara Region ,2010)*

Niagara Region accepts hauled sewage via tank-truck at six (6) of its eleven (11) wastewater treatment plants. Hauled sewage is however only accepted from approved sewage haulers who have Niagara Region Sewage Hauler permits (Niagara Region, 2008).

Hauled sewage that is treated may be applied to agricultural land as a nutrient in accordance with the requirements for the management of non-agricultural source materials (NASM) in O.Reg.267 under the Nutrient Management Act. Information on land application of NASM is in the backgrounder for threats 6 and 7: The application, handling and storage of non-agricultural source material.

Note that amendments to Regulation 347 under the Environmental Protection Act in 2003 have prohibited the land application of untreated waste from chemical or portable toilets.

Technical Background on the management and disposal of hauled sewage

Subject to the appropriate approvals, septage can either be disposed as waste in landfill sites, dewatering trenches or waste stabilization lagoons or, land applied. Alternatively, it can be treated and converted into biosolids as a source of nutrients.

With an MOE certificate of approval, hauled sewage can be applied to land through direct surface application, or incorporation into soil through subsurface injection.

The transportation of septage is a significant cost from a business perspective. To minimize the costs, many haulers collect and temporarily store septage in tanks or lagoons, linking the septage disposal process to other threat categories such as septic system holding tanks and the storage of sewage.

2. What causes this activity to be a drinking water threat?

The MOE Tables of Drinking Water Threats (Government of Ontario, 2009), identify two chemicals (nitrogen and total phosphorus) and pathogens as substances that could make their way into surface and groundwater as a result of the application of hauled sewage to land (circumstances 96 to 101 and 1971). The primary source of nitrogen, total phosphorus and pathogens in hauled sewage is from human waste as well as household and personal care products.

Risk Level

Depending on the location and the size of the application area, the land application of hauled sewage can be classified as a significant, moderate or low drinking water threat. For the chemical threats nitrogen and total phosphorus, the risk rating increases with the size of the application area ($A<1$ ha, $1 \text{ ha} \leq A \leq 10$ ha, >10 ha) and can be significant at vulnerability 9-10. Hauled sewage is considered a pathogen threat within intake protection zones.

3. Understanding the nature of the drinking water threats

Hauled sewage can be applied to land that meets specific minimum requirements. These requirements are described later in this report. However, this activity does not occur in NPCA.

Table 3.1 identifies where these activities are or would be significant or moderate drinking water threats based on the MOE Tables of Drinking Water Threats and how many threats are currently evaluated. The count for existing significant threats has been taken from the Assessment Report, where existing threats were determined based on current land uses and interpretation of aerial photography. There are currently no existing significant threats. Please note that the information in these tables about the existing threats is subject to change with ongoing field verification.

Table 3.1 - Application of Hauled Sewage to Land

Vulnerable Area		V.S.	Significant	Moderate	Existing Significant Threats
DeCew Falls	Main Intake IPZ -1	8.0	P	C	
	Lake Gibson Emergency Intake IPZ-1	8.0	P	C	
	Hwy 406 Control Structure IPZ-1	8.0	P	C	
	Main Intake IPZ-2	6.4		P	
	Lake Gibson Emergency Intake IPZ-2	6.4		P	
Port Colborne	IPZ-1	9.0	C (>10ha), P	C(<10ha)	
	IPZ-2	8.1	P	C	
Niagara Falls	IPZ-1	8.0	P	C	
Welland	IPZ-1	7.0		C (>10ha), P	
Fort Erie	IPZ-1	7.0		C (>10ha), P	

V.S. – Vulnerability Score, C – Indicates a chemical threat, P – Indicates a pathogen threat
Note: Intake protection zones with a vulnerability score less than 5.6 are not applicable to significant and moderate threats.

4. Applicable legislation, policies and programs

a. National

There are federal guidelines for the application of hauled sewage and biosolids to federal lands. These guidelines generally defer to the provincial standard for the province in which the federal facility is located.

b. Provincial

Environmental Protection Act and Certificates of Approvals

A certificate of approval issued by the Ministry of the Environment (MOE) under Part V of the *Environmental Protection Act* is required in order to apply hauled sewage to land (Government of Ontario, 1990). Ontario Regulation 347, made under the *Environmental Protection Act*, specifies the standards for the location, maintenance and operation of waste disposal sites for

hauled sewage. Each hauler/spreader requires a certificate of approval (Hauled Sewage Waste Management System). This approval contains conditions for the safe transport of the hauled sewage and general requirements for land application. A site specific ~~inspection~~ approval is required for each site where hauled sewage is land applied. Approved sites can then be added to the schedule of a Waste Management System Certificate, which lists the sites approved for application. Once approved, the applicant is required to keep records of how the conditions of a certificate of approval are met (Government of Ontario, 1990). These records are not submitted to MOE unless specifically requested.

The MOE has published a "Guide to Applying for a Certificate of Approval to Spread Sewage and Other Biosolids on Agricultural Lands (Organic Soil Conditioning)" (Ontario Ministry of the Environment, 1996) that outlines the extensive documentation required to support an application for a certificate of approval. The supporting information includes, but is not limited to, the source and type of material to be applied, waste analysis report, soil analysis report, terrain description, surface physiology and geology, depth to the water table, water wells, separation distances, application areas, crops, schedule of use, notification to adjacent landowners, and confirmation from the municipality.

The general land application requirements contained in a Hauled Sewage Waste Management System are listed in Table 4.1. Reductions to the requirements can be considered by MOE if there are acceptable technical reasons. Proposed sites for the application of hauled sewage are assessed on a case-by-case basis.

Table 4.1 – Minimum Setback Requirements for the Application of Hauled Sewage to Land

Feature	Value
Minimum distance to wells	90 m
Minimum distance to public roadway	30 m
Minimum distance to individual residences	90 m [1]
Minimum distance to residential areas	450 m [2]
Minimum distance to watercourses	60 m to 180 m [3]

[1] may be reduced to 25 m if injected or incorporated within 24 hours

[2] may be reduced to 50 m if injected or incorporated within 24 hours

[3] The minimum distance to a watercourse is dependent on slope and soil permeability, which is determined through field observation.

Provincial Policy Statement, 2005

The Provincial Policy Statement (PPS) is issued under Section 3 of the *Planning Act*, and provides direction on matters of provincial interest related to land use planning and development. Decisions affecting planning matters must be consistent with the PPS. When considering applications for new development under the Planning act, municipalities must ensure that their decisions are consistent with the PPS, and municipalities must review their official plans at least every five years to ensure they are consistent with the PPS. The PPS does

not apply retroactively to existing development. The relevant portions of the PPS are described below.

The PPS indicates that municipal sewage services are the preferred form of servicing for new development. Where private communal or individual on-site sewage services (e.g. septic systems) are to be used for new development, lot creation is only to be permitted if there is confirmation of sufficient reserve sewage system capacity within municipal sewage services or private communal sewage. This capacity relates to the ability to store and treat hauled sewage. It is required because the Province discourages the application of untreated septage to land.

Reserve capacity for private communal and individual on-site sewage services is considered sufficient if the hauled sewage from the development can be treated or disposed of at sites approved under the *Environmental Protection Act* or the *Ontario Water Resources Act*, but not by land-applying untreated, hauled sewage.

Septage treatment capacity can be confirmed in a number of ways including the implementation of a municipal septage plan, and determining that there is an MOE approved facility with capacity to receive and treat septage that is accessible within the area of new development. The capacity could be provided by a municipal sewage treatment plant in the municipality, or through written agreement with another municipality or an approved private sector facility.

c. Municipal

Land Use Planning and other municipal tools

Application of septage is an **activity** that occurs on the landscape, and is not considered a land use, and therefore application of septage is not generally regulated through land use planning. As noted above, however, when considering new development, municipalities must make decisions that are consistent with the PPS, which establishes a hierarchy of servicing considerations to ensure the new development can be appropriately serviced, and land application of septage as a means of sewage disposal is not a viable option.

Municipal Septage Business Plans and Management Plans

A number of municipalities in Ontario have prepared septage business plans or septage management plans, and have received funding to build or increase the capacity of existing wastewater treatment plants in order treat septage.

Suggestions on the content of a municipal septage plan are listed in MOE's "Provincial Policy Statement, 2005: Reserve Sewage System Capacity for Hauled Sewage". They include background information on the service area and an inventory of available treatment and disposal options; information about the number of private systems and the type and volume of septage being produced; and a proposed strategy to treat septage. The strategy would outline existing treatment capacity versus future treatment capacity requirements, the method of

treatment, the provider, and the financial implications (Ontario Ministry of the Environment, 2007).

5. Gaps in existing legislation, policies and programs

- No gaps have been identified at this time.

6. Policy considerations

- REMINDER: The main consideration for reducing or eliminating drinking water threats related to the application of hauled sewage to land is to make sure that septage does not enter surface water and/or groundwater.
- The Source Protection Plan will need to address the land application of hauled sewage.
- Clean Water Act Part IV tools interim risk management plans, risk management plans, prohibition, and restricted land uses cannot be used for waste disposal sites, which include the land application of hauled sewage. This is because they are governed by Certificates of Approval which are provincial instruments and not subject to the Part IV tools. However the MOE has indicated there are no existing certificates of approval for the application of hauled sewage in Niagara and that none will be approved.
- The Source Protection Plan will need to include a policy approach to address those "would be" significant drinking water threats that are unlikely to occur in a given vulnerable area. For example, a general policy may be appropriate in an urban setting even if it is unlikely that hauled sewage would be applied there.
- The applicant is required to keep records of how the conditions of a certificate of approval are met. They are not required to be submitted to MOE unless specifically stated in the certificate of approval. However, they must be made available at the request of the MOE such as during planned inspection.

Examples of risk management measures and policy ideas

For discussion purposes, this section of the report provides examples of risk management measures and policy ideas that could be applicable to the application of hauled sewage to land. It is not an exhaustive list.

The examples are categorized by the types of policy tools that can be used to meet the source protection plan objectives. The MOE Risk Management Measures Catalogue was reviewed as part of this exercise and measures were incorporated where appropriate.

7. Examples of risk management measures and policy ideas

Table 7.1 – Example Risk Management Measures and Policy Ideas for Hauled Sewage

Policy Tool	Example
Education and Outreach	• Area-wide education and outreach programs targeted to haulers/spreaders and agricultural/rural landowners on the importance of respecting separation requirements and of monitoring the impact of applied sewage on water quality. • Promote widespread adoption of best management practices for haulers/spreaders (e.g. pre-treatment of septage, method of incorporation into soil, timing of application). • Area-wide education and outreach programs targeted at landowners with septic systems and holding tanks about the importance of maintaining their systems and reducing their use of phosphorus-containing products.
Incentive Programs	• Area-wide incentive programs for agricultural/rural landowners to establish permanent buffers on lands for which there are certificates of approval to apply hauled sewage.
Land Use Planning	• Prohibit the establishment of waste disposal sites as defined under Part V of the EPA
Prescribed Provincial Instruments	• The CofA is one of the Instruments prescribed under the CWA • Reference the MOE not allowing new CofAs in IPZs

Appendix A - References

Canadian Council of Ministers. 2009. Emerging Substances of Concern in Biosolids: Concentrations and effects of treatment processes. Final Report – Field Sampling Program. Hydromantis Inc. (ON), University of Waterloo (ON), Trent University (ON). Submitted to the Canadian Council of Ministers of the Environment. www.ccme.ca/assets/pdf/pn_1440_contam_invt_rvw.pdf

Government of Ontario. 1990. Environmental Protection Act. www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90e19_e.htm

Government of Ontario. 1990. Environmental Protection Act. Ontario Regulation 347 – General Waste Management. www.e-laws.gov.on.ca/html/regs/english/elaws_regs_900347_e.htm

Niagara Region, 2010. Report to Chair and Members of the Public Works Committee, Subject: 2009 Reserve Water and Wastewater Treatment Capacities.

Niagara Region, 2008. Sewage Hauler Manual, Environmental Enforcement, Water and Wastewater Services, Niagara Region Public Works, Revision 1.08.

Niagara Region, 2008b. By-law No.47-2008, A By-law to regulate discharges to the sanitary and storm sewer systems of the Regional Municipality of Niagara and to repeal By-law No. 39-2002.

Ontario Ministry of the Environment. 1996. Guide to Applying for a Certificate of Approval to Spread Sewage and Other Biosolids on Agricultural Lands (Organic Soil Conditioning). Ministry of the Environment, Toronto, ON. www.ene.gov.on.ca/envision/gp/3681e.pdf

Ontario Ministry of the Environment. 2009. Tables of Drinking Water Threats. 2008, as amended in 2009. www.ene.gov.on.ca/publications/cw/7561e03.pdf

Ontario Ministry of the Environment and Ontario Ministry of Agriculture, Food and Rural Affairs. 1996. Guidelines for the Utilization of Biosolids and Other Wastes on Agricultural Land. Ministry of the Environment, Toronto, ON. www.ene.gov.on.ca/envision/gp/3425e.pdf

Ontario Ministry of Municipal Affairs and Housing. 2005. Provincial Policy Statement, 2005. Queen's Printer for Ontario, Toronto, ON. www.mah.gov.on.ca/Page1485.aspx

Ontario Ministry of the Environment. 2007. Fact Sheet: Provincial Policy Statement, 2005: Reserve Sewage System Capacity for Hauled Sewage. www.ene.gov.on.ca/en/publications/forms/6316e.php

Drinking Water Source Protection Background Document
Prescribed Drinking Water Threat 1B
The Storage of Tailings from Mining Operations
April 7, 2011

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Note: We would like to thank Cataraqui Region Conservation Authority and Conservation Ontario for the use of their background research documents in preparing these reports.

1. Definition

This paper provides background information for **prescribed drinking water threat 1B – waste disposal sites: subthreat, the storage of tailings from mining operations.**

The main consideration for reducing, managing or eliminating drinking water threats related to the storage of tailings is to make sure that any discharge from the storage area does not contain contaminants in a volume and concentration that would threaten the quality of the receiving surface water or groundwater.

Mining operations relate to the removal of all metallic minerals and twenty (20) non-metallic minerals from the ground in accordance with the *Mining Act*. Examples of metallic minerals include gold, silver and copper. Non-metallic minerals include graphite, mica and phosphate rock.

Mining operations do not include aggregate operations that require approval under the *Aggregate Resources Act*. Examples of aggregate include sand, gravel, limestone and granite.

Tailings are the waste materials left over after processing ore to extract the mineral of interest. They are typically made up of waste ground rock, spent processing water and reagents. Some tailings are reactive and produce acid after they are deposited. Tailings are transported to the impoundment area as a slurry (water/waste mixture) and excess water is decanted to the environment. Reactive tailings can solubilize metals of concern to drinking water. The most common types of storage facility are pits and surface impoundment structures.

This drinking water threat relates specifically to the storage of tailings from mining operations.

2. What causes this activity to be a drinking water threat?

The MOE Tables of Drinking Water Threats (Ontario Ministry of the Environment, 2009) identify a number of elements and chemicals as substances that could make their way into surface water and groundwater as a result of a discharge from a tailings storage area (circumstances 1533 to 1584). The following elements and chemicals could threaten the safety of drinking water sources in certain situations.

- Arsenic
- Lead
- Silver
- Cadmium
- Mercury
- Hydrogen sulfide
- Chromium VI
- Nickel
- Zinc
- Copper
- Nitrogen
- Cyanide
- Total phosphorus

All of these chemicals are by-products of processing ore to extract minerals.

3. Understanding the nature of the drinking water threat

Depending on the location, type of contaminant being discharged and the reporting requirements, the discharge from a tailings storage area can be classified as a significant, moderate or low drinking water threat.

The Abandoned Mine Inventory System, maintained by the Ministry of Northern Development, Mines and Forestry, can be accessed online and contains basic information about all known inactive and abandoned mines located on both Crown and private land within Ontario (see Appendix B for a weblink).

The storage of tailings from mining operations would only be a significant threat for the Port Colborne IPZ-1 with a vulnerability score of 9 (Table 3.1).

Table 3.1 - Storage of Tailings from Mining Operations

Vulnerable Area		VS	Significant	Moderate	Existing Significant Threats
Port Colborne	IPZ-1	9.0	Notes 1 and 2	Notes 1 and 3, or 4 and 2, or 1 and 2	
	IPZ-2	8.1			
DeCew Falls	Main Intake IPZ -1	8.0			
	Lake Gibson Emergency Intake IPZ-1	8.0			
	Hwy 406 Control Structure IPZ-1	8.0			
Niagara Falls	IPZ-1	8.0			
Welland	IPZ-1	7.0		Notes 1 and 2	
Fort Erie	IPZ-1	7.0			

NOTES:

VS – Vulnerability Score

Note:

1. Tailings from mining operations are stored in an impoundment structure located on the surface
2. The site is part of a facility for which National Pollutant Release Inventory (NPRI) notices require a person to report
3. The site is not part of a facility for which NPRI notice requires a person to report
4. Tailings from mining operations are stored in a pit

Intake protection zones with a vulnerability score of 6.4 or less are not listed as not applicable to significant and moderate threats.

4. Applicable legislation, policies and programs

a) Federal and Provincial

There are numerous permits and approvals associated with the exploration, production, and closure of mines. The document "A Practitioner's Guide to Planning for and Permitting a Mineral Development Project in Ontario" (Ministry of Northern Development, Mines and Forestry, March 2008) identifies a minimum of 53 permits and approvals under various legislation that could be required over the lifetime of a mining project depending on the type and size of the project, and location.

The following regulations, legislations and programs apply to mining in Ontario. Some permits and approvals can be directly related to drinking water source protection and are clearly identified as such (i.e. they are prescribed instruments under the *Clean Water Act*).

Ontario Water Resources Act, Permit to Take Water (Government of Ontario, 1990)

Water Taking and Transfer (Permits to Take Water) - Section 34 of the Ontario Water Resources Act requires anyone taking more than a total of 50,000 litres of water in a day (50 cubic metres, or 10,000 gallons per day), to obtain a permit. The trigger for the permit is in respect to the capacity of the water-taking equipment, not the actual amount of water taken or transferred.

Section 34 of the *Ontario Water Resources Act* is a prescribed instrument in the source protection planning process.

Ontario Water Resources Act (OWRA), (Government of Ontario, 1990) Industrial Sewage Works

An industrial sewage works for a mine or advanced exploration program may include mine water treatment systems, settling ponds, storm water collection and treatment systems, mill process water treatment and discharge, tailings (processed ore) facilities, coolant water or other water treatment and management systems.

A Certificate of Approval under Section 53 of the OWRA is required to establish, alter, extend or replace any new or existing industrial sewage works that release or discharge, store or transport any wastewater to a groundwater, surface water or the surface of the ground.

Environmental Protection Act (Government of Ontario, 1990) Effluent Monitoring and Effluent Limits Regulations

A mining operation that is a metal mining or industrial mineral facility may also be subject to one of the industrial sector specific "Effluent Monitoring and Effluent Limits Regulations" under Ontario's Environmental Protection Act, which are also known as the Municipal/Industrial

Strategy for Abatement (MISA) Regulations. The relevant MISA regulations are (see Appendix B for weblinks):

- Ontario Regulation 561/94 (Effluent Monitoring and Effluent Limits – Industrial Minerals Sector)
- Ontario Regulation 560/94 (Effluent Monitoring and Effluent Limits – Metal Mining Sector)

The industrial minerals section MISA regulation only applies to the existing industrial mineral mining and processing facilities specifically named in the regulation. The types of subject facilities include plants that produce cement, lime, magnesium, graphite, talc, gypsum, salt and some other materials.

The metal mining sector MISA regulation applies to any existing or future mining operation that meets the regulation's definition of a "metal mining plant" once the plant has discharged over a single day a total volume of more than 50,000 litres of process effluent, cooling water effluent and overflow effluent, as defined in the regulation. Subsequent reductions of the plant's total effluent volume to below 50,000 litres per day do not relieve the plant from the regulatory requirements unless the plan permanently closes.

Fisheries Act, Metal Mining Effluent Regulations (MMER) (Government of Canada, 2002)

The Metal mining Effluent Regulations, under the Fisheries Act, governs mine waste and how it is disposed. The Fisheries Act protects fish habitat in lakes and rivers by prohibiting the release of deleterious substances, and the alteration or destruction of fish habitat.

Mines subject to the MMER are required to conduct effluent characterization, toxicity testing and water quality monitoring as well as meet limits for the discharge of deleterious substances. These regulations are enforced by Environment Canada.

Environmental Protection Act (Government of Ontario, 1990)

Since tailings are considered to be a waste, a certificate of approval is required from the Ministry of the Environment under Part V (section 39) of the *Environmental Protection Act* for the necessary waste disposal site or waste management system. Ontario Regulation 347, made under the *Environmental Protection Act*, specifies the standards for the location, maintenance and operation of waste disposal sites.

Part X of the Environmental Protection Act requires immediate notification to the Ministry of the Environment and others in the event of a spill of a pollutant into the natural environment. Any abnormal discharge of a contaminant into the natural environment is considered a spill and requires immediate notification. The owner or controller of the pollutant also has the duty to act to restore the natural environment and prevent any adverse effects.

Mining Act (Government of Ontario, 1990)

The Mining Act regulates the acquisition and maintenance of mineral rights (claim staking, prospecting, mineral exploration and mine development related to mining land tenure), and the safe, environmentally sustainable closure of mining operations. It has limited application in the day-to-day activities of operating mines.

A closure plan is required before a proponent starts advanced exploration. A closure plan must include financial assurance, a plan for site rehabilitation and consider the following four objectives:

1. Protection of public health and safety;

2. Alleviation or elimination of environmental damage;

3. Achieve a productive use of the land, or a return to its original condition or an acceptable alternative; and,

4. To the extent achievable, provide for sustainability of social and economic benefits resulting from mine development and operations

b) Municipal

Land Use Planning

Many municipalities have policies regarding mining operations in their official plans. In general, these policies identify locations of active and abandoned mines as well as mineral reserves; and identify the need for official plan and/or zoning by-law amendments in order to establish a mining operation. They also indicate the need to protect existing sensitive land uses (such as residential areas) from the establishment of new or expanding mining operations where there is incompatibility.

5. Gaps in existing legislation, policies and programs

- Historically, provincially legislation did not address the closure and rehabilitation of mines. There are limited resources available to properly assess and close the numerous abandoned mines in Ontario.

- Threat as listed in the table of drinking water threats does not take into consideration other types of mining operations that can be environmentally damaging (i.e. drill hole water from advanced exploration, storage of waste rock, etc…)

- Specific information needs to provided to the regulators of the various legislative instruments (both prescribed and un-prescribed) to alert them of the drinking water sources and vulnerable areas.

6. Policy considerations

- REMINDER: The main consideration for reducing or eliminating drinking water threats related to the storage of tailings is to make sure that any discharge from the storage area does not contain contaminants in a volume and concentration that would threaten the quality of the receiving surface water or groundwater.

- *Clean Water Act* Part IV tools interim risk management plans, risk management plans, prohibition, and restricted land uses cannot be used for waste disposal sites, which include the storage of tailings from a mining operation.

• A significant mine tailings drinking water threat in the Port Colborne IPZ-1 is unlikely to occur. However, the source protection plan will still needs to address this "would be" situation.

7. Examples of risk management measures and policy ideas

For discussion purposes, this section of the report provides examples of risk management measures and policy ideas that could be applicable to the storage of tailings from a mining operation. It is not an exhaustive list.

The examples are categorized by the types of policy tools that can be used to meet the source protection plan objectives. The MOE Risk Management Measures Catalogue was reviewed as part of this exercise and measures were incorporated where appropriate.

Table 7.1 – Example risk management measures and policy ideas for the storage of mine tailings

Policy Tool	Example
Education and Outreach	• Area-wide education programs targeted to private landowners who have abandoned mines on their property to work with the Ministry of Northern Development and Mines to properly decommission the mines and any associated tailings storage areas. • Area-wide education programs to rural landowners about protecting groundwater quality (abandoned mines can be a direct pathway to groundwater and should not be used as a landfill). • Provide the MNDMF with the map layer showing all of the municipal SW & GW sources and vulnerable areas, especially those with a high vulnerability (SW scored 9 & 10, GW scored 10)
Land Use Planning	• Prohibit the storage of mine tailings through a zoning by-law within the Port Colborne IPZ where it would be a significant drinking water threat.
Prescribed Provincial Instruments	• Recommend MOE consideration of vulnerable areas in the approval process as applicable to mining sites with particular attention to conditions preventing impacts to quality.
Municipal Operations / Infrastructure	• Encourage companies to share spills response plans, site sampling, monitoring and inspection reports, • Encourage companies to install emergency spills containment structures, leak detection measures or equipment, or subsurface barriers.
Other	• Encourage the Ministry of Northern Development and Mines to work with others to properly close and rehabilitate abandoned mines that could have tailings in the area.

Appendix A – Reference List

Government of Canada 2002. Fisheries Act. Metal Mining Effluent Regulation. http://laws.justice.gc.ca/en/showtdm/cr/SOR-2002-222

Government of Ontario. 1990. Environmental Protection Act. www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90e19_e.htm

Government of Ontario. 1990. Mining Act. www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90m14_e.htm

Appendix B – Additional Resources

1. Ontario Ministry of Northern Development and Mines. Abandoned Mine Inventory System www.geologyontario.mndmf.gov.on.ca.

2. Ministry of the Environment. Environmental Protection Act. Regulations addressing effluent monitoring and effluent limits:
    - O. Reg. 561/94- EFFLUENT MONITORING AND EFFLUENT LIMITS - INDUSTRIAL MINERALS SECTOR
    - O. Reg. 560/94 -EFFLUENT MONITORING AND EFFLUENT LIMITS - METAL MINING SECTOR

Drinking Water Source Protection Background Document
Subthreat 1C: Waste Disposal Sites
May 24, 2011

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Note: We would like to thank Cataraqui Region Conservation Authority and Conservation Ontario for the use of their background research documents in preparing these reports.

1. Definition

This paper provides information for prescribed drinking water threat 1C – waste disposal sites. The main consideration for reducing or eliminating significant drinking water threats related to waste disposal sites is to make sure that any discharge from the sites does not result in a significant risk to municipal drinking water through a lack of measures to mitigate the threat.

The Environmental Protection Act (EPA) provides a definition for a "waste disposal site" (R.S.O. 1990, c. E.19, Part V). In general terms, a waste disposal site is any land, building, structure in connection with the depositing, disposal, handling, storage, transfer, treatment or processing of waste (which includes ashes, garbage, refuse, domestic waste, industrial waste, municipal refuse, etc.). Operational activities associated with these sites are also included in the definition. Generally, waste disposal site Certificates of Approval are issued under the EPA, and are required prior to the establishment, extending, or ongoing operation of a waste disposal site.

The following types of waste disposal sites are indicated in the MOE Tables of Drinking Water Threats (2008, as amended in 2009) and are to be considered for the purposes of the drinking water source protection initiative:

- the application of:
    - hauled sewage (*see Hauled Sewage Backgrounder*)

- the land disposal of:
    - petroleum refinement waste
    - hazardous waste, liquid industrial waste, or processed liquid industrial waste
    - municipal waste (deposit at a dump or landfilling of waste)
    - industrial waste or commercial waste
    - liquid industrial waste (discharged into a geological formation by means of a well)

- the storage of:
    - Tailings from mining operations (*see Storage of Tailings from Mining Operations Backgrounder*)
    - PCB waste
    - hazardous waste or liquid industrial waste

Exemptions are given for domestic waste generation – waste disposal sites do not apply to the storage or disposal on a private property, unless the situation becomes a nuisance (Director's decision), or where the activity would fall under the Ontario Water Resources Act (e.g. sewage disposal, water quality impacts) (EPA R.S.O. 1990, c. E.19, Part V). As such, activities such as dumpsters on privately owned property and salvage yards would not generally apply.

Waste related activities and types of waste disposal that do not require Certificates of Approval

(and are therefore not significant threats) are outlined in sections 5, 6(3) and 17.1 of Regulation 347. Examples include, but are not limited to, on-site incinerators and garbage grinders and used tire sites less than 5,000 units.

Finally, the circumstances also include a site that is not approved to accept hazardous waste or liquid industrial waste, but accepts a small amount under a limited quantity exemption. Such is the case for municipal landfills or transfer stations accepting household hazardous waste.

The primary focus of this backgrounder is on the land disposal of municipal waste since it is the most likely prevalent type of waste disposal site, although references to the other types of waste disposal sites are identified throughout this backgrounder. It should be noted that the content in sections 4 and 5 are heavily weighted towards municipal waste disposal sites.

2. What causes this activity to be a drinking water threat?

There are thirty-five (35) chemicals (circumstances 1533 to 1943) listed in the MOE Tables of Drinking Water Threats and shown in Table 2.1, next page (Ontario Ministry of the Environment, 2009). These chemicals have the potential to be introduced into surface and groundwater as a result of the storage and land disposal of a prescribed waste.

Appendix A to this report outlines the possible sources of the contaminants.

3. Understanding the nature of the drinking water threats

Existing and historic waste disposal sites were not identified within the intake protection zones. Waste disposal sites are classified as active, inactive (i.e. is no longer used, but did not implement a closure plan) or closed (according to a closure plan).

There are a number of guidelines identifying setback distances for the establishment of new waste disposal sites, including keeping these sites away from settlement areas. The Ontario Ministry of the Environment Guideline D-4: Land Use On or Near Landfills and Dumps (s. 5.0) makes reference to 500 meter setbacks to identify the study area in the evaluation of a new site to sensitive land uses (e.g. private residence, pasturing land or livestock husbandry, and cemeteries) , but this is not a legal requirement. Ontario Regulation 232/98 (s.7.) states that a 100m buffer is preferred around a landfill site, although a absolute minimum buffer around a landfill site is 30 m, and would require a written report identifying that the buffer area is sufficient to address any impacts of the operation.

Private waste disposal sites may accept a variety of municipal, industrial and commercial waste but only in accordance with their Certificate of Approval.

Acceptance of hazardous waste or industrial waste in small quantities, if stored above, or partially above grade, increases the potential for even small municipal operations to be identified as a significant drinking water threat.

A future waste disposal site within the Port Colborne IPZ-1 (Table 3.1) could be identified as a significant threat. Please note that there are 46, and 39, hectares of land on the west and east side of the Port Colborne IPZ-1, respectively, but the land is almost entirely federal jurisidction.

Table 2.1: Chemical Threats associated with the storage and land disposal of a prescribed waste.

Threat Grouping	Chemical Parameter
Land Disposal of Municipal Waste (O. Reg. 347 s. 1 land disposal definition clauses (a) & (b))	Arsenic, Barium, BTEX, Cadmium, Dichlorobenzene-1,4, Lead, Mercury, Nitrogen, Selenium, Trichloroethylene (DNAPL), Uranium, Vinyl chloride (DNAPL)
Land Disposal of Industrial Waste or Commercial Waste (O. Reg. 347 s. 1 land disposal definition clause (c))	
Land Disposal of Petroleum Refining Waste (O. Reg. 347 s. 1 land disposal definition clause (d))	BTEX, PAHs, Petroleum Hydrocarbons (F1-F4)
Land Disposal of Hazardous Waste, Liquid Industrial Waste or Processed Liquid Industrial Waste (O. Reg. 347 s. 1 land disposal definition clauses (a) & (b))	Arsenic, Barium, Cadmium, Chromium VI, D-2,4, Lead, Mercury, PCBs, Selenium, Silver, 2,4,5-T, Uranium
A Site that is Not Approved to Accept, but Does Accept a Hazardous or Industrial Waste (O. Reg. 347 waste description clauses (p), (q), (r), (s), (t) or (u); hazardous waste definition clause (d))	Arsenic, Barium, Cadmium, Chromium VI, D-2,4, Lead, Mercury, Selenium, Silver, 2,4,5-T
Storage of Hazardous Waste at Disposal Sites (as defined in O. Reg. 347 (General – Waste Management), R.R.O. 1990)	
PCB Waste Storage at Disposal Sites (as described in O. Reg. 362 s.3 or in accordance with clause 8(a))	PCBs
Liquid Industrial Waste Injection into a Well (as defined in O. Reg. 347 (General – Waste Management), R.R.O. 1990)	Arsenic, Atrazine, Barium, Bis(2-ethylhexyl) phthalate, BTEX, Cadmium, Carbofuran, Chlorobenzene, Copper, Cyanide (CN-), Dichlorobenzene-1,2 (ortho), Dichlorobenzene 1,4 (para), Hexachlorobenzene, Hexachlorocyclopentadiene, Lead, Mercury, PCBs, Oxamyl, 1,2,4-T, Trichloroethane-1,1,1, Trichloroethylene (DNAPL), Vinyl Chloride (DNAPL), Zinc

Table 3.1 - Waste Disposal Sites[1]

Vulnerable Area	VS	Significant[2]	Moderate

Port Colborne	IPZ-1	9.0	>10ha Petroleum refining waste landfarming (BTEX, PAHs), >10 ha waste landfills for (i) Hazardous (As, CrIV, U), (ii) Municipal (As, U), and/or (iii) Solid Industrial/ Commercial waste (As, U) landfills -Storage of hazardous waste or liquid industrial waste (As, CrIV)	-Petroleum refining waste landfarming [3] -Hazardous waste landfill -Municipal waste landfill -Solid Non Hazardous Industrial or Commercial -Liquid industrial waste injection well [4] -PCB Waste Storage -Storage of hazardous waste or liquid industrial waste [5]
	IPZ-2	8.1		- Petroleum refining waste landfarming >1 ha Hazardous, Municipal and Solid Non Hazardous Industrial/ Commercial waste landfill -PCB Waste Storage -Storage of hazardous waste or liquid industrial waste [5]
DeCew Falls	Main Intake IPZ -1	8.0		
	Lake Gibson IPZ-1 Alternate Intake	8.0		
	Hwy 406 Control Structure IPZ-1	8.0		
	Main Intake IPZ -2	6.4		>10ha Petroleum refining waste landfarming (BTEX)
	Lake Gibson IPZ-2 Alternate Intake	6.4		
Niagara Falls	IPZ-1	8.0		See DeCew Falls IPZ-1 V.S. 8.0
	IPZ-2	6.4		See DeCew Falls IPZ-2 V.S. 6.4
Welland	IPZ-1	7.0		>1ha Petroleum refining waste landfarming >10ha Hazardous, Municipal and Solid Non Hazardous Industrial/ Commercial waste landfills -Storage of hazardous waste or liquid industrial waste
Fort Erie	IPZ-1	7.0		

NOTES:

VS – Vulnerability Score, BTEX – Benzene, toluene, ethylbenzene, xylenes, PAHs – Polycyclic aromatic hydrocarbons

As – Arsenic, CrIV – Chromium IV, U - Uranium

[1] - excluding (a) hauled sewage and (b) storage, treatment and discharge of tailings from mines, part of a separate backgrounders, [2] – There are no enumerated significant waste disposal threats

[3] - Petroleum hydrocarbons F1/F2/F3 and F4, [4] - Combined rate of discharge >3,800,000 m^3/year

[5] - This category includes but not limited to the storage of wastes described in clauses (p), (q), (r), (s), (t) or (u) of the definition of hazardous waste

Intake protection zones with a vulnerability score of 5.6 or less are not listed as not applicable to significant and moderate waste disposal site threats.

4. Applicable legislation, policies and programs

a) Provincial

Acts and Regulations

There are numerous permits and approvals under various legislation associated with waste disposal sites. The following permits and approvals can be related to drinking water source protection. Items which are prescribed instruments under the *Clean Water Act* are noted. The following web-site identifies the mechanisms by which waste disposal sites (landfills) are managed in Ontario: http://www.ene.gov.on.ca/en/land/limo/regulates.php

Environmental Protection Act (Part V – Waste Management) (Government of Ontario, 1990) (Prescribed Instrument – Waste Certificate of Approval)

Other than where an exemption applies, a certificate of approval is required from the Ministry of the Environment under Part V of the *Environmental Protection Act (s. 27). A certificate of approval (C of A) is required* prior to using, operating, establishing, altering, enlarging or extending a waste management system or a waste disposal site. It is also required for the active operation of a waste disposal site, providing rules to manage and limit potential discharge of contaminants into the natural environment. Detailed operational standards are set out in specific Certificates of Approval for each waste disposal site. (Certificate of Approval information is available from Land Inventory Management Ontario (LIMO) (http://www.ene.gov.on.ca/en/land/limo/index.php). A certificate of approval may contain conditions around:

- The types of waste to be accepted and applicable service area
- Control measures/inspections to ensure unacceptable waste (as determined in the C of A) does not enter the landfill
- Maximum volume of waste allowed per day and per year
- Any necessary conditions for design and operation of a site
- Environmental monitoring conditions for the site, including leachate, surface water, groundwater, biomonitoring and weather conditions
- Treatment of contaminated surface water
- Measures to close a site, including ensuring the site is properly maintained and monitored

PCB waste storage/disposal sites are exempt from the requirements of a Certificate of Approval as per O. Reg.362 made under the Act (s. (5)), subject to conditions surrounding reporting, removal of PCB waste and where a certificate of approval has not been issued for a site after January 1, 1981 specifying how PCB waste is to be generally looked after.

Renewable Energy Approvals are not a final disposal (i.e., land filling) but the use of materials that could be considered waste, can be considered inputs to a process that will generate energy (i.e. energy from waste facilities, incinerators, etc). This instrument could apply to the land filling of municipal waste and land disposal of solid, non hazardous industrial or commercial waste threat circumstances, as waste products may be stored at Renewable Energy Act facilities before processing occurs.

Ontario Regulation 347: General Waste Management (Government of Ontario, 1990)

Section 11 of Ontario Regulation 347, made under the *Environmental Protection Act*, specifies the generic standards for waste disposal sites, definitions of waste, and designates, classifies and exempts waste sites. However, the regulation leaves room for professional judgment and interpretation. It includes the following standards that are relevant to drinking water source protection:

- Restricting access to authorized persons
- Treatment of runoff before being discharged into watercourses
- Separation between waste and the maximum water table at the site to ensure that any impacts of leachate to the groundwater are within acceptable limits at the property boundary
- Collection and treatment of leachate impacted groundwater
- The prevention of surface water pollution through appropriate mitigation measures and environmental monitoring in and around the site
- Regular inspection and maintenance of final and daily cover material over the fill area

Ontario Regulation 232/98: Landfilling Sites (Government of Ontario, 1998)

This regulation applies to new or expanded landfill sites (as of August 1, 1998) that receive municipal waste (i.e. non-hazardous) and have a final capacity greater than 40,000 cubic metres (for example Niagara Region's Humberstone, Road 12 and Bridge Street landfills and the Niagara Waste Systems Limited landfill are all over 1 million cubic metres). It details the requirements for design, operation, closure, post-closure care and financial assurance of new municipal landfill sites and the preparation of certificates of approval. Parts III and V outline specific design and construction specifications, as well as operational standards for landfilling sites.

Ontario Water Resources Act (Government of Ontario, 1990)
(Prescribed Instrument – Sewage Works Certificates of Approval – OWRA, s. 53)

For a landfill discharging to a sewer, the quality and quantity of the discharge is controlled by local sewer use bylaws, and the requirements or limitations of the receiving wastewater treatment plant.

Leachate Collection systems that discharge to surface water also require approval under the Ontario Water Resources Act (OWRA). The discharge criteria are generally unique to each site and listed in the Certificate of Approval. The criteria are determined by background surface water quality or assimilative capacity.

Environmental Assessment Act (EAA) (Government of Ontario, 1990)

Many landfill proposals, particularly larger sites, may require approval under the Environmental Assessment Act (EAA). Under the EAA, a broader view of the environment is taken and issues beyond the effects on the natural environment must be addressed. An Environmental Assessment is triggered by the proposed capacity of the landfill or by a request from the public to have an individual EA completed at a smaller site.

Once a landfill is subject to EAA approval, the decision to hold a public hearing and give approval for the undertaking rests with the Minister

Guidelines and Procedures

Guidelines and procedures do not have the same legal status as requirements set out in acts and regulations. The only instance where they become legally binding is when they are imposed through reference in a certificate of approval.

Guidelines B-7: Reasonable Use (Ontario Ministry of the Environment, 1994) and B-7-1: Determination of Contaminant Limits and Attenuation Zone (Ontario Ministry of the Environment, 2008)

These MOE guidelines acknowledge that leachate may cause some contamination to the local groundwater underlying the waste material. The overall objective of the reasonable use guideline is to ensure a waste disposal facility's impact on local groundwater is "reasonable" and will not result in unacceptable impairment to the groundwater quality of neighboring properties.

Guideline B-7 includes criteria where the MOE may not support waste disposal facilities including:

- Sites where no appreciable attenuation can be provided (i.e. the subsurface environment does not improve the quality of leachate);
- Sites where natural attenuation is weak (e.g. fractured rocks); and
- Sites where the consequences of failure are unacceptable (e.g. a failure may contaminate the only drinking water source for a community)

Guideline B-7-1 sets out an approach to determine impact limits for the groundwater at the down gradient property boundary in an area referred to as a "contaminant attenuation zone". It essentially allows limited impairment of off-site properties. The level of impairment depends on the current use of groundwater. For example, where groundwater is used for drinking and the quality of the water is better than the Ontario Drinking Water Standards it is permitted to allow off-site migration of contaminants that would result in a reduction of water quality as follows:

- Up to 50% of the difference between background conditions and the ODWO for non-heath-related parameters; and
- Up to 25% of the difference between background conditions and the ODWO for heath-

related parameters.

Guideline D-4: Land Use On or Near Landfills and Dumps (Ontario Ministry of the Environment, 1994)

The MOE has prepared a number of guidelines on land use compatibility between waste disposal sites and sensitive land uses. Guideline D-4 provides guidelines on land uses (either existing or proposed) that are sensitive to landfills and include:

- permanent structures used in animal husbandry (such as a barn),
- agricultural land used for pasturing livestock,
- residences,
- other permanent structures where a person is present on a full time basis (but not including food or motor vehicle service facilities adjacent to a highway, utility operations, scrap yards, heavy industrial uses, gravel pits, quarries, mining or forestry activities), and cemeteries.

Areas of potential influence and separation distances vary depending on the type of adjacent land use, the nature of the landfill and known contaminant migration. The most significant contaminant, discharges and visual problems are generally anticipated within 500 m of a landfill; therefore a minimum 500 m setback in the evaluations of new sites is required. Sensitive land uses are generally not permitted adjacent to or on closed landfills. However, it is expected that municipalities will deal with this issue through their official plans and in conjunction with the provincial landfill development process (i.e. MOE Guideline D-4). The Port Colborne IPZ-1 is less than 150 m of land at its widest points on either side of the canal.

Procedure C-13-1: Engineered Facilities (Ontario Ministry of the Environment, 2008)

The MOE indicates in this procedure that there are limitations for engineered waste disposal sites and that any site should be located in an area with a high degree of natural protection and where groundwater is not and would not be used.

Guidelines for Environmental Protection Measures at Chemical and Waste Storage Facilities (Ontario Ministry of the Environment, 2007)

This guideline identifies environmental protection measures for chemical and waste storage areas and protection measures for human health and is identified as a resource during the planning of upgrades to existing storage areas and for the design and operation of new facilities. MOE abatement staff, owners, operators and designers of chemical and waste storage facilities may utilize this document, which indicates best practices, and spill containment provisions. Also recognized is the fact that the information contained within the guidelines is a point of reference, but other viable alternatives exist which may be equivalent or exceed the guidelines presented in the report.

b) Municipal

Land Use Planning

Many municipalities have policies regarding waste disposal sites in their official plans. In general, these policies recognize existing sites and indicate the need for an official plan and/or zoning by-law amendment in order to establish a new site. Many official plans recognize that new sites may not be possible within their boundaries based on legislative requirements.

Municipalities that have waste disposal site policies may also explicitly prohibit the storage or disposal of nuclear and toxic (hazardous) waste.

Waste Management Practices

The Government of Ontario gave waste managers in Ontario the goal of diverting 60% of waste from disposal by the end of 2008, which represents an increase of 32% from 2004 (Ontario Ministry of the Environment, 2004). In 2009, the Niagara Region residential waste diversion rate was 44% based on the Waste Diversion Ontario datacall submission. Niagara's current target of 65% residential waste diversion by 2010 will be reviewed as part of the Region's new Long Term Waste Management Strategic Plan.

This goal indirectly supports the drinking water source protection initiative through the implementation of policies and programs that increase the lifespan of sites (i.e. fewer new waste disposal sites are required), and keep certain materials out of landfills, thereby improving the quality of runoff from the site that enters surface water and groundwater.

5. Gaps in existing legislation, policies and programs

- Although the Ontario Ministry of the Environment Guidelines and Procedures note specific consideration for water quality protection, they are not legally binding unless included in Certificates of Approval.

- Historical landfill/dump locations are not necessarily identified or monitored. Although unknown, these could be impacting drinking water sources. However Niagara Region municipal water quality results do not suggest as such.

- Landfills approved prior to August 1, 1998 did not require the same level of consideration for design and construction specifications or operational standards (i.e. Parts III and V of Ontario Regulation 232/98).

- Waste disposal sites are not explicitly prohibited within vulnerable areas in municipal official plans and zoning by-laws. However municipalities have the power to do so.

- Exemptions in the definitions of a "waste disposal site" may have a bearing on whether an activity is captured by a prescribed instrument (e.g. certificate of approval)

- Waste disposal sites do not generally apply to waste generated on one's own property (e.g. dumpsters), although there is onus on the receiver of the waste (e.g. a municipality) to ensure the waste meets their certificate of approval, if they are to collect the waste material off-site, or if they receive materials at a landfill.

- Certificates of approval are not generally required for PCB waste disposal sites however this does not mean they are not regulated/monitored. For example, Niagara Region has Director's instructions issued by the Ministry of the Environment for the PCB cell located at the Humberstone Landfill Site. These Director's instructions for all intents and purposes are the same as a certificate of approval.

- The frequency of household hazardous waste collection opportunities (e.g. collection days) may not be sufficient to accommodate the needs of the community; therefore, household hazardous wastes may still be illegally disposed with household garbage. However a municipal hazardous – special waste (MHSW) program , partially funded by industry and government, has increased the number of drop off locations in Niagara (www.dowhatyoucan.ca). The driver to reduce illegal disposal of household and commercial, institutional and industrial hazardous waste, is full Extended Producer Responsibility (EPR). But, the province of Ontario has not yet transitioned to full EPR for the MHSW program.

- Residents may not know the impact waste disposal might have on drinking water sources.

6. Policy considerations

- REMINDER: The main consideration for reducing or eliminating significant drinking water threats related to waste disposal sites is to make sure that any discharge from the sites does not result in a significant risk to municipal drinking water through appropriate measures to mitigate the threat, such that discharge from the sites do not threaten the quality of surface water sources, are adequately mitigated or are not sited in an intake protection zone.

- *Clean Water Act* Part IV tools interim risk management plans, risk management plans, prohibition, and restricted land uses cannot be used for waste disposal sites.

- Prescribed Instruments may be used to address concerns for waste disposal sites, but identified risk management measures are only mandatory for significant drinking water threats. However, this does not prevent their voluntary incorporation.

- The Source Protection Plan will need to include a policy approach to address all "would be" significant drinking water threats, even those that are unlikely to occur in a given vulnerable

area. For example, a general policy may be appropriate in an urban setting even if it is unlikely that waste disposal sites would be applied there.

7. Examples of risk management measures and policy ideas

For discussion purposes, this section of the report provides examples of risk management measures and policy ideas that could be applicable to waste disposal sites. It is not an exhaustive list.

The examples are categorized by the types of policy tools that can be used to meet the source protection plan objectives. The MOE Risk Management Measures Catalogue (see Appendix C for a weblink) was reviewed as part of this exercise and measures were incorporated where appropriate; many of the measures in the catalogue are already required by applicable provincial instruments.

Table 7.1 – Risk Management Measures for Waste Disposal Sites

Policy Tool	Example
Education and Outreach	n/a (see Other – strategic action category)
Incentive Program	n/a (see Other – strategic action category)
Land Use Planning	Prohibit waste disposal sites in areas where they would be a significant drinking water threat.
Prescribed Provincial Instruments	Certificate of Approval criteria that provide necessary protection to prevent significant drinking water threats.
Municipal Operations / Infrastructure	n/a (see Other – strategic action category)
Risk Management Plans	n/a
Prohibition	n/a
Restricted Land Uses	n/a
Other	Strategic actions concerned with reducing the amount of waste generated (and thereby reducing the need for additional landfill sites), e.g. education and outreach, incentive programs (e.g. backyard composters), municipal operations (e.g. garbage bag fee and limits, diversion programs, green bin program, by-laws control non-collectable materials, waste audits, electronics recycling)

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Appendix A – Contaminant Sources at Waste Disposal Sites for Municipal Waste

Arsenic – Arsenic was used as a wood preservative for many years. It can be found in pharmaceuticals, pigments, plumbing, and pesticides among other products.

Atrazine – Used as an herbicide to control broadleaf and grassy weeds in agricultural crops and general weed control.

Barium – a metallic earth metal not found as a mineral. Barium is used primarily to remove gases in electronic vacuum tubes (e.g. TV cathode ray tubes). Other uses include: an alloy in spark plug wires, petroleum drilling mud, rubber filler, x-ray radiocontrast agent, rat poison, a coating for fluorescent lamps, and flame colour (green) for fireworks.

Bis(2-ethylhexyl) adipate- used primarily as a plasticizer in flexible vinyl products and is widely used in flexible food film. It is commonly blended with di(2-ethylhexyl) phthalate and di(isooctyl) phthalate in PVC and other polymers. It is used as a solvent and as a component of aircraft lubricants. It is important in the processing of nitrocellulose and synthetic rubber, in plasticizing polyvinyl butyral, cellulose acetate butyrate, polystyrene and dammar wax and in cosmetics

Bis(2-ethylhexyl) phthalate – used primarily as a plasticizer in flexible vinyl products and products made of PVC. It is also used as hydraulic fluid, dielectric fluid in capacitors, solvent in lightsticks, imitation leather, rainwear, footwear, upholstery, flooring, wire and cable, tablecloths, shower curtains, food packaging materials and children's toys.

BTEX – This acronym stands for Benzene, Toluene, Ethylbenzene and Xylenes. They are volatile organic compounds (VOC) found in petroleum products such as gasoline, diesel fuel, and heating oil.

Cadmium – a soft ductile metal, associated with zinc extraction. Cadmium is used primarily for electroplating other metals or alloys to protect them against corrosion, and is used extensively in the production of low-melting-point alloys, solders, and low-cadmium copper.

Chlorobenzene - used as a solvent (grease and paint), and in the production of pesticides, rubber polymers, and textile dyes.

Carbofuran – used as an insecticide/nematicide in agricultural crops (Health Canada's Pest Management Regulatory Agency (PMRA), is proposing phase out of carbofuran products in Canada (under the Pest Control Products Act,).

Chromium VI – infrequently occurs in nature and is generally the result of industrial and domestic emissions. Chromium VI is used in the metallurgical industry for chrome alloy and chromium metal production and chrome plating. It is also used in the chemical industry as oxidizing agents and in the production of other chromium compounds.

Copper – a malleable ductile metal, sometimes occurring in its natural state. Copper ore is mined and processed to be used most commonly in electrical systems, plumbing systems, castings, and heat exchangers. Historically copper has been used in a wide variety of domestic, commercial, and industrial applications.

Cyanide (CN-) – used in electroplating, extraction of ores (gold, silver), metal processing, photographic processes, production of synthetic rubber, chemical synthesis, manufacture of plastics, pesticide/rodenticide control, dehairing of hides, laboratory processes and the manufacture of dyes and pigments.

Dichlorobenzene-1,2 (ortho) – primarily used as a base material for several herbicides. Additional uses include: a solvent for waxes, gums, resins, tars, rubbers, oils and asphalts; as an insecticide for termites and locust borers; as a degreasing agent for metals, leather, paper, dry-cleaning, bricks, upholstery and wool; as an ingredient of metal polishes; in motor oil additive formulations; and in paints.

Dichlorobenzene-1,4 (para) – used mainly as an air freshener/deodorizer and a moth repellent (moth balls). It is also used in the manufacture or a range of pesticides, pharmaceuticals, and polyphenylene sulfide resins.

Dichlorophenoxy Acetic Acid (D-2,4) – used as an agricultural and commercial pesticide/herbicide to control broadleaf dicot weeds.

Hexachlorobenzene - released in trace amounts in the manufacture and use of chlorinated solvents and pesticides, and in emissions from incinerators and other industrial processes. (not used commercially in Canada since 1972)

Hexachlorocyclopentadiene – mainly used in the production of insecticides. Also used in polyester resins and flame retardants.

Hydrogen Sulphide - results from the anaerobic bacterial breakdown of organic matter. It also occurs in volcanic gases, natural gas, and some well waters. Hydrogen Sulphide is used to produce pure sulfur, in laboratory chemistry, the production of alkali metal sulfides and metal sulfides, the separation of heavy water.

Lead, Mercury – Lead and mercury contaminants can be found in batteries, paint, cathode ray tubes in computer screens and TVs, electronics and old plumbing. Mercury is also found in compact fluorescent lights, thermostats and dental amalgum.

Nitrogen – a inert gas which makes up 78% of Earth's atmosphere used biologically by growing organisms and released by decaying plant and animal matter. Nitrogen gas is also distilled for industrial processes, nitrate fertilizers, explosives, food preservation, incandescent light bulbs, production of electronics, aircraft fuel, paintball gun propellant, and as a pressurizing agent for beer kegs. Nitrogen in the liquid form is used a refrigeration and cooling.

Nickel – a lustrous metal, extracted from ore. It has a wide range of uses including stainless steel, magnets, coinage, rechargeable batteries, and special alloys.

Oxamyl – commercial/agricultural insecticide

Phosphorus (total) - commonly found in inorganic phosphate rocks. It is an essential element for all living cells. Commercial uses include fertilizers, explosives, nerve agents, friction matches, fireworks, pesticides, toothpaste, and detergents.

Petroleum Hydrocarbons (F1-F4) – organic compounds found naturally in crude oil. Predominantly used as a combustible fuel source, also used in road asphalt and a propellant in aerosol sprays.

Polychlorinated Biphenyls (PCBs) – synthetic industrial chemicals widely used prior to the late 1970s as dielectrics in electrical transformers and capacitors, as heat exchange fluids, paint and plastic additives, cutting oils, and inks.

Polycyclic Aromatic Hydrocarbons (PAHs) - emitted naturally from forest fires. Human-related activities can include wood heating, aluminum smelters, creosote-treated products, spills of petroleum products, and industrial processes.

Selenium – occurs naturally and is associated with copper ores, used widely in electronics and photocopiers. Selenium occurs in a wide variety of items from vegetables to personal hygiene products.

Silver – a lustrous metal, occurring naturally. Currently used in electrical systems, mirrors, chemical reactions (catalyst), photographic film, and disinfectants and microbiocides.

Pathogens – a biological agent that causes disease. Pathogens can be transmitted by bacteria and fungus in contaminated meat, animal and human wastes.

Trichloroethylene (TCE) – a chlorinated hydrocarbon (DNAPL) used as an industrial solvent for degreasing metal parts. Historically used as a dry cleaning solvent and for coffee decaffeination.

Trichlorophenoxyacetic acid-2,4,5 – herbicide used to defoliate broad leaf plants (phased out in 1970's) (aka Agent Orange)

Trichlorobenzene-1,2,4 - used as an intermediate in chemical synthesis, a solvent, a coolant, a lubricant and a heat-transfer medium. It is also used in polyester dyeing, in termite control preparations and as an insecticide.

Trichloroethane-1,1,1 - used as a solvent for adhesives, in metal degreasing and in the manufacture of vinylidene chloride. Other applications include its use in pesticides, textile processing, cutting fluids, aerosols, lubricants, cutting oil formulations, drain cleaners, shoe polishes, spot cleaners, printing inks,

and stain repellents.

Uranium – a metallic chemical element occurring naturally in low concentrations. Uranium is used in nuclear technology, ammunitions, guidance devices, as a shielding material, and a target for X-ray imaging. Historically used as a photographic toner, coloured glass, and glow-in-the-dark paints.

Vinyl chloride – an industrial chemical (DNAPL) used to produce Polymer Polyvinyl Chloride (PVC) for electrical wiring/insulation, food packaging, and many household and industrial items. Vinyl chloride enter the environment by leaches from old PVC products such as pipes and siding (pre-1990) and industrial discharge from chemical and latex manufacturing plants. It is also a natural breakdown product of trichloroethylene (TCE).

Zinc – a lustrous metal, mainly used for plating steel for corrosion-resistance. Other uses include batteries, alloys, dietary supplements, deodorants, anti-dandruff shampoos), and paints.

Appendix B – Reference List

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Ontario Ministry of the Environment. 2009. Land Disposal Restrictions (LDR) Handbook
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Appendix B-1 - Legislative Definitions Excerpts

Waste Management Facility (under the Environmental Protection Act)

Definitions, Part V

25. In this Part,

"waste" includes ashes, garbage, refuse, domestic waste, industrial waste, or municipal refuse and such other materials as are designated in the regulations; ("déchets")

"waste disposal site" means,

(a) any land upon, into, in or through which, or building or structure in which, waste is deposited, disposed of, handled, stored, transferred, treated or processed, and

(b) any operation carried out or machinery or equipment used in connection with the depositing, disposal, handling, storage, transfer, treatment or processing referred to in clause (a);

"waste management system" means any facilities or equipment used in, and any operations carried out for, the management of waste including the collection, handling, transportation, storage, processing or disposal of waste, and may include one or more waste disposal sites. R.S.O. 1990, c. E.19, s. 25; 1992, c. 1, s. 25.

Application of Part, domestic waste

26. This Part does not apply to the storage or disposal by any person of the person's domestic wastes on the person's own property unless the Director is of the opinion, based upon reasonable and probable grounds, that such storage or disposal is or is likely to create a nuisance, or to any sewage or other works to which the *Ontario Water Resources Act* or the regulations thereunder apply. R.S.O. 1990, c. E.19, s. 26; 2005, c. 12, s. 1 (11).

Tables of Drinking Water Threats - Definitions

Hazardous Waste: O. Reg. 347 (General – Waste Management)

"hazardous waste" means a waste that is a,

(a) hazardous industrial waste,

(b) acute hazardous waste chemical,

(c) hazardous waste chemical,

(d) severely toxic waste,

(e) ignitable waste,

(f) corrosive waste,

(g) reactive waste,

(h) radioactive waste, except radioisotope wastes disposed of in a landfilling site in accordance with the written instructions of the Canadian Nuclear Safety Commission,

(i) pathological waste,

(j) leachate toxic waste, or

(k) PCB waste,

but does not include,

(l) hauled sewage,

(m) waste from the operation of a sewage works subject to the *Ontario Water Resources Act* where the works,

(i) is owned by a municipality,

(ii) is owned by the Crown or the Ontario Clean Water Agency, subject to an agreement with a municipality under the Ontario Water Resources Act, or

(iii) receives only waste similar in character to the domestic sewage from a household,

(n) domestic waste,

(o) incinerator ash resulting from the incineration of waste that is neither hazardous waste nor liquid industrial waste,

(p) waste that is a hazardous industrial waste, hazardous waste chemical, ignitable waste, corrosive waste, leachate toxic waste or reactive waste and that is produced in any month in an amount less than five kilograms or otherwise accumulated in an amount less than five kilograms,

(q) waste that is an acute hazardous waste chemical and that is produced in any month in an amount less than one kilogram or otherwise accumulated in an amount less than one kilogram,

(r) an empty container or the liner from an empty container that contained hazardous industrial waste, hazardous waste chemical, ignitable waste, corrosive waste, leachate toxic waste or reactive waste,

(s) an empty container of less than twenty litres capacity or one or more liners weighing, in total, less than ten kilograms from empty containers, that contained acute hazardous waste chemical,

(t) the residues or contaminated materials from the clean-up of a spill of less than five kilograms of waste that is a hazardous industrial waste, hazardous waste chemical, ignitable waste, corrosive waste, leachate toxic waste or reactive waste, or

(u) the residues or contaminated materials from the clean-up of a spill of less than one kilogram of waste that is an acute hazardous waste chemical;

Related Definition: Threat Circumstance: A site accepts a waste described in clause (p), (q), (r), (s), (t), or (u) of the definition of hazardous waste as defined in Regulation 347 (General – Waste Management), made under the Environmental Protection Act: - clauses identified in italics above.

A site accepts a waste described in clause (p), (q), (r), (s), (t), or (u) of the definition of hazardous waste as defined in Regulation 347 (General – Waste Management), made under the Environmental Protection Act Or in clause (d) of the definition of liquid industrial waste

"liquid industrial waste" means waste that is both liquid waste and industrial waste but does not include,

(d) waste that is produced in any month in an amount less than twenty-five litres or otherwise accumulated in an amount less than twenty-five litres,

Liquid Industrial Waste: O. Reg. 347 (General – Waste Management)

"liquid industrial waste" means waste that is both liquid waste and industrial waste but does not include,

(a) hazardous waste,

(a.1) hauled sewage,

(b) waste from the operation of a sewage works described in clause (m) of the definition of "hazardous waste",

(c) waste from the operation of a water works subject to the *Ontario Water Resources Act* or the *Safe Drinking Water Act, 2002*,

(d) waste that is produced in any month in an amount less than twenty-five litres or otherwise accumulated in an amount less than twenty-five litres,

(e) waste directly discharged by a generator from a waste generation facility into,

(i) a sewage works, other than a storm sewer, that is subject to the *Ontario Water Resources Act* or was established before April 3, 1957, or

(ii) a sewage system regulated under Part 8 of the building code made under the *Building Code Act, 1992*,

(f) waste that results directly from food processing and preparation operations,

(g) drilling fluids and produced waters associated with the exploration, development or production of crude oil or natural gas,

(h) processed organic waste, or

(i) asbestos waste;

Municipal waste: O. Reg. 347 (General – Waste Management)

"municipal waste" means,

(a) any waste, whether or not it is owned, controlled or managed by a municipality, except,

(i) hazardous waste,

(ii) liquid industrial waste, or

(iii) gaseous waste, and

(b) solid fuel, whether or not it is waste, that is derived in whole or in part from the waste included in clause (a);

Petroleum Refining Waste: O. Reg. 347 (General – Waste Management) – as defined in the circumstance (not the glossary)

"land disposal" means, with respect to a waste, the deposit or disposal of the waste upon, into, in or through land, including,

(d) the landfarming of the waste, in the case of a petroleum refining waste,

"landfarming" means the biodegradation of petroleum refining wastes by naturally occurring soil bacteria by means of controlled application of the wastes to land followed by periodic tilling;

Land Disposal of Municipal Waste and Hazardous Waste, Liquid Industrial Waste or Processed Liquid Industrial Waste within the meaning of clauses (a) and (b) of the definition of "land disposal" in section 1 of Regulation 347, R.R.O. 1990 (General - Waste Management) made under the Environmental Protection Act:

"land disposal" means, with respect to a waste, the deposit or disposal of the waste upon, into, in or through land, including,

(a) the deposit of the waste at a dump,

(b) the landfilling of the waste,

Industrial or Commercial Waste and Industrial Waste - within the meaning of clause (c) of the definition of "land disposal" in section 1 of Regulation 347 (General- Waste Management) made under the Environmental Protection Act:

"land disposal" means, with respect to a waste, the deposit or disposal of the waste upon, into, in or through land, including,

(c) the discharge of the waste into a geological formation by means of a well,

PCB Waste Disposal Site as described in Section 3 of Regulation 362 (Waste Management – PCBs), R.R. O. 1990, made under the Environmental Protection Act, or under s. 8a:

3. (1) Every site containing PCB waste and PCB related waste but not containing other wastes is classified as a PCB waste disposal site. R.R.O. 1990, Reg. 362, s. 3 (1).

(2) In subsection (1),

"PCB related waste" means waste containing low levels of PCBs or waste arising from a spill or clean up of PCB liquid or PCB waste. R.R.O. 1990, Reg. 362, s. 3 (2).

8. No person shall have at a waste disposal site PCB wastes received by the person after the 15th day of January, 1982 unless,

(a) the PCB waste was delivered to the waste disposal site under written instructions of the Director; or

Definition of PCB waste in R.R.O. 1990, Regulation 362 (Waste Management – PCB's), made under the Environmental Protection Act: as per Glossary definition referencing this regulation

"PCB waste" means PCB equipment, PCB liquid or PCB material, but does not include,

(a) PCB material or PCB equipment after it has been decontaminated pursuant to guidelines issued by the Ministry of the Environment or instructions issued by the Director,

(b) PCB equipment that is,

(i) an electrical capacitor that has never contained over one kilogram of PCBs,

(ii) electrical, heat transfer or hydraulic equipment or a vapour diffusion pump that is being put to the use for which it was originally designed or is being stored for such use by a person who uses such equipment for the purpose for which it was originally designed, or

(iii) machinery or equipment referred to in subclause (c) (i), or

(c) PCB liquid that,

(i) is at the site of fixed machinery or equipment, the operation of which is intended to destroy the chemical structure of PCBs by using the PCBs as a source of fuel or chlorine for purposes other than the destruction of PCBs or other wastes and with respect to which a certificate of approval has been issued under section 9 of the Act after the 1st day of January, 1981 specifying the manner in which PCB liquid be processed in the machinery or equipment, or

(ii) is in PCB equipment referred to in subclause (b) (ii). ("déchets de BPC") R.R.O. 1990, Reg. 362, s. 1.

"PCB equipment" means equipment designed or manufactured to operate with PCB liquid or to which PCB liquid was added or drums and other containers used for the storage of PCB liquid; ("appareils contenant des BPC")

"PCB liquid" means,

(a) liquids, other than liquids used or proposed for use for road oiling, containing PCBs at a concentration of more than fifty parts per million by weight,

(b) liquids used or proposed for use for road oiling, containing PCBs at a concentration of more than five parts per million by weight, and

(c) liquids made contrary to section 6 by diluting liquids referred to in clause (a) or (b); ("liquides contenant des BPC")

"PCB materials" means materials containing PCBs at a concentration of more than fifty parts per million by weight whether the material is liquid or not; ("matières contenant des BPC")

Appendix C – Ad

Additional

Resources

1. Ministry of the Environment - Landfill Inventory Management Ontario (LIMO) www.ene.gov.on.ca/en/land/limo/index.php
2. Ministry of the Environment. Landfill Inventory Management Ontario (LIMO) How Ontario regulates Landfills. www.ene.gov.on.ca/en/land/limo/regulates.php
3. Lindsay Ops Landfill Public Review Committee: www.city.kawarthalakes.on.ca/city-hall/boards-committees/lindsay-ops-landfill-public-review-committee
4. Ministry of the Environment. January, 1986. New Ontario Waste Classes, www.ene.gov.on.ca/envision/gp/4188e.pdf
5. Waste Disposal Site and Waste Management System Certificates of Approval, MOE www.ene.gov.on.ca/en/business/cofa/wastedisposal.php
6. The MOE Water Quality Risk Management Measures Catalogue (Version 2, 09/07/2010) http://maps.thamesriver.on.ca/swpCAMaps/rmc/disclaimer.aspx
7. Ministry of the Environment. SPP Bulletins available at: www.conservationontario.ca/members/members_source_protection_committee/spc_index.html (username: spcmember; password: spc123)

Drinking Water Source Protection Background Document
Prescribed Drinking Water Threat 2A
The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage
Sub-threat: Stormwater Management
June 3, 2011

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Note: We would like to thank Cataraqui Region Conservation Authority and Conservation Ontario for the use of their background research documents in preparing these reports.

1. Definitions

This paper provides background information for prescribed drinking water threat 2A - **– The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage, sub-threat: stormwater management.**

The intent of this paper is to consider stormwater management in the light of the *Clean Water Act, 2006*. Source Protection Committees are challenged with the task of addressing risks to drinking water sources by managing the activities which threaten drinking water sources as understood through the Tables of Drinking Water Threats. The goal is to produce cleaner effluent from stormwater management systems, thus reducing impacts on both surface and groundwater through the reduction of contaminants on the landscape.

The definitions pertaining to stormwater are found in the *Ontario Water Resources Act* and O.Reg 525/98. **Stormwater** means rainwater runoff, water runoff from roofs, snowmelt and surface runoff. Some additional examples would include lawn watering and car washing since this water also makes its way into water bodies via the storm sewer system. Under the *Clean Water Act* the threat to drinking water is limited to stormwater management facilities. A **Stormwater management facility** is defined as a facility for the treatment, retention, infiltration or control of storm water. It is assumed facility refers to the system of managing stormwater, including stormwater pipes that discharge directly into streams or water bodies. Combined sanitary and storm sewers and presented in a separate backgrounder. Storm water management is also in place to address issues of flooding, erosion, recharge and other environmental goals.

Appendix A to this report outlines the possible sources of some of the contaminants in stormwater.

Where stormwater is managed, it is often under a storm water management plan which addresses run-off through conveyances and end-of-pipe collection and treatment systems.

Conveyance is the movement or transfer of stormwater via gutters, sewer pipes, culverts and ditches. Storm sewers collect runoff along roads, and since the 1980s are normally separate from sanitary sewers that collect wastewater from homes or business.

End-of-pipe collection and treatment systems provide quantity and quality control. There are many types of these “end-of-pipe” management systems. One of the most prevalent is the stormwater management pond which captures excess runoff, allows time for settling of suspended pollutants and retains flow until it can be absorbed back into the natural watercourses.

Other management techniques include oil and grit separators which are containment units designed to remove coarse sediment and oils from stormwater before it enters the storm-drain network, the ground or other treatment.

2. What causes this activity to be a drinking water threat?

Stormwater management systems can be a significant or moderate, chemical or pathogen, sewage threat for rural, residential (high and low density) or industrial/commercial areas, depending on the size of the drainage area.

While there is no standard definition for high or low residential densities, generally low density development refers to detached single family residential development, duplexes and semi-detached dwellings. High density development refers to the more concentrated development patterns typically found in the centres of urban areas such as apartment buildings.

There are twenty chemicals and pathogens included in the MOE Tables of Drinking Water Threats (Ontario Ministry of the Environment, 2009) for stormwater management facilities. Any of these contaminants can make their way into surface water and groundwater and threaten the safety of a drinking water source.

- Pathogens
- Aluminum
- Arsenic
- Cadmium
- Chloride
- Chromium VI
- Copper
- Glyphosate
- Lead
- Mecoprop
- Mercury
- Nickel
- Nitrogen
- Polycyclic aromatic hydrocarbons
- Petroleum hydrocarbons F1- F4
- Total phosphorus *
- Zinc

Note: * Total phosphorous is only considered for surface water because excessive inputs result in eutrophication and can cause toxic algae blooms.

The circumstances (277 to 504 and 1949) are divided based on the chemical released, the size of the drainage area the facility serves and the predominant surrounding land uses flowing into the facility.

It should be noted that the circumstances included in the MOE Tables of Drinking Water Threats (2008, as amended in 2009) are for **stormwater management facilities only** and do not include run-off from properties where there is no management facility such as a farm field.

3. Understanding the nature of the drinking water threats

Depending on the location, drainage area and type of land use, a stormwater management facility can be classified as a significant, moderate or low drinking water threat.

Future discharge of untreated stormwater has the potential to be a significant threat for intake protection zones with vulnerability scores greater than 8. The Port Colborne IPZ-1 could have a future significant stormwater management threat if either:

1. The drainage area for an outlet was enlarged to 100 hectares; or
2. The drainage area is greater than 10 hectares and the predominant land uses are industrial or commercial.

The Port Colborne IPZ-2, Decew Falls IPZ-1s and Niagara Falls IPZ-1 could have a significant stormwater management threat if there was created a drainage area greater than 100 hectares and the predominant land uses were industrial or commercial.

Table 3.1 - Stormwater management

Vulnerable Area		VS	Significant	Moderate	Existing Significant Threats
Port Colborne	IPZ-1	9.0	C[1,2]	C[3], P	
	IPZ-2	8.1	C[4]	C[3]	
DeCew Falls	Main Intake IPZ -1	8.0		C[5,6]	
	Lake Gibson Alternate Intake IPZ-1	8.0			
	Hwy 406 Control Structure IPZ-1	8.0			
Niagara Falls	IPZ-1	8.0			
	IPZ-2	6.4		C[7]	
Welland	IPZ-1	7.0		C[8,9]	
Fort Erie	IPZ-1	7.0			
DeCew Falls	Main Intake IPZ -2	6.4		C[7]	
	Lake Gibson Alternate Intake IPZ-2	6.4			

NOTES:

VS – Vulnerability Score, C – Chemical threat, P – Pathogen threat

1 – Drainage area is greater than 100 hectares, and the predominant land uses are rural, agricultural, residential, industrial or commercial.

2 - Drainage area is greater than 10 hectares, and the predominant land uses are industrial or commercial.

3 – Drainage area of any size, and the predominant land uses are rural, agricultural, residential, industrial or commercial.

4 - Drainage area is greater than 100 hectares, and the predominant land uses are industrial or commercial.

5 – Drainage area is greater than 1 hectare, and the predominant land uses are rural, agricultural or residential.

6 – Drainage area of any size, and the predominant land uses are industrial or commercial.

7 – Drainage area is greater than 100 hectares, and the predominant land uses are high density residential, industrial or commercial.

8 – Drainage area is greater than 100 hectares and the predominant land uses are rural, agricultural, or low density residential.

9 – Drainage area is greater than 10 hectares and the predominant land use is high density residential, industrial or commercial.

Table 3.2 –Drainage areas outletting in IPZs

Vulnerable Area		Number of outlets & sizes (hectares)	Predominant Land Use for >10ha
Port Colborne	IPZ-1	Six: 41,36, 31, 15, 1 and 1 ha	Urban residential
	IPZ-2	No mapped stormwater outlets	
DeCew Falls	Main Intake IPZ -1		
	Lake Gibson Alternate Intake IPZ-1		
	Hwy 406 Control Structure IPZ-1		
Niagara Falls	IPZ-1	Three:12, 4 and 3 ha	Residential

4. Applicable Legislation, Policies and Programs

a) Provincial

Ontario Water Resources Act (Government of Ontario, 1990)

Stormwater management facilities require a certificate of approval (C of A) issued by the MOE under the *Ontario Water Resources Act*.* The MOE "Guide for Applying for Approval of Municipal and Private Water and Sewage Works" (August 2000) is used by applicants to ensure that their proposals meet the legislative requirements for a C of A. The terms and conditions of the C of A generally address:

- criteria for operation and performance of the stormwater management facility,
- requirements for monitoring and recording of specific indicators of the environmental impact of the works (water quality, not quantity),
- reporting on incidents, and
- provision of contingencies to prevent and deal with accidental spills.

*In some cases these responsibilities have been delegated to municipalities, .e.g. pipe distribution systems.

Stormwater Management Planning and Design Manual

The MOE "Stormwater Management Planning and Design Manual" (March 2003) provides practical information on how to design stormwater management facilities in Ontario. It focuses on quantity and quality control and it is the main reference document for urban stormwater management within many Source Protection Areas. There are three different levels of quality treatment all relating to sediment control (see below), although the document does mention the need to consider bacteria near recreational/swimming areas and temperature for cold water streams.

- *Enhanced* – removes 80% of suspended solids and is used in areas with highly permeable soils, sensitive spawning habitat, high baseflow, clear waters and low erosion.
- *Normal* – removes 70% of suspended solids and is used in areas with some sediment loading and less sensitive spawning habitat.
- *Basic* – removes 60% of suspended solids and is used in areas with high sediment loading and significantly altered stream system with little opportunity to rehabilitate.

Pesticides Act (Government of Ontario, 1990) and Ontario Regulation 63/09 (Ontario's Cosmetic Pesticides Ban – Government of Ontario, 2009)

The MOE Tables of Drinking Water Threats identify two pesticide ingredients (glyphosate and mecoprop) that can be found in stormwater discharge and result in a drinking water threat. Ontario's cosmetic pesticides ban applies to the majority of pesticides, including these two.

The cosmetic pesticides ban took effect on April 22, 2009. The requirements of the ban are detailed in the Pesticides Act and Ontario Regulation 63/09. The ban should have the effect of reducing the amount of pesticides in stormwater.

The provincial ban prohibits the application of pesticides for cosmetic purposes on lawns, vegetable and ornamental gardens, patios, driveways, cemeteries, and in parks and school yards. More than 250 pesticide products are banned for sale and over 95 pesticide ingredients are banned for cosmetic uses. Exceptions to the ban are made for: public health and safety, natural resources, golf courses, sports fields, specialty turf, agriculture, forestry and public works.

Local fire departments must be made aware of pesticide storage related to manufacturers, operators and vendors to protect human health and the environment.

b) Regional

Conservation Authority Planning Policy

Ontario Conservation Authorities (CAs) are commenting agencies under the *Planning Act*. One of their roles is to review stormwater management plans for new development and to provide comments to their member municipalities. The following aspects are considered through this review:

- maintenance of the hydrologic cycle,
- recognition of riparian water rights, and
- retention and improvement of ecosystem health.

Flood control, maintaining baseflow in watercourses, water temperature, erosion and sediment control, limiting nutrient and bacteria loading, maintaining fish habitat, and groundwater recharge and contamination may be of interest in a particular watershed or subwatershed.

To ensure consistency in their approach to stormwater management, many CA's have various guidelines for stormwater management that form part of the Planning Policy (e.g. NPCA Stormwater Management Guidelines, 2010). These guidelines outline a CA's main policies and objectives for stormwater management. Some of the CA's roles include reviewing applications for development on or in Regulated Areas, as well as providing technical advice to approval authorities.

Municipal

Municipalities throughout Ontario have varying levels of policies regarding stormwater management and natural vegetative buffers for water bodies in their official plans and in

some cases Stormwater Management Facilities under the OWRA. The importance of protecting natural heritage features (e.g. wetlands) is also recognized for its role in decreasing stormwater runoff.

- Stormwater Management - All municipalities require stormwater management (SWM) plans to accompany subdivision applications. Most of them also require SWM plans for commercial and industrial development.

- Development Setbacks - Development setbacks from water bodies are generally between 15 m (Type 2 and 3 Fisheries) to 30 m (Type 1 Fisheries). The intent of the water setback is to provide a buffer of undisturbed soil and vegetation along the shoreline, which will help to filter runoff, prevent soil erosion, and provide wildlife habitat. A number of municipalities require or encourage the maintenance of natural vegetation cover (trees, shrubs, vines, groundcovers) within at least 15 m of the watercourse.

5. Gaps in existing legislation, policies and programs

The provincial legislative and municipal requirements for stormwater management are comprehensive.

6. Policy considerations

- *Clean Water Act* Part IV tools interim risk management plans, risk management plans, prohibition, and restricted land uses cannot be used for stormwater management systems.

- The Certificate of Approval under the OWRA is a provincial instrument to which the SPC can ask MOE to include conditions.

Policy Tool	Examples
Education and Outreach	n/a
Incentive Programs	Retrofit facilities in need of upgrade.
Land Use Planning	Policy to prevent the drainage areas and land use types which are significant threats
Prescribed Provincial Instruments	Policy to prevent the drainage areas and land use types which are significant threats
Municipal Operations / Infrastructure	Retrofit facilities in need of upgrade.
Risk Management Plans	n/a
Prohibition	n/a
Restricted Land Uses	n/a

Appendix A – Contaminant Sources in Stormwater Runoff

Aluminum – Aluminum comes from roofing materials, soil erosion, scrap metal and wearing automotive parts.

Arsenic – Arsenic was used as a wood preservative for many years. It can also be found in plumbing and pesticides among other products. It occurs naturally in bedrock deposits on the Canadian Shield.

Cadmium, copper, lead, nickel and zinc – These metals can be found in vehicle exhaust, brake linings, and tire and engine wear.

Chloride – The main source of chloride in stormwater is from road de-icers and detergents. It occurs naturally in bedrock deposits.

Mercury – mercury is often associated with electronics, but it can result from atmospheric deposition (coal burning, waste incineration).

Nitrogen, total phosphorus - Nitrogen is found in fertilizers that are applied to lawns and golf courses, the decomposition of natural rock and soils, air deposition from vehicle exhaust, detergents used to wash cars on the street, and pet waste.

Glyphosate, mecoprop – these chemicals are active ingredients in herbicides.

Polycyclic Aromatic Hydrocarbons (PAHs) – These chemicals can be found in vehicle exhaust, coal tar-based sealants used on paved roads and parking lots, and creosote treated wood.

Petroleum Hydrocarbons – The sources of petroleum hydrocarbons include the disposal of used oil and other fluids on the ground or into storm drains, spills of gasoline or oil, and leaks of oil and other fluids from vehicles, hydraulic oil is at industrial sites, runoff from residential car washing.

Pathogens – Pathogens can be associated with animal waste and combined sewers.

Appendix B – Reference List

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Drinking Water Source Protection Background Document
Prescribed Drinking Water Threat 2B
The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage
Sub-threat: Wastewater Treatment Plants and Sewer Systems
May 20, 2011

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Note: We would like to thank Cataraqui Region Conservation Authority and Conservation Ontario for the use of their background research documents in preparing these reports.

1. Definition

This paper provides background information for prescribed drinking water threat 2B – **the establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage – sewage treatment plants and sewer networks**.

The main consideration for reducing or eliminating drinking water threats related to sewage treatment plants and sewer systems is to make sure that any discharge from the sites does not result in a significant risk to drinking water. Also, future sewage treatment plants and sewer networks must not create a significant drinking water threat.

This report includes the activities that follow as identified in the Ontario Ministry of the Environment (MOE) Tables of Drinking Water Threat (MOE, 2009):

i. Sewage treatment plant effluent discharges (including lagoons): All sewage treatment plants release treated wastewater that is called effluent. The effluent can be directly released to a watercourse or waterbody or its release from a lagoon can be scheduled.
ii. Storage of sewage (treatment plant tanks): Many sewage treatment plants have sewage storage tanks as part of the treatment process.
iii. Sewage treatment plant by-pass discharge to surface water: Sometimes the capacity at a sewage treatment plant is overwhelmed and partially treated or untreated sanitary waste is released into the receiving water body. This is generally as a result of an extreme wet weather event (i.e. significant rainfall or snow melt) where the sanitary sewer network is not completely isolated from stormwater. Combined sewers or sewer networks with inflow/infiltration issues are the root cause of bypasses.
iv. Sanitary sewers and related pipes: these are the pipes that collect sanitary waste from all the serviced buildings in the area.
v. Combined sewer discharge from a stormwater outlet to surface water: in older parts of urban areas there are sometimes pipes that convey both stormwater and sanitary sewage. Under dry weather conditions, the pipe contains mainly sanitary sewage. During rainfall or snowmelt, the water flows into the same pipe and 'combines' with the sanitary sewage.

2. What causes this activity to be a drinking water threat?

There are 318 chemical and pathogen circumstances for sewage systems and sewage works listed in the MOE Tables of Drinking Water Threats (MOE, 2009) that could make their way into surface and groundwater as a result of a discharge. The main groups of contaminants are pesticides, metals, synthetic chemicals and pathogens (circumstances 631-694 and 1958, 719-783 and 1948, 784-903 and 1959 and 904-1097 and 1960-1961, 212-276 and 1947).

The following chemicals and pathogens could threaten the safety of drinking water sources in certain situations.

- Antimony
- Arsenic
- Barium
- BTEX
- Cadmium
- Chlorophenol-2
- Chromium VI
- Copper
- Cyanide (CN-)
- Dibutyl phthalate
- Dichlorobenzene-1,2 (ortho)
- Dichlorobenzene-1,4 (para)
- Dichlorobenzidine-3,3
- Dichlorophenol-2,4
- Ethylene Glycol
- Hexachlorobenzene
- Lead
- MCPA (2-methyl-4-chlorophenoxyacetic acid)
- Mercury
- Nickel
- Nitrogen
- Nitrosodimethylamine-N (NDMA)
- Pentachlorophenol
- Phenol
- Phosphorus (total)
- Polychlorinated Biphenyls (PCBs)
- Hydrocarbons (PAHs)
- Silver
- Trichloroethylene
- Vinyl chloride
- Zinc
- Pathogens

3. Understanding the nature of the drinking water threat?

Depending on the location, type of facility and designed discharge rate, a sewage treatment facility or sewer network can be classified as a significant, moderate or low drinking water threat.

Instances of future significant sewage discharge threats (from combined sewer or a sewage treatment plant) are not expected. This is because new combined sewers are not permitted by the MOE. However, it is recognized that inflow of extraneous flows into the sewer system can in some instances create a CSO type condition. Details of circumstances that could constitute significant sewage discharge threats, however unlikely, are shown in Table 3.1 for the Niagara Peninsula Source Protection Area.

Table 3.1 - Discharge from combined sewer or sewage treatment plant

Vulnerable Area		VS	Significant	Moderate	Existing Significant Threats
Port Colborne	IPZ-1	9.0	C[1] P[2,3]	C[4,5,6,7] P[3,5,6]	
	IPZ-2	8.1	C[8] P[2]	C[4,9] P[3,5,6]	
DeCew Falls	Main Intake IPZ -1	8.0			
	Lake Gibson Alternate Intake IPZ-1	8.0			
	Hwy 406 Control Structure IPZ-1	8.0			
Niagara Falls	IPZ-1	8.0			
	IPZ-2	6.4		C[8], P[2]	
Welland	IPZ-1	7.0		C[1] P[2,3]	
Fort Erie	IPZ-1	7.0			
DeCew Falls	Main Intake IPZ -2	6.4		C[8] P[2]	
	Lake Gibson Alternate Intake IPZ-2	6.4			

NOTES:

VS – Vulnerability Score

1 – combined sewer discharge (other than by way of a designed bypass), or a wastewater treatment facility, discharging sanitary sewage and part of a wastewater treatment facility designed to treat at an average daily rate more than 17,500 m^3/day (Although not in the IPZs Port Colborne (Seaway) wastewater treatment plant has a designed capacity of 19,600m^3/day)

2 – combined sewer discharge or a wastewater treatment facility, discharging sanitary sewage to surface water

3 – sanitary sewage works wastewater tank where spillage may introduce pathogens to groundwater or surface water

4 – combined sewer discharge (other than by way of a designed bypass), or a wastewater treatment facility, discharging sanitary sewage and part of a wastewater treatment facility designed to treat at an average daily rate more than 500 m^3

5 – sanitary sewer pipes designed to convey more than 100,000 m^3/day (Note: the Niagara Region sanitary sewage main within the Port Colborne IPZ-1 transmits less than this)

6 – septic system or holding tank

7- sanitary sewage works wastewater tank associated with a wastewater treatment facility designed to treat at an average daily rate greater than 17,500 m^3

8 – combined sewer discharge (other than by way of a designed bypass), or a wastewater treatment facility, discharging sanitary sewage and part of a wastewater treatment facility designed to treat at an average daily rate more than 50,000 m^3/day (Although not in the IPZs Niagara Falls and Port Weller wastewater treatment plants have designed capacities of 68,300 and 56,180 m^3/day, respectively)

9- sanitary sewage works tank associated with a wastewater treatment facility designed to treat at an average daily rate greater than 50,000 m^3

4. Applicable legislation, policies and programs

a) Provincial

Ontario Water Resources Act

Certificates of approval (C of A) are required under the *Ontario Water Resources Act* for sewage systems and other sewage works from the Ministry of the Environment. These C of As are prescribed instruments under the *Clean Water Act*. The MOE "Guide for Applying for Approval of Municipal and Private Water and Sewage Works" (August, 2000) is used by applicants to ensure that their proposals meet the legislative requirements for a C of A.

The terms and conditions of the C of A generally address the criteria for operation and performance of the sewage treatment plant, the requirements for monitoring and recording of specific indicators of the environmental impact of the works (e.g. effluent standards), reporting on incidents, and provision of contingencies to prevent and deal with accidental spills. The most important aspect of the environmental impact considered in the assessment of any proposed sewage works is the anticipated impact of the facility's final effluent quality on the receiver (i.e. surface water body, land area, soil and/or ground water aquifer) and its potential users.

All operators at a sewage treatment plant must be licensed operators.

b) Municipal

Land Use Planning

Those municipalities with existing water and sanitary sewage services will not permit development that would require unplanned expansions to these systems. New development within the serviced areas must connect to them (i.e. no private well and septic system).

In general, communal water and sewage systems are not supported because of the financial implications to the municipality. However, some may consider this form of servicing in areas where there is a public health threat that cannot be easily serviced by existing municipal systems.

Sewer Use By-laws

Municipalities often have sewer use by-laws that regulate connections to the sanitary sewer systems, as well as the types and concentrations of waste that can enter the systems. Industrial, commercial, institutional or multi-residential building developments may be required to pre-treat, monitor and report on sewage or stormwater discharge. Dilution of waste to meet concentration requirements is prohibited. Special agreements may be required to all special exceptions to these rules.

5. Gaps in existing legislation, policies and programs

- Sewer use by-laws may not address all source water protection concern relating to the contaminants identified in the MOE Tables of Drinking Water Treats (MOE, 2009).

6. Policy Considerations

- REMINDER: The main consideration for reducing or eliminating drinking water threats related to sewage systems and sewage works is to produce cleaner effluent.

- *Clean Water Act* Part IV tools including interim risk management plans, risk management plans, prohibition, and restricted land uses cannot be used for sewage systems or sewage works.

- Policies related to the preferential location of new facilities with separation from intake protection zones.

- The source protection plan will need to include a high-level policy approach ("a catch-all policy") to address those "would be" drinking water threats that are unlikely to occur in a given vulnerable area.

Examples of risk management measures and policy ideas

For discussion purposes, this section of the report provides examples of risk management measures and policy ideas that could be applicable to sewage treatment plants and combined sewers. It is not an exhaustive list.

The examples are categorized by the types of policy tools that can be used to meet the source protection plan objectives. The MOE Risk Management Measures Catalogue (Version 2, 10/03/2010) was reviewed as part of this exercise and measures were incorporated where appropriate; many of the measures in the catalogue are already required by applicable provincial instruments.

Table 6.1 Risk Management Measures for Sewage Systems and Sewage Works

Policy Tool	Example
Education and Outreach	• Area-wide education and outreach programs targeted at sanitary sewer users about what can and cannot be poured down the drain, what other disposal options are available, how incorrectly disposed of substances/materials negatively affect the treatment system and the quality of the effluent leaving the treatment facility.
Incentive Programs	• Assist with disconnecting illegal connections to the sewer network (eavestroughs, sump pumps).
Land Use Planning	• Prohibit new sewage treatment plants in areas where they would be a significant drinking water threat.
Prescribed Provincial Instruments	• Require/encourage (depending on level of threat) the MOE to take extra care in its review of applications for sites within and adjacent to intake protection zones, to prioritize inspections for these areas and revisit effluent targets to address drinking water threats (e.g. require any contaminant listed in the MOE Tables of Drinking Water Threats to be below the minimum detection limit).
Municipal Operations / Infrastructure	• Inflow/infiltration reduction programs. • Upgrade sewage treatment plants • Continue to separate combined sewer. • Enact and enforce sewer use by-laws.

Appendix A – Reference List

Government of Ontario. 1990. Ontario Water Resources Act http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90o40_e.htm

Ontario Ministry of the Environment. August, 2000. Guide for Applying for Approval of Municipal and Private Water and Sewage Works. http://www.ene.gov.on.ca/environment/en/resources/STD01_076038.html

Ontario Ministry of the Environment. March 1995. Procedure D-5-2: Application of Municipal Responsibility for Communal Water and Sewage Services. http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/std01_079311.pdf

CH2M Hill and XCG Consultants. July 2010. Pollution Control Plan Update for the City of Kingston.

Corporation of the City of Brockville. September 27, 1994. By-law No. 12-91.

Corporation of the City of Kingston. November 4, 2008. By-law No. 2008-192.

Corporation of Loyalist Township. May 8, 2006. By-law No. 2006-044

Town of Gananoque. 1988. By-law No. 88-09

Appendix B – Additional Resources

The MOE Water Quality Risk Management Measures Catalogue (Version 2, 09/07/2010) http://maps.thamesriver.on.ca/swpCAMaps/rmc/disclaimer.aspx

Drinking Water Source Protection Background Document
Prescribed Drinking Water Threat 2C
The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage
Subthreat: Sewage System or Sewage Works – Industrial Effluent Discharges

Table of Contents

Note: We would like to thank Cataraqui Region Conservation Authority and Conservation Ontario for the use of their background research documents in preparing these reports.

1. Definition

This paper provides background information for **prescribed drinking water threat 2C – The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage, Subthreat: Sewage System or Sewage Works – Industrial Effluent Discharges**

Industrial sewage works are any works for the collection, transmission, treatment or disposal of effluent generated from industrial operations. These works include, but are not limited to:

- process and cooling water streams, including discharges from heat pump systems;
- industrial sewage lagoons and biological treatment plants;
- wastewater treatment systems for sectors such as pulp and paper and meat processing facilities;
- quarry and mine dewatering systems and wash plants;
- landfill leachate treatment systems;
- groundwater remediation treatment systems, including mobile units; and
- river/harbour dredging projects with treatment facilities on-shore.

Industrial effluent discharges also include those from sewage and stormwater treatment. These works are included in other subthreat categories and are addressed in similar background reports.

2. What causes this activity to be a drinking water threat?

There are 131 circumstances listed in the MOE Tables of Drinking Water Threats (2009) that identify sewage works for industrial effluent discharges as significant, moderate and low level drinking water threats. In all circumstances the system must discharge to surface water. The threat circumstances recognize that the effluent discharges could result in the presence of chemicals in both surface water and groundwater, and the presence of pathogens in surface water.

The chemical circumstances can be divided into two broad categories:

1. those industrial sewage systems that are associated with a facility for which National Pollution Release Inventory (NPRI) reporting is required for substances listed in Groups 1, 2, 3 or 4 of Part 1 of Schedule 1 or Part 2 of Schedule 1 of the NPRI Notice; and
2. those facilities for which NPRI reporting is not required.

The National Pollutant Release Inventory is Canada's legislated inventory of pollutant releases to air, water and land, disposals, and transfers for recycling (see link to website in Appendix B). Environment Canada manages the inventory, which tracks over 300 substances or groups of substances. Owners or operators of facilities that meet the reporting requirements must calculate the quantities of specified substances manufactured, processed or otherwise used and report these quantities on an annual basis.

The chemicals associated with drinking water threats for either significant, moderate or low levels are

- Acrylonitrile
- Aluminum
- Arsenic or arsenic compound
- Biphenyl-1,1'
- Bis(2-ethylhexyl) phthalate
- Boron
- Bromomethane
- BTEX
- Butoxyethanol-2
- Butyl-n alcohol
- Butyl-tert alcohol
- Cadmium or cadmium compound
- Carbon tetrachloride
- Chloride
- Chloroform
- Chromium VI
- Cobalt or cobalt compound
- Copper or copper compound
- Cyanide
- Dichlorobenzene-1,2
- Dichlorobenzene-1,4
- Dichloroethane-1,2
- Ethylene glycol
- Formaldehyde
- Hexachlorobenzene
- Hexachloroethane
- Hydrazine or hydrazine salt
- Hydroquinone
- Iron
- Lead or lead compound
- Manganese or manganese compound
- Mercury or mercury compound
- Methanol
- Methyl ethyl ketone
- Methylene chloride (Dichloromethane)
- Molybdenum
- Naphthalene
- Nickel or nickel compound
- Nitrogen
- Nitrosodimethylamine-N (NDMA)
- Adsorbable Organic Halides (AOXs)
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Pentachlorobenzene
- Petroleum Hydrocarbons F1 to F4
- Phenol
- Total phosphorus
- Selenium or selenium compound
- Silver or silver compound
- Sodium fluoride
- Styrene
- Hydrogen sulphide
- Tetrachlorobenzene-1,2,4,5
- Tetrachloroethylene
- Trichlorobenzene-1,2,4
- Trichloroethylene or DNAPL that degrades to TCE
- Tritium
- Vanadium
- Vinyl chloride or DNAPL that degrades to VC
- Zinc

These substances could be by-products, impurities, reactants or manufacturing aids resulting from manufacturing or processing methods. Fifty six (56) of the chemicals listed are associated with threats at the significant level.

The Tables of Drinking Water Threats identify five classes of industrial operations as drinking water threats based solely on the release of pathogens. These operations include meat plants, seafood processing operations, dairy producers or dairy product manufacturing operations, animal food manufacturing operations that manufacture food from animal sources, and pulp and paper mills. Only meat processing plants are significant drinking water threats.

3. Understanding the nature of the drinking water threats

Sewage systems or works associated with industrial effluent discharges can only be a significant drinking water threat in an intake protection zone with a vulnerability score greater than 8. To be classified as significant the discharge would need to be associated with a facility that is required to report to NPRI for substances listed in Groups 1, 2, 3 or 4 of Part 1 of Schedule 1 (chemical threat) or Part 2 of Schedule 1 of the NPRI Notice (chemical threat) or be a meat plant (pathogen threat).

Table 3.1 - Industrial sewage effluent discharging to surface water

Vulnerable Area		VS	Significant	Moderate	Existing Significant Threats
Port Colborne	IPZ-1	9.0	C[1] P[5]	C[1,3] P[5]	
	IPZ-2	8.1	C[1] P[2]	C[1,3]	
DeCew Falls	Main Intake IPZ -1	8.0			
	Lake Gibson Alternate Intake IPZ-1	8.0			
	Hwy 406 Control Structure IPZ-1	8.0			
Niagara Falls	IPZ-1	8.0			
	IPZ-2	6.4		C[1] P[2]	
Welland	IPZ-1	7.0		C[1,3] P[2]	
Fort Erie	IPZ-1	7.0			
DeCew Falls	Main Intake IPZ -2	6.4		C[1] P[2]	
	Lake Gibson Alternate Intake IPZ-2	6.4			

NOTES:

VS – Vulnerability Score
1 – National Pollutant Release Inventory (NPRI) reporting required
2 – Meat processing plant
3 – NPRI reporting not required
5 – Seafood plant
Intake protection zones with a vulnerability score of 5.6 or less are not listed as not applicable to significant and moderate threats.

4. Applicable legislation, policies and programs

a. National

National Pollutant Release Inventory (NPRI)

The NPRI is legislated under the *Canadian Environmental Protection Act, 1999* as a way to track pollutant releases, disposals, and transfers for recycling (see link to NPRI website in Appendix B). The information is used to identify pollution prevention priorities, to support the assessment and risk management of chemicals, to assist with the development of targeted regulations for the reduction of the release of toxic substances, to encourage actions to reduce the release of pollutants, and to improve public understanding. Reporting is required for facilities that have a specified number of employees or that are engaged in specified activities, and if one or more of the listed substances is manufactured, processed, or otherwise used in the facility. The owner or operator of the facility must calculate the quantities of the specified substances and report these quantities on an annual basis. The data reported are available for public review in annual summary reports and datasets released by Environment Canada.

Examples of facilities that report to NPRI for land and water discharges include petroleum refineries, mines, pulp and paper operations, steel mills, and automobile manufacturers.

b. Provincial

Ontario Water Resources Act, R.S.O. 1990

A certificate of approval is required from the Ministry of the Environment under section 53 of the *Ontario Water Resources Act*, R.S.O. 1990 for industrial sewage systems that discharge pollutants to ground and surface water (Government of Ontario, 1990). It should be noted that there is no requirement for a certificate of approval if the facility discharges to a municipal sewer, as the discharge is regulated under the applicable sewer use by-law.

According to the MOE Guide for Applying for Approval of Industrial Sewage Works there are numerous supporting information requirements for an application. These include: (1) site plans, (2) sewage quantity and quality characteristics, (3) sewage works design report, (4) engineering drawings and specifications, and (5) environmental impact analysis (Ontario Ministry of the Environment, 1999).

The documents provided with the application are referred to and the details included in the text of the certificate thus they become part of the certificate. However, proprietary information would not be included in the certificate or made available to the public. Certificate of approval applications are typically circulated by the MOE to agencies that may have an interest for notification, their review and comment.

Municipal Industrial Strategy for Abatement (MISA)

The Province committed to the management of persistent toxic substances in response to the Canada/Ontario Agreement Respecting the Great Lakes Basin Ecosystem. The Municipal Industrial Strategy for Abatement (MISA) program was the provincial response to addressing levels of persistent toxic substances that are discharged directly by industry into Ontario's waterways. The program focuses on nine industrial sectors that are the major toxic polluters: petroleum, pulp and paper, metal mining, industrial minerals, metal casting, organic chemical manufacturing, inorganic chemical, iron and steel, and electric power generation (see Appendix B for a link to the programs website).

A regulation (Effluent Monitoring and Effluent Limits) exists under the *Environmental Protection Act, R.S.O. 1990* for each industrial sector. These regulations specify the regulated facilities, sampling points, calculations required, effluent quality and flow monitoring, notification requirements, record keeping, and reporting requirements. There are also protocols for sampling and analysis associated with the regulations (links to individual regulations can be found in Appendix B). There are no MISA regulated facilities within the Niagara Peninsula Source Protection Area intake protection zones.

Procedure B-1-5: Deriving receiving-water based, point-source effluent requirements for Ontario waters (Ontario Ministry of Environment and Energy, 1994)

This procedure is used by the MOE to establish receiving-water based effluent requirements for point source discharges to surface waterbodies. The procedures are based on the policies and water quality criteria contained in *Water Management – Policies, Guidelines and Provincial Water Quality Objectives (PWQO; MOE, 1994).* The effluent requirements are used for certificates of approval or other legal documents.

Guideline D-6: Compatibility between Industrial Facilities and Sensitive Land Uses (Ontario Ministry of the Environment, 1995)

This MOE document is intended to be used as a land use planning tool to prevent or minimize future land use problems due to the encroachment of sensitive land uses and industrial land uses on one another. It assists the user with determining compatible mixed land uses and compatible intensification of land uses. The guideline encourages informed decision-making by provincial staff, municipalities and consultants.

The Guideline defines the term *sensitive land uses* to include recreational uses deemed to be sensitive, and buildings or associated amenity areas where people or the natural environment could be adversely affected by emissions generated by the operation of a nearby industrial facility. These land uses include residences, retirement homes, schools, daycares, hospitals, churches, campgrounds, etc.

c. Municipal

Land Use Planning

Land use planning, implemented locally through municipal official plans, zoning by-laws and other tools, can ensure that threat activities associated with specific land uses are located away from the sources of municipal drinking water. This may be achieved by designating industrial areas away from sensitive land uses and natural features, and establishing separations and minimum distance requirements between threat activities and drinking water sources.

5. Policy considerations

- The federal and provincial legislative requirements for sewage works for industrial effluent discharges are comprehensive.
- *Clean Water Act, 2006* Part IV tools - risk management plans, prohibition, and restricted land uses cannot be used for sewage systems, which include industrial sewage works.
- Regardless of the current planning context, policies are required to be included within the Source Protection Plan to ensure that this activity does not become a significant threat to the municipal drinking water supply.

Examples of risk management measures and policy ideas

For discussion purposes, this section of the report provides examples of risk management measures and policy ideas that could be applicable to industrial sewage systems. It is not an exhaustive list.

The examples are categorized by the types of policy tools that can be used to meet the source protection plan objectives. The MOE Risk Management Measures Catalogue (see Appendix B for a link) was reviewed as part of this exercise and measures were incorporated where appropriate; many of the measures in the catalogue are or could be linked to applicable provincial instruments.

Table 5.1. Examples of risk management measures and policy ideas for industrial sewage

Policy Tool	Example
Land Use Planning	• Require *Planning Act* applications for industrial uses to disclose information about materials and chemicals used on site, finished products, and sewage effluent to determine whether any proposed activities would constitute a threat (linked to restricted land uses). • Encourage municipalities to establish site plan control in their official plans, if not already established. Require site plans for new industrial development; determine most appropriate location for effluent outfall based on proximity to sources of drinking water. • Restrict/prohibit industrial land use where it would be a significant threat
Prescribed Provincial Instruments	• Require/encourage MOE to include monitoring for specific parameters of concern to drinking water quality in certificates of approval for industrial sewage works. • Maintain minimum separation distances between sewer outfall and the intake protection zone. • Restrict/prohibit industrial certificates of approval where it would be a significant threat
Municipal Operations / Infrastructure	• Encourage industries to assess pollution prevention strategy and to review industrial sewage works designs, and to make retrofits where necessary to address the parameter of concern, overflows, and the volume of wastewater. Can the chemical of concern be replaced with a less harmful alternative? Encourage the reuse of treated wastewater. • Make sure that emergency response plans for overflows includes contacting the municipal water treatment plant operator.

Appendix A – Reference List

Government of Ontario. 1990. Ontario Water Resources Act. www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90o40_e.htm

Ontario Ministry of the Environment. 1999. Guide for Applying for Approval of Industrial Sewage Works.
www.ene.gov.on.ca/environment/en/resources/STD01_076041.html

Ontario Ministry of the Environment 1995. Guideline D-6: Compatibility between Industrial Facilities and Sensitive Land Uses.
www.ene.gov.on.ca/environment/en/resources/STD01_076071.html

Ontario Ministry of Environment and Energy. 1994. Procedure B-1-5: Deriving receiving-water based, point-source effluent requirements for Ontario waters.
www.ene.gov.on.ca/environment/en/resources/STD01_078855.html

Appendix B – Additional Resources

1. Drinking Water Threat Contaminants Summary (DRAFT).

2. Environment Canada. National Pollutant Release Inventory. www.ec.gc.ca/inrp-npri/default.asp?lang=en

3. The MOE Water Quality Risk Management Measures Catalogue (Version 2, 09/07/2010) http://maps.thamesriver.on.ca/swpCAMaps/rmc/disclaimer.aspx

4. Ministry of the Environment. Municipal Industrial Strategy for Abatement (MISA) program. http://www.ene.gov.on.ca/environment/en/industry/standards/spills/index.htm

5. Ministry of the Environment. Environmental Protection Act. Regulations addressing effluent monitoring and effluent limits:

   - O. Reg. 560/94_-EFFLUENT MONITORING AND EFFLUENT LIMITS - METAL MINING SECTOR
   - O. Reg. 215/95- EFFLUENT MONITORING AND EFFLUENT LIMITS - ELECTRIC POWER GENERATION SECTOR
   - O. Reg. 561/94- EFFLUENT MONITORING AND EFFLUENT LIMITS - INDUSTRIAL MINERALS SECTOR
   - O. Reg. 64/95 - EFFLUENT MONITORING AND EFFLUENT LIMITS - INORGANIC CHEMICAL SECTOR
   - O. Reg. 214/95- EFFLUENT MONITORING AND EFFLUENT LIMITS - IRON AND STEEL MANUFACTURING SECTOR
   - O. Reg. 562/94- EFFLUENT MONITORING AND EFFLUENT LIMITS - METAL CASTING SECTOR
   - O. Reg. 63/95- EFFLUENT MONITORING AND EFFLUENT LIMITS - ORGANIC CHEMICAL MANUFACTURING SECTOR
   - O. Reg. 537/93- EFFLUENT MONITORING AND EFFLUENT LIMITS - PETROLEUM SECTOR
   - O. Reg. 760/93- EFFLUENT MONITORING AND EFFLUENT LIMITS - PULP AND PAPER SECTOR

Drinking Water Source Protection Background Document

Prescribed Drinking Water Threat 3:
The Application of Agricultural Source Material to Land

May 25, 2011

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Note: We would like to thank Cataraqui Region Conservation Authority and Conservation Ontario for the use of their background research documents in preparing these reports.

Prescribed Drinking Water Threat 3: The Application of Agricultural Source Material to Land

The primary consideration for reducing or eliminating drinking water threats related to the application of agricultural source material (ASM) is to make sure it does not enter surface water and / or groundwater.

1. Definition

The application of ASM involves the addition of nutrients to the land for the purpose of improving the growth of agricultural crops and for soil conditioning.

There are three sources of nutrients to be considered through the drinking water source protection initiative: 1) agricultural source material (ASM), 2) non-agricultural source material, and, 3) commercial fertilizer and compost. Non-agricultural source material and commercial fertilizer will be addressed through separate policies. The focus of this document will be on ASM.

According to Ontario Regulation 267/03 – General under the *Nutrient Management Act*, ASM includes, but is not limited to, the following materials that may be produced on a farm:

- Manure produced by farm animals, including bedding materials
- Runoff from farm-animal yards and manure storages
- Farm washwaters,
- Specific anaerobic digestion output from on-farm biogas plants, and
- Specific compost.

Nutrient management strategies and plans are used by phased-in farms to optimize the relationship between the land-based application of nutrients, farm management techniques and crop requirements; to maximize the efficient use of on-site nutrients; and to minimize adverse impacts to the environment.

2. What causes this activity to be a drinking water threat?

The Ontario Ministry of the Environment (MOE) Tables of Drinking Water Threats (2008, as amended in 2009) identify nitrogen, total phosphorus, and pathogens as contaminants that could make their way into surface and groundwater as a result of the application of ASM to land (circumstances 1 to 18 and 1944, and specifically circumstance 1, 12, 12-18 and 1944 for Niagara Peninsula SPA). These nutrients and pathogens could threaten the safety of drinking water sources in certain situations due to runoff or spills.

3. What is the local scale of the drinking water threat?

Farming is a common land use in the Niagara Peninsula Source Protection Area. ASM is produced on livestock farms. Permanent nutrient storage facilities are generally, but not always, located near barns and outdoor confinement areas. Temporary field nutrient storage facilities can be located near barns and outdoor confinement areas, as well as on fields where the ASM will be applied. Table 3.1 identifies those areas where the application of ASM has been identified as an existing threat, or where ASM would be a threat based on the vulnerability score.

The classification of this activity as a significant, moderate or low drinking water threat is dependent on its specific location (vulnerability score) as well as the combination of the managed land percentage and livestock density for the vulnerable area. In general, the greater the managed land percentage and livestock density, the greater the inherent risk to drinking water.

This threat has been identified as a significant pathogen threat for Port Colborne, DeCew, and Niagara Falls, and a significant chemical threat for Port Colborne. The chemical threats are broken down into three categories for each of the contaminants.

- The managed land, as a percentage for the ASM applicable area is at least 40%, but not more than 80% and the livestock density is sufficient to annually apply ASM at a rate greater than 1.0 nutrient unit per acre. (Threat Circumstances 11, and 12)
- The managed land percentage, as a percentage for the ASM applicable area, is more than 80% and the livestock density is sufficient to annually apply ASM at a rate that is at least 0.5 nutrient unit per acre but not more than 1.0 nutrient unit per acre. (Threat Circumstances 15 and 16)
- The managed land, as a percentage for the ASM applicable area, is more than 80% and the livestock density is sufficient to annually apply ASM at a rate that is more than 1.0 nutrient unit per acre. (Threat Circumstances 17 and 18)

Currently, Port Colborne contains 14% managed lands. In order for this threat to become significant in the IPZs, the managed lands in Port Colborne would need to increase to at least 40% of the applicable area and contain a livestock density of at least 0.5 Nutrient Units per acre.

The existence of pathogen threat 1944, a significant threat for Port Colborne, involves the following;

- ASM is applied to land in any quantity and the application results in the presence of one or more pathogens in surface water.

Reminder:

• Managed lands include cropland, fallow land, improved pasture, golf courses, sports fields and lawns to which ASM, non-agricultural source material, or commercial fertilizer could be

applied. This value was calculated based on MOE Technical Rules and is included in the Assessment Report.

• Livestock density is the number of farm animals in a given area. Livestock density is standardized to nutrient units per acre since different types of animals produce different amounts of manure with different nutrient values. A nutrient unit is based on the amount of nutrients that give the fertilizer replacement value of the lower of 43 kilograms of nitrogen or 55 kilograms of phosphate as nutrient as established by reference to the Nutrient Management Protocol. The livestock density value was calculated based on MOE Technical Rules and is included in the Assessment Report.

Table 3.1 identifies where these activities are or would be significant or moderate drinking water threats based on the MOE Tables of Drinking Water Threats and how many threats are currently evaluated. The count for existing significant threats has been taken from the Assessment Report, where existing threats were determined based on current land uses and interpretation of aerial photography. Please note that the information in these tables about the existing threats is subject to change with ongoing field verification.

Table 3.1 - Application of Agricultural Source Material to Land

Vulnerable Area		**V.S.**	**Significant**	**Moderate**	**Existing Significant Threats**
DeCew Falls	Main Intake IPZ -1	8.0	P	C	3P
	Lake Gibson Emergency Intake IPZ-1	8.0	P	C	3P
	Hwy 406 Control Structure IPZ-1	8.0	P	C	2P
	Main Intake IPZ-2	6.4		P	
	Lake Gibson Emergency Intake IPZ-2	6.4		P	
Port Colborne	IPZ-1	9.0	C; P	C	
	IPZ-2	8.1	P	C	
Niagara Falls	IPZ-1	8.0	P	C	
	IPZ-2	6.4		P	
Welland	IPZ-1	7.0		C, P	
Fort Erie	IPZ-1	7.0		C, P	

V.S. – Vulnerability Score

C – Indicates a chemical threat

P – Indicates a pathogen threat

Note: Intake protection zones with a vulnerability score of 5.6 or less are not listed as not applicable to significant and moderate ASM threats.

4. Applicable legislation, policies and programs

a) National

Fisheries Act

In general the *Fisheries Act* is enforced by Fisheries and Oceans Canada; however, the section that applies to contamination is under the authority of Environment Canada. The deposition of any deleterious substance (contaminant) is in contravention of the legislation. Section 36(3) of the *Fisheries Act* states that "… no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water."

b) Provincial

Environmental Protection Act

The *Environmental Protection Act* (EPA), which is enforced by the MOE, prohibits the discharge of contaminants into the natural environment. Although the application of animal wastes to land in accordance with normal farming practices and the regulations made under the *Nutrient Management Act* does not require approval under the EPA, farmers must ensure that ASM spills do not occur.

Ontario Water Resources Act

The *Ontario Water Resources Act* (OWRA) contains general prohibitions against discharging pollutants to surface or groundwater. Permits are required for some vegetated filter strip systems and constructed wetlands, if these methods will be used to treat manure run off and milking centre wash water.

Nutrient Management Act and Ontario Regulation 267/03

The Nutrient Management Act passed on June 27, 2002. It addresses land-applied materials containing nutrients. This includes provisions for the development of strong new standards for all land-applied materials containing nutrients, a proposal to ban the land application of untreated septage over a five-year period, and proposed strong new requirements such as: the review and approval of nutrient management plans, certification of land applicators and a new registry system for all land applications (Government of Ontario, 2002).

The Act provides a comprehensive nutrient management framework for Ontario's agricultural industry, municipalities and other generators of materials containing nutrients, including clear environmental protection guidelines. It builds on the existing system by giving current best management practices the force of law, and creating comprehensive, enforceable, province-wide standards to regulate the management of all land- applied materials containing nutrients. The Act contains amendments to the *Environmental Protection Act*, the *Highway Traffic Act*, the *Ontario Water Resources Act* and the *Pesticides Act*, and consequential amendments to the *Farming and Food Production Protection Act, 1998* to ensure consistency and give higher recognition to the standards.

Sections 10, 14 and 28 of Ontario Regulation 267/03 – General are prescribed instruments under the *Clean Water Act*. These sections relate to the approval of nutrient management strategies and nutrient management plans, and to compliance with nutrient management strategies and plans that are in force (Government of Ontario, 2003).

Farms are regulated under the Nutrient Management Act if the farm generates greater than 300 nutrient units annually or generate between 5 and 300 NU annually and have applied for a building permit to construct a building used to hold farm animals or manure. Nutrient management strategies and plans are used by some farms to optimize the relationship between the land-based application of nutrients, farm management techniques and crop requirements; to maximize the efficient use of on-site nutrients; and to minimize adverse impacts to the environment.

Nutrient Management Strategies and Plans
O. Reg. 267/03 is the principal regulation related to the application of ASM to land and to the storage of ASM for phased-in operations. Nutrient management strategies are required for:

1. farms that generate more than 300 nutrient units;
2. farms that generate greater than 5 nutrients units annually if:
    a. an earthen lagoon is constructed or;
    b. there is building permit application to construct or expand barns used for housing livestock or other structures for storage of manure ;
3. if there is a regulated mixed anaerobic digester on the farm.

Not all strategies are approved by the Ministry of Agriculture, Food and Rural Affairs (OMAFRA); some farms only register their operation and have the strategy kept at the farm.

Nutrient Management Plans are required if:

1. a farm generates more than 300 NU annually or;
2. a farm with greater than 5 NU is located within 100 m of a municipal well.

These plans are filed on the farm and are reviewed by the MOE Agricultural Environmental Officer during compliance inspections. Under the Regulation, a farm that is not required to have a nutrient management strategy cannot be required to have a nutrient management plan, even if the farm is within 100m of a municipal well.

Ontario Regulation 267/03 contains land application standards that include timing restrictions for application, vegetated buffers zones adjacent to surface water, and setbacks from surface water and wells that are applicable to all farms that require a nutrient management plan or non-agricultural source material (NASM) Plan. These standards are considered to be best management practices that should be adopted by farms not phased-in under the NMA.

The "Nutrient Management Protocol" (OMAFRA, September 2009, as amended) provides technical standards and procedures related to O. Reg. 267/03 – General. According to the

Protocol, a nutrient management strategy must contain numerous components including information about the type and volume of prescribed materials (ASM and NASM) generated by the farm, the intended destination of the materials, and storage facilities. A nutrient management plan must contain numerous components including information about the nutrients that will be applied (type, content, application rate); the fields where the nutrients will be applied; and cropping practices, crop rotation and yields. The required contingency plan covers topics such as more nutrients than addressed in the ASM nutrient management strategy and/or plan, and unanticipated release of nutrients (e.g. spills).

Individuals who prepare nutrient management strategies and plans for ASM must be certified through the OMAFRA. Custom manure application businesses must have a Prescribed Materials Business Owners Licence. Employees of the custom application business who apply nutrients to an agricultural operation that requires a nutrient management plan or NASM plan must have a Nutrient Application Technician Licence.

Requirements for the Application of ASM

For farms required to have a nutrient management plan. there are additional restrictions on the application of ASM based on time of year, slope and application rate, application method, incorporation, crop residue (e.g. stalks and leaves), and distances from surface water. For example, liquid ASM cannot generally be applied to land when the soil is snow-covered or frozen, while solid ASM can be applied under restrictions. These restrictions are considered to be best management practices for non-regulated farms. The minimum setback requirements for the application of ASM to land are listed in Table 4.1.

Table 4.1 - Minimum setback requirements for the application of ASM to land

Feature	**Value**
Minimum distance to municipal wells	100m
Minimum distance to drilled wells (>15m deep with 6m casing)	15m
Minimum distance to all other wells including dug wells	30m
Minimum distance to top of bank including surface water	13m [1]
No application of liquid manure to an area whose maximum sustained slope is 25% or greater, within 150m from the top of the bank of the surface water	

[1] This distance may be reduced to as little as 3 m if the ASM is injected into soil, placed with seed, there is a specified amount of crop residue, or if it is applied to a living crop (such as in a pasture)

A vegetated buffer zone is required between land where ASM is applied and surface water. The buffer zone must have a minimum width of 3 m and be maintained under continuous vegetated cover including perennial grasses, other herbaceous plants, or trees and perennial forage crops that can be harvested as hay or silage.

O. Reg. 267/03 restricts the use of high trajectory irrigation guns to land apply liquid manure or NASM on all farms regardless of whether or not they have a nutrient management strategy, nutrient management plan or NASM plan. The regulation also contains rules for the land application of anaerobic digestion output on all farms regardless of whether or not they have a nutrient management plan. The minimum setback requirements listed in Table 4.1 apply to the application of anaerobic digestion output if;

i. the anaerobic digestion materials were treated in a mixed anaerobic digestion facility,
ii. at least 50 per cent, by volume, of the total amount of anaerobic digestion materials were on-farm anaerobic digestion materials, and
iii. the anaerobic digestion materials did not contain sewage biosolids or human body waste.

Compliance

Compliance and enforcement of the *Nutrient Management Act* is the responsibility of the MOE. According to "Complying with Environmental Legislation on Farms" (MOE, September 2009), the MOE's on-farm compliance program uses a problem-solving approach to help farmers comply with the law and manage environmental issues through education and outreach. Minor violations can be addressed through voluntary abatement plans, authorizing document amendments (to the nutrient management strategy and/or plan), and provincial officer orders. Enforcement, including Provincial *Offenses Act* summons, investigation and prosecution, are used in situations where serious issues are identified.

Farms are selected for inspection based on risk, complaints, size and whether a previous inspection was conducted. During the inspections several "control points" (i.e. areas where there is a risk of groundwater or surface water contamination: manure storage and transfer locations, agricultural and non-agricultural source material land application) are considered. Records and buffers are also checked by the inspector.

Canada-Ontario Environmental Farm Plan

The Environmental Farm Plan (EFP) is a program that is delivered locally through the Ontario Soil and Crop Improvement Association with expertise provided by the Ontario Ministry of Agriculture and Food. It is a voluntary educational program for farmers delivered through local workshops. Participants are provided instruction on how to progress through the risk assessment and action plan development contained in the EFP workbook. Limited funds (either a 50/50 or 30/70 cost share depending on project) are available to help address areas identified in the plan as needing improvement. The process is as shown in the following figure:

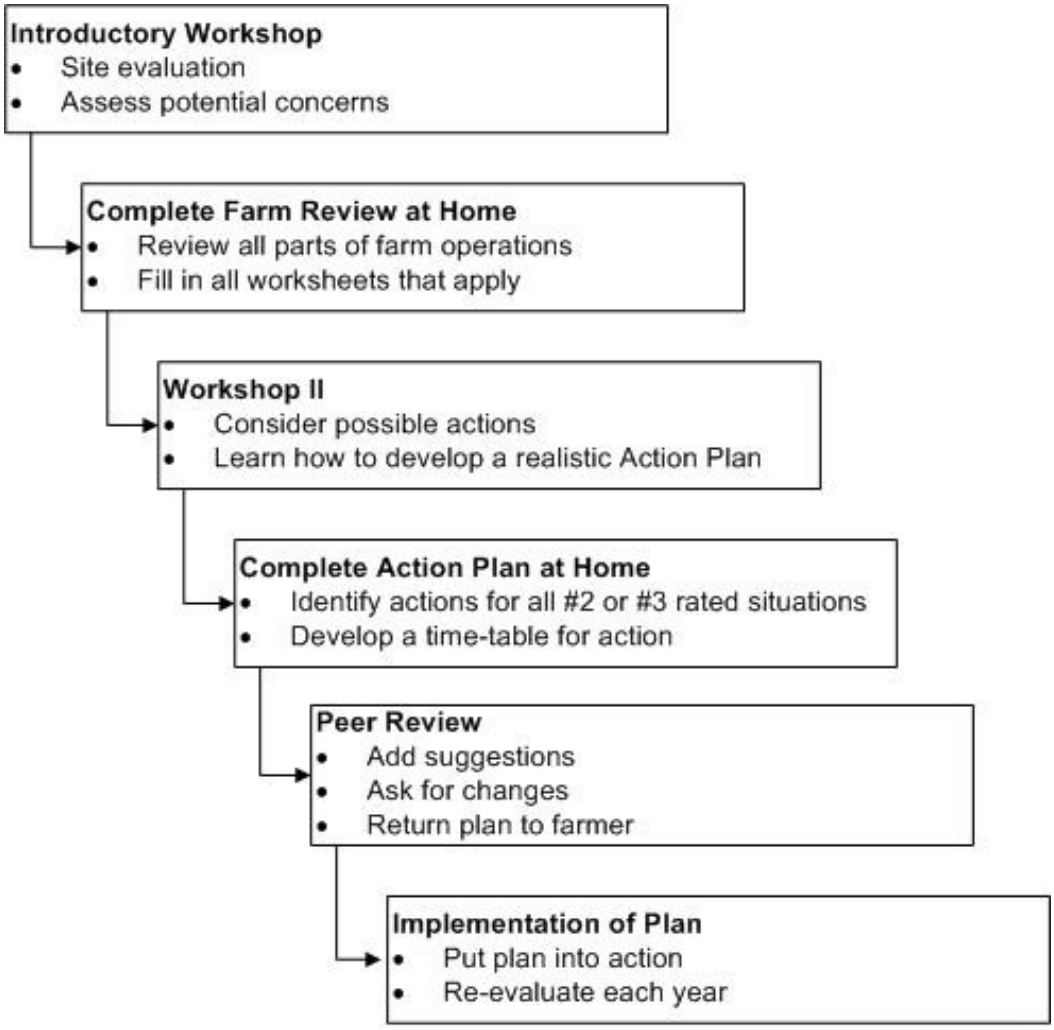

Figure 4.1 – Environmental Farm Plan Process (OSCIA, 2005)

The risk assessment gives the farmer the opportunity to rate the current level of environmental concern in up to 23 different areas on the farm. The results of the risk assessment and the action plan are confidential whereby the only people that see the information are the farmer and a local peer review group. The areas relevant to the drinking water source protection initiative include:

- Water wells
- Pesticide handling and storage
- Fertilizer handling and storage
- Storage of petroleum products
- Disposal of farm wastes
- Treatment of household waste
- On-farm storage of livestock manure
- Livestock yards and outdoor confinement areas
- Milking centre washwater

- Water efficiency
- Soil management
- Nutrient management
- Manure use and management
- Pest management
- Stream, ditch and floodplain management
- Wetlands, woodlands and wildlife

The information sheets on nutrient management for the EFP program are generally consistent with the requirements of O. Reg. 267/03.

c) Municipal

Municipal By-laws

Municipalities have the ability to pass by-laws about the economic, social and environmental well-being of the municipality, and about the health, safety and well-being of people, under the *Municipal Act*.

Municipalities have authorities to enact by-laws for specific matters within their jurisdiction and these authorities are available under the Municipal Act, or, in the case of the City of Toronto, under the City of Toronto Act. Municipalities have broad authorities to pass by-laws about the economic, social, and environmental well-being of the municipality, and about the health, safety, and well-being of people. There are limitations on these authorities which need to be taken into consideration. Very generally, these broad authorities may not conflict with specific authorities found in other legislation. For example, any municipal by-law with respect to construction or demolition of buildings is superceded by the Building Code Act and the Building Code. In addition, in the event of a conflict between a municipal by-law and federal and provincial legislation, the legislation prevails. For example, if a municipality wishes to enact legislation to protect its drinking water sources, the municipality must review the applicable legislation to ensure that the municipal by-law does not conflict with it. Municipalities can supplement provincial regulatory schemes, provided that the by-law does not conflict with the provincial legislation.

In a two tier system, each tier may have exclusive jurisdiction over a matter, for example, lower tiers may enact zoning by-laws whereas upper tiers may be responsible for public health. As a result, the upper tier municipality cannot use its broad authorities to pass a by-law which is specifically within the jurisdiction of the lower tier.

Municipalities may also use authorities under the Municipal Act to set up a licensing regime for businesses. The licensing system generally applies to how operators conduct the business, rather than how a product is applied. However, the municipality may determine that there are certain conditions to holding a license, such as certification or operators.

Minimum Distance Separation Formulae

Agricultural activities can include livestock facilities (e.g. barns and manure storage), and are generally permitted by municipalities on lands that are designated and zoned for agricultural and rural use. In order to reduce incompatibility concerns about odour from livestock facilities, Provincial minimum distance separation (MDS) formulae are used by municipalities to separate land uses.

Different formulae are applied to new or expanding non-agricultural uses (such as houses) that could impact existing livestock facilities (MDS I), and to new or expanding livestock facilities that could impact existing non-agricultural uses (MDS II). The formulae are applied to lands subject to most types of *Planning Act* applications and to activities that require building permits. The MDS I formulae are applied to low-intensity uses (e.g. industry, one house) proposed within a 1 km radius of the livestock facility, and to high-intensity uses (e.g. a subdivision) proposed within a 2 km radius.

In terms of drinking water source protection, the MDS has the effect of providing separation between new livestock facilities (and permanent nutrient storage facilities) and municipal and private drinking water wells. The MDS requirements may exceed the minimum well separation required under O. Reg. 267/03 (Nutrient Management Act).

The *Niagara Regional Policy Plan (2007)* recognizes the prime agricultural areas throughout the region. These agricultural areas are suitable for both field crops and livestock. Policy 6.A.16 requires that local Official Plans and Zoning By-laws use the Minimum Distance Separation (MDS) Formula of the Agricultural Code of Practice as their standard for livestock operations. The main purpose of this Official Plan policy is to address/prevent nuisance odour impacts.

5. Gaps in existing legislation, policies and programs

• There may be limitations in the verification of nutrient management strategies made under the *Nutrient Management Act*.

• Under Ontario Regulation 267/03, nutrient management strategies and nutrient management plans are only required for farms that meet specific criteria, leaving the vast majority of farms outside of this Regulation. Nutrient Management Plans for ASM do not require approval by OMAFRA.

• The minimum 3 m vegetated buffer zone adjacent to surface water is considered to be a best management practice; however, it is substantially less than what is required for land development and site alteration (15 m to 30 m) in the Natural Heritage Reference Manual (Ontario Ministry of Natural Resources, 2010) which is designed to specifically address the protection of fish habitat and not source water. Should a setback be proposed, further research would be needed in order to determine the appropriate setback to protect source water.

• The Environmental Farm Plan (EFP) program is voluntary and confidential, which makes it appealing for farmers; however, there is no way to track if and how action plans are being implemented. However aggregated numbers on EFPs for larger areas are available from OSCIA.

6. Policy considerations

• REMINDER: The main consideration for reducing or eliminating drinking water threats related to the application of ASM is to make sure that ASM does not enter surface water and/or groundwater.
• Based on the IPZ vulnerability scores, this activity is or would be a significant threat in three locations for pathogens; Port Colborne, DeCew, and Niagara Falls, and in one location (Port Colborne) for chemicals.

7. Examples of risk management measures and policy ideas

For discussion purposes, this section of the report provides examples of risk management measures and policy ideas that could be applicable to the application of ASM to land, and to the storage of ASM. It is not an exhaustive list.

The examples are categorized by the types of policy tools that can be used to meet the source protection plan objectives. The MOE Water Quality Risk Management Measures Catalogue (Version 2, 09/07/2010) was reviewed as part of this exercise and measures were incorporated where appropriate.

Table 7.1 – Policy Tool Examples

Policy Tool	Example
Education and Outreach	• Area-wide education and outreach programs targeted to haulers/spreaders and agricultural/rural landowners on the importance of respecting separation requirements and of monitoring the impact of ASM on water quality. • Area-wide education program about crop nutrient requirements to reduce the excess use of fertilizers. • Area-wide program for farmers to improve the design and maintenance of on-farm subsurface tile drainage systems • Promote voluntary nutrient management strategies and plans for farms that do not qualify under O. Reg. 267/03. Host annual workshops with farmers, giving them the opportunity to network with other farmers and government organizations.
Incentive Programs	• Area-wide incentive programs for agricultural/rural landowners to establish buffers of a suitable width based on site specific considerations on lands for which there are nutrient management plans. • EFP Cost-Share Program should include funds to help implement projects from the EFP action plans for farms in IPZs and WHPAs. • Financial incentives for upgrading equipment
Municipal Tools and / or Land Use Planning	• Prohibit the land application of ASM within the IPZs where it can be a significant drinking water threat, in official plans and zoning by-laws or under the Municipal Act as directed under the SPP. • Prohibit the land application of ASM within a specified distance to

	surface water. • Prohibit the storage of ASM within a specified distance to surface water.
Prescribed Provincial Instruments (applicable only to the storage of ASM)	• Require/encourage (depending on level of threat) OMAFRA and MOE to ensure any newly proposed nutrient management strategies and plans for farms within intake protection zones satisfy conditions of the SPP policies, and also require there is reporting back to OMAFRA or MOE and the SPC (i.e. status of sites, sampling and monitoring programs). • Require/encourage OMAFRA to review approved nutrient management strategies and plans to ensure compliance with the Niagara Peninsula Source Protection Plan. • Require/encourage MOE to prioritize inspections for these areas, and to conduct regular inspections. • As a condition of a plan or strategy, do not permit application of ASM in an IPZ where it would be a significant drinking water threat.
Land Securement	• Purchase or place easements on land in IPZs.
Risk Management Plans	• Require risk management plans for farms in IPZs where these activities are or would be significant drinking water threats.
Prohibition	• Prohibit the application and storage of ASM where these activities are or would be significant drinking water threats.
Restricted Land Uses	• Flag agricultural land uses (that are associated with the application and storage of ASM) are restricted land uses in IPZs where these activities are or would be significant drinking water threats so that municipal planners and building officials consider implications of proposed development.

Appendix A - Reference List

Government of Canada. 1985. Fisheries Act. http://laws.justice.gc.ca/en/F-14/index.html

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Ontario Ministry of the Environment. 2009. Tables of Drinking Water Threats. 2008, as amended in 2009. www.ene.gov.on.ca/publications/cw/7561e03.pdf

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Changes made:

- **Additions made to municipal act section from v3 CO backgrounders**

Drinking Water Source Protection Background Document

Prescribed Drinking Water Threat 4:
The Storage of Agricultural Source Material

May 25, 2011

Table of Contents

Note: We would like to thank Cataraqui Region Conservation Authority and Conservation Ontario for the use of their background research documents in preparing these reports.

Prescribed Drinking Water Threat 4: The Storage of Agricultural Source Material

The primary consideration for reducing or eliminating drinking water threats related to the storage of agricultural source material is to make sure it does not enter surface water and/or groundwater.

1. Definition

The storage of agricultural source material (ASM) involves the storage of manure.

According to Ontario Regulation 267/03 – General under the *Nutrient Management Act*, agricultural source materials (ASM) includes but is not limited to the following materials that may be produced on a farm:

- manure produced by farm animals, including bedding materials
- runoff from farm-animal yards and manure storages

ASM can be stored in a permanent nutrient storage facility (usually a steel or concrete tank or earthen lagoon), or on a temporary field nutrient storage site (only for solid ASM). Nutrient management strategies and plans are used by some farms to optimize the relationship between the land-based application of nutrients, farm management techniques and crop requirements; to maximize the efficient use of on-site nutrients; and to minimize adverse impacts to the environment.

2. What causes this activity to be a drinking water threat?

The Ontario Ministry of the Environment (MOE) Tables of Drinking Water Threats (2008, as amended in 2009) identify nitrogen, total phosphorus and pathogens as contaminants that could make their way into surface and groundwater as a result of the storage of ASM (circumstances 1201 to 1224 and 1962 to 1964).

3. What is the local scale of the drinking water threat?

Farming is a common land use in the Niagara Peninsula Source Protection Area. ASM is produced on livestock farms. Permanent nutrient storage facilities are generally, but not always, located near barns and outdoor confinement areas. Temporary field nutrient storage facilities can be located near barns and outdoor confinement areas, as well as on fields where the ASM will be applied. Table 3.1 identifies those areas where the storage of ASM has been identified as threat.

The classification of this activity as a significant, moderate or low drinking water threat is dependent on its specific location (vulnerability score) as well as the combination of the

managed land percentage and livestock density for the vulnerable area. In general, the greater the managed land percentage and livestock density, the greater the inherent risk to drinking water.

The prescribed threat of the storage of agricultural source material is prescribed threats 1201 through 1224, and 1962 to 1964. These threats are impacted by the storage location of the material (above or below grade, temporary or permanent); the weight or volume of the material stored; and, the threat that a spill or runoff may result in the presence of nitrogen or phosphorous in the ground or surface water.

This threat has been identified as a significant threat in Port Colborne for chemical treats and DeCew and Niagara Falls for pathogen threats. Significant chemical threats are broken down into three categories for each of the chemical contaminants (nitrogen and phosphorous).

- ASM is stored at or above grade in or on a permanent nutrient storage facility. The weight or volume of the manure stored annually is sufficient to annually land apply the ASM at a rate that is more than 1.0 nutrient units per acre.
- ASM is stored at or above grade on a temporary field nutrient storage site. The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is more than 1.0 nutrient units per acre of the farm units.
- A portion, but not all, of the ASM is stored above grade or on a permanent nutrient storage facility. The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is more than 1.0 nutrient units per acre of the farm units.

Table 3.1 identifies where these activities are or would be significant or moderate drinking water threats based on the MOE Tables of Drinking Water Threats and how many threats are currently occurring. The count for existing significant threats has been taken from the Assessment Report, where existing threats were determined based on current land uses and interpretation of aerial photography. Please note that the information in this table is subject to change based on ongoing field verification.

Table 3.1 - Storage of Agricultural Source Material

Vulnerable Area		V.S.	Significant	Moderate	Existing Significant Threats
DeCew Falls	Main Intake IPZ -1	8.0	P	C; P	3P
	Lake Gibson Emergency Intake IPZ-1	8.0	P	C; P	3P
	Hwy 406 Control Structure IPZ-1	8.0	P	C; P	2P
	Main Intake IPZ-2	6.4		P	
	Lake Gibson Emergency Intake IPZ-2	6.4		P	
Port Colborne	IPZ-1	9.0	P	C; P	
	IPZ-2	8.1	P	P	
Niagara Falls	IPZ-1	8.0	P	C; P	
	IPZ-2	6.4		P, C	
Welland	IPZ-1	7.0		C, P	
Fort Erie	IPZ-1	7.0		C, P	

V.S. Vulnerability Score
C – Indicates a chemical threat
P – Indicates a pathogen threat
Note: Intake protection zones with a vulnerability score of 5.6 or less not listed as not applicable to significant and moderate ASM threats

4. Applicable legislation, policies and programs

a) National

Fisheries Act

In general the *Fisheries Act* is enforced by Fisheries and Oceans Canada; however, the section that applies to contamination is under the authority of Environment Canada. The deposition of any deleterious substance (contaminant) is in contravention of the legislation. Section 36(3) of the *Fisheries Act* states that "… no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water."

b) Provincial

Environmental Protection Act

The *Environmental Protection Act* (EPA), which is enforced by the MOE, prohibits the discharge of contaminants into the natural environment. Although the application of animal wastes to land in accordance with normal farming practices and the regulations made under the *Nutrient Management Act* does not require approval under the EPA, farmers must ensure that ASM spills do not occur.

Ontario Water Resources Act

The *Ontario Water Resources Act* (OWRA) contains general prohibitions against discharging pollutants to surface or groundwater. Permits are required for vegetated filter strip systems and constructed wetlands, if these methods will be used to treat milking centre washwater.

Nutrient Management Act and Ontario Regulation 267/03

General Sections 10, 14 and 28 of Ontario Regulation 267/03 – General are prescribed instruments under the *Clean Water Act*. These sections relate to the approval of nutrient management strategies and nutrient management plans, and to compliance with nutrient management strategies and plans that are in force.

Nutrient Management Strategies and Plans

O. Reg. 267/03 is the principal regulation related to the application of ASM to land and to the storage of ASM for phased-in operations. Nutrient management strategies are required farms that generate more than 300 NU annually, if there is a building permit application to construct or expand barns or ASM storage facilities so that more than 5 NU would be generated, or if there is a regulated mixed anaerobic digester on the farm. The strategy must be approved by the Ministry of Agriculture, Food and Rural Affairs (OMAFRA).

Nutrient management plans are required if a farm generates more than 300 NU annually, or if a farm with greater than 5 NU is located within 100 m of a municipal well. These plans are filed on the farm and are reviewed by the MOE Agricultural Environmental Officer during compliance inspections. The Officer can request OMAFRA to review and approve a nutrient management plan. Under the Regulation, a farm that is not required to have a nutrient management strategy cannot be required to have a nutrient management plan, even if the farm is within 100m of a municipal well.

The regulation contains land application standards that include timing restrictions for application, vegetated buffers zones adjacent to surface water, and setbacks from surface water and wells that are applicable to all farms that require a nutrient management plan or NASM Plan. These standards are considered to be best management practices for non-regulated farms.

The “Nutrient Management Protocol” (OMAFRA, September 2009) provides technical standards and procedures related to O. Reg. 267/03 – General. According to the Protocol, a nutrient management strategy must contain numerous components including information about the type and volume of prescribed materials (ASM and NASM) generated by the farm, the intended destination of the materials, and storage facilities. A nutrient management plan must contain numerous components including information about the nutrients that will be applied (type, content, application rate); the fields where the nutrients will be applied; and cropping practices, crop rotation and yields. The required contingency plan covers topics such as more nutrients than addressed in the ASM nutrient management strategy and/or plan, and unanticipated release of nutrients (e.g. spills).

Individuals who prepare nutrient management strategies and plans for ASM must be certified through the OMAFRA. Custom manure application businesses must have a Prescribed Materials Business Owners License. Employees of the custom application business who apply nutrients to an agricultural operation that requires a nutrient management plan or NASM plan must have a Nutrient Application Technician License.

Requirements for the Storage of ASM

For farms phased in under O. Reg. 267/03, the minimum setback requirements for a permanent nutrient storage facility are listed in Table 4.1. Temporary field nutrient sites must also meet setback requirements if solid ASM is to be stored on the site for more than 24 hours (value in brackets if different). These requirements are generally considered to be best management practices for temporary storage less than 24 hours. The storage requirements are considered to be best management practices for non-regulated farms.

Table 4.1 - Minimum setback requirements for the storage of ASM

Feature	Value
Minimum distance to municipal wells	100m
Minimum distance to drilled wells (>15m deep with 6m casing)	15m (45m)
Minimum distance to all other wells including dug wells	30m (90m)
Minimum distance to field drainage tiles or piped municipal drains	15m
Minimum flow path to surface water of tile inlet	50m

A site characteristic study that consists of a hydrogeological or geotechnical investigation performed by a qualified person is required to identify the soil types and presence of any aquifer or bedrock at the site of the proposed permanent nutrient storage facility. The regulation includes design standards for the walls, floors, liners and capacity of a facility.

For farms phased in under O. Reg. 267/03, a permanent solid nutrient storage facility must have a runoff management system to handle all of the runoff generated by the facility (e.g. solid manure piled on a concrete base). The system must consist of at least one of the following:

- A roof used to prevent the entry of precipitation, assuming that any water upstream of the facility has been diverted away from the facility.
- Vegetated filter strip systems
- Properly sized runoff collection and storage systems
- A permanently vegetated area (PVA), if runoff from the facility is generated from an area less than 300 sq. m. The location requirements for a PVA are similar to those for the nutrient storage facility (see table 4.1).
- A sewage works approved under the OWRA or a sewage system approved under the Ontario Building Code.

The part of the regulation that addresses the design, establishment and operation of vegetated filter strip systems (VFSS) applied to all farms regardless of whether or not they have a nutrient management strategy. The requirements for a VFSS are similar to those for the nutrient storage facility.

Compliance

Compliance and enforcement of the *Nutrient Management Act* is the responsibility of the MOE. According to "Complying with Environmental Legislation on Farms" (MOE, September 2009), the MOE's on-farm compliance program uses a problem-solving approach to help farmers comply with the law and manage environmental issues through education and outreach. Minor violations can be addressed through voluntary abatement plans, authorizing document amendments (to the nutrient management strategy and/or plan), and provincial officer orders. Enforcement, including Provincial *Offenses Act* summons, investigation and prosecution, are used in situations where serious issues are identified.

Farms are selected for inspection based on risk, complaints, size and whether a previous inspection was conducted. During the inspections several "control points" (i.e. areas where there is a risk of groundwater or surface water contamination: manure storage and transfer locations, agricultural and non-agricultural source material land application) are considered. Records and buffers are also checked by the inspector.

Canada-Ontario Environmental Farm Plan

The Environmental Farm Plan (EFP) is a program that is delivered locally through the Ontario Soil and Crop Improvement Association with expertise provided by the Ontario Ministry of Agriculture and Food. It is a voluntary educational program for farmers delivered through local workshops. Participants are provided instruction on how to progress through the risk assessment and action plan development contained in the EFP workbook. Limited funds (either a 50/50 or 30/70 cost share depending on project) are available to help address areas identified in the plan as needing improvement. The process is as shown in the following figure:

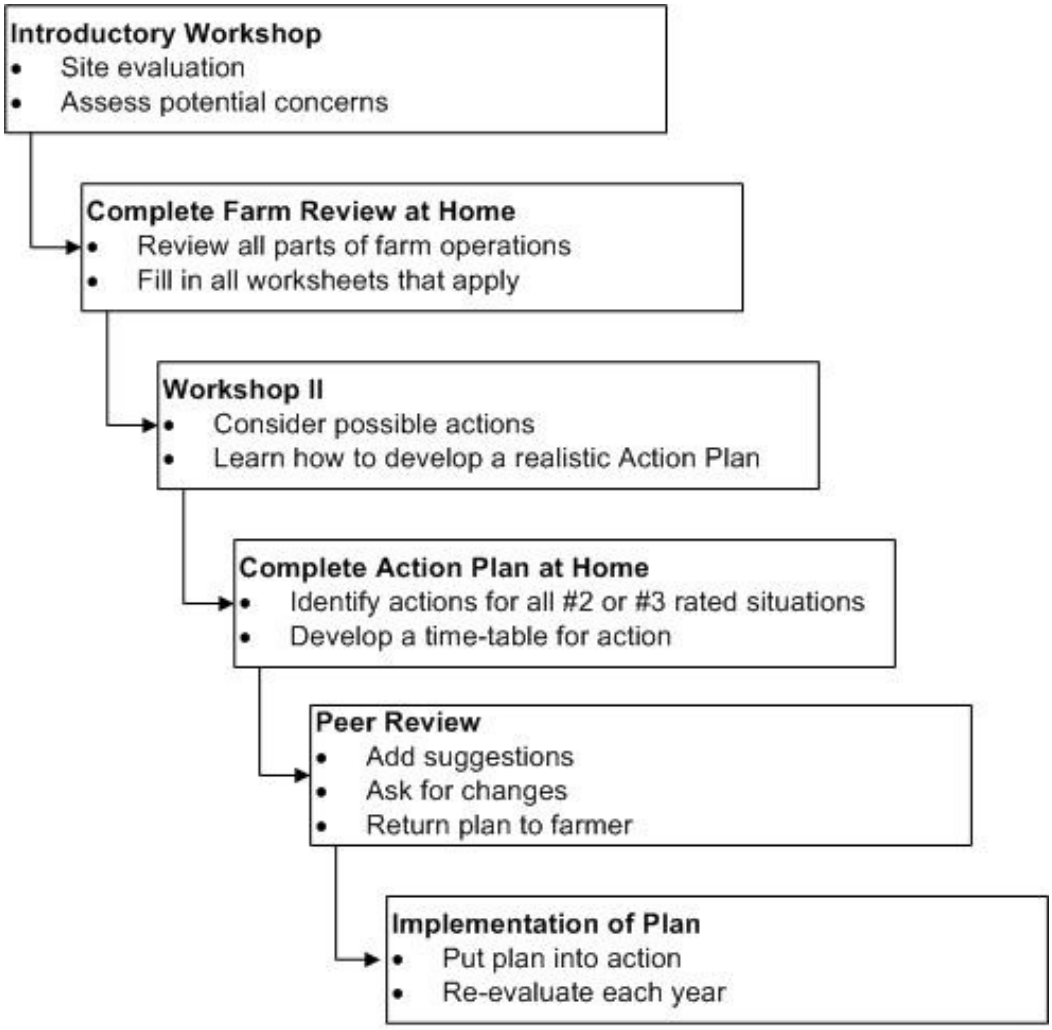

Figure 4.1 – Environmental Farm Plan Process (OSCIA, 2005)

The risk assessment gives the farmer the opportunity to rate the current level of environmental concern in up to 23 different areas on the farm. The results of the risk assessment and the action plan are confidential whereby the only people that see the information are the farmer and a local peer review group. The areas relevant to the drinking water source protection initiative include:

- Water wells
- Pesticide handling and storage
- Fertilizer handling and storage
- Storage of petroleum products
- Disposal of farm wastes
- Treatment of household waste
- On-farm storage of livestock manure
- Livestock yards and outdoor confinement areas
- Milking centre washwater

- Water efficiency
- Soil management
- Nutrient management
- Manure use and management
- Pest management
- Stream, ditch and floodplain management
- Wetlands, woodlands and wildlife

The information sheets on nutrient management for the EFP program are generally consistent with the requirements of O. Reg. 267/03.

c) Municipal

Municipal By-laws

Municipalities have the ability to pass by-laws about the economic, social and environmental well-being of the municipality, and about the health, safety and well-being of people, under the *Municipal Act*.

Municipalities have authorities to enact by-laws for specific matters within their jurisdiction and these authorities are available under the Municipal Act, or, in the case of the City of Toronto, under the City of Toronto Act. Municipalities have broad authorities to pass by-laws about the economic, social, and environmental well-being of the municipality, and about the health, safety, and well-being of people. There are limitations on these authorities which need to be taken into consideration. Very generally, these broad authorities may not conflict with specific authorities found in other legislation. For example, any municipal by-law with respect to construction or demolition of buildings is superceded by the Building Code Act and the Building Code. In addition, in the event of a conflict between a municipal by-law and federal and provincial legislation, the legislation prevails. For example, if a municipality wishes to enact legislation to protect its drinking water sources, the municipality must review the applicable legislation to ensure that the municipal by-law does not conflict with it. Municipalities can supplement provincial regulatory schemes, provided that the by-law does not conflict with the provincial legislation.

In a two tier system, each tier may have exclusive jurisdiction over a matter, for example, lower tiers may enact zoning by-laws whereas upper tiers may be responsible for public health. As a result, the upper tier municipality cannot use its broad authorities to pass a by-law which is specifically within the jurisdiction of the lower tier.

Municipalities may also use authorities under the Municipal Act to set up a licensing regime for businesses. The licensing system generally applies to how operators conduct the business, rather than how a product is applied. However, the municipality may determine that there are certain conditions to holding a license, such as certification or operators.

Minimum Distance Separation Formulae
Agricultural activities can include livestock facilities (e.g. barns and manure storage), and are generally permitted by municipalities on lands that are designated and zoned for agricultural and rural use. In order to reduce incompatibility concerns about odour from livestock facilities, Provincial minimum distance separation (MDS) formulae are used by municipalities to separate land uses.

Different formulae are applied to new or expanding non-agricultural uses (such as houses) that could impact existing livestock facilities (MDS I), and to new or expanding livestock facilities that could impact existing non-agricultural uses (MDS II). The formulae are applied to lands subject to most types of *Planning Act* applications and to activities that require building permits. The MDS I formulae are applied to low-intensity uses (e.g. industry, one house) proposed within a 1 km radius of the livestock facility, and to high-intensity uses (e.g. a subdivision) proposed within a 2 km radius.

In terms of drinking water source protection, the MDS has the effect of providing separation between new livestock facilities (and permanent nutrient storage facilities) and municipal and private drinking water wells. The MDS requirements may exceed the minimum well separation required under O. Reg. 267/03.

The Niagara Regional Policy Plan (2007) recognizes the prime agricultural areas throughout the region. These agricultural areas are suitable for both field crops and livestock. Policy 6.A.16 requires that local Official Plans and Zoning By-laws use the Minimum Distance Separation (MDS) Formula of the Agricultural Code of Practice as their standard for livestock operations.

d) Conservation Authorities Act RSO 1990 as amended (August 2002)
Under the Conservation Authorities Act, local Conservation Authorities are given their mandate and direction in the making and administration of land use planning. Conservation Authorities have established Regulations pursuant to Section 28 under which they may:

i. Restrict and regulate the use of water in or from rivers, streams, inland lakes, ponds, wetlands and natural or artificially constructed depressions in rivers or streams;
ii. Prohibit, regulate, or require the permission of the authority to straighten, change, divert, or interfere in any way with the existing channel of a river, creek , stream, or watercourse, or change or interfere with any wetland; and
iii. Prohibit, regulate or require the permission of the authority for development if, in the opinion of the authority, the control of flooding, erosion, dynamic beaches or pollution or the conservation of land may be affected by development.

In light of these Regulations, the construction of any storage facility would be subject to Conservation Authority requirements; however, the application of ASM to land would not trigger a review under the Conservation Authorities Act.

5. Gaps in existing legislation, policies and programs

• There may be limitations in the verification of nutrient management strategies made under the *Nutrient Management Act*.
• Under Ontario Regulation 267/03, nutrient management strategies and nutrient management plans are only required for farms that meet specific criteria, leaving the vast majority of farms outside of this Regulation.
• The Environmental Farm Plan program is voluntary and confidential, which makes it appealing for farmers; however, there is no way to track if and how action plans are being implemented.
• The MDS Formulae may not be uniformly implemented between municipalities or within municipalities.

6. Policy considerations

• REMINDER: The main consideration for reducing or eliminating drinking water threats related to the storage of ASM is to make sure that ASM does not enter surface water and/or groundwater.
• This activity is or would be a significant threat in Port Colborne, Niagara Falls and DeCew.

7. Examples of risk management measures and policy ideas

For discussion purposes, this section of the report provides examples of risk management measures and policy ideas that could be applicable to the application of ASM to land, and to the storage of ASM. It is not an exhaustive list.

The examples are categorized by the types of policy tools that can be used to meet the source protection plan objectives. The MOE Water Quality Risk Management Measures Catalogue (Version 2, 09/07/2010) was reviewed as part of this exercise and measures were incorporated where appropriate.

Table 7.1 – Policy Tool Examples

Policy Tool	Example
Education and Outreach	• Promote voluntary nutrient management strategies and plans for farms that do not qualify under O. Reg. 267/03.
Incentive Programs	• Area-wide incentive programs for agricultural/rural landowners to establish buffers of a suitable width based on site specific considerations on lands for which there are nutrient management plans. • EFP Cost-Share Program should include funds to help implement projects from the EFP action plans for farms in IPZs.

Land Use Planning	• Prohibit the storage of ASM within the IPZs where it can be a significant drinking water threat, in official plans and zoning by-laws. • Prohibit the storage of ASM within a specified distance of surface water • Require a minimum sized vegetated buffer adjacent to surface water
Prescribed Provincial Instruments	• Require/encourage (depending on level of threat) OMAFRA and MOE to take extra care in its review of proposed nutrient management strategies and plans for farms within and adjacent to intake protection zones and to require reporting back to OMAFRA or MOE (i.e. status of sites, sampling and monitoring programs). • Require/encourage OMAFRA to review approved nutrient management strategies and plans to ensure compliance with the Niagara Peninsula Source Protection Plan. • Require/encourage MOE to prioritize inspections for these areas, and to conduct regular inspections. • Do not permit storage of ASM in an IPZ where it would be a significant drinking water threat.
Land Securement	• Purchase or place easements on land in IPZs.
Risk Management Plans	• Require risk management plans for farms in IPZs where these activities are or would be significant drinking water threats.
Prohibition	• Prohibit the storage of ASM in IPZs where these activities are or would be significant drinking water threats.
Restricted Land Uses	• Flag agricultural land uses (that are associated with the application and storage of ASM) are restricted land uses in IPZs where these activities are or would be significant drinking water threats so that municipal planners and building official consider implications of proposed development.

Appendix A - Reference List

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Drinking Water Source Protection Background Document

Prescribed Drinking Water Threat 6:
The Application of Non-Agricultural Source Material

Prescribed Drinking Water Threat 7:
The Handling and Storage of Non-Agricultural Source Material

May 11, 2011

Table of Contents

Note: We would like to thank Cataraqui Region Conservation Authority and Conservation Ontario for the use of their background research documents in preparing these reports.

Prescribed Drinking Water Threat 6: The Application of Non-Agricultural Source Material

Prescribed Drinking Water Threat 7: The Handling and Storage of Non-Agricultural Source Material

The primary consideration for reducing or eliminating drinking water threats related to the application, handling and storage of non-agricultural source material is to make sure it does not enter surface water and/or groundwater.

1. Definition

Nutrients are materials that can be applied to land for the purpose of improving the growth of agricultural crops and for soil conditioning. NASM is primarily used for agricultural lands, however, there are some applications to non-agricultural land uses. They are an essential component of plant growth. There are three sources of nutrients to be considered through the drinking water source protection initiative: agricultural source material, non-agricultural source material and commercial fertilizer.

According to Ontario Regulation 267/03 – General under the *Nutrient Management Act*, non-agricultural source materials (NASM) include the following materials that are intended to be applied to land as nutrients, but that are not produced on a farm:

- Pulp and paper biosolids
- Sewage biosolids
- Anaerobic digestion output where less than 50% of the total material is on-farm anaerobic digestion materials (anaerobic digestion is a process used to decompose organic matter by bacteria in an oxygen-limited environment)
- Any other material that is not from an agricultural source and that is capable of being applied to land as a nutrient (such as materials from dairy product or animal food manufacturing).

NASM that will be applied to fields on a farm can be stored in a permanent nutrient storage facility (usually a steel or concrete tank), or on a temporary field nutrient storage site (only for solid NASM stored for more than 24 hours). There are restrictions about what types of NASM can be stored on a farm and for how long. This is contingent on all the material being used at that farm otherwise an EPA approval will be required.

As of January 1, 2011, the land application and on-farm storage of NASM is be regulated under the *Nutrient Management Act*, phased in over a five year transitional period for previous approvals under the EPA.

2. What causes these activities to be a drinking water threat?

The Ministry of the Environment (MOE) Tables of Drinking Water Threats (2008, as amended in 2009) identify nitrogen, total phosphorus and pathogens as contaminants that could make their way into surface and groundwater as a result of the application of NASM to land (circumstances 37 to 54, 1970 and 1971), and the handling and storage of NASM (circumstances 1409 to 1432, 1965 to 1968). These nutrients and pathogens could threaten the safety of drinking water sources in certain situations due to runoff or spills.

The concentration of nitrogen and total phosphorus will vary by NASM type. For example, sewage biosolids are a good source of nitrogen and phosphorus whereas some types of pulp and paper biosolids, while being a good source of organic matter, contain very low concentrations of these nutrients.

Threat 1970 and 1971 of the MOE Tables of Drinking Water Threats (2008, as amended in 2009) are the pathogen threats associated with the application of NASM. This threat specifically addresses the following sources of NASM;

- seafood processing operations
- dairy producers
- dairy product manufacturing operations
- pulp and paper mills
- animal food manufacturing operations (from animal sources)
- meat plants
- sewage works

While heavy metals and pharmaceuticals in biosolids are garnering public attention, they are outside the scope of the *Clean Water Act* at this time.

3. What is the local scale of these drinking water threats?

The classification of NASMs as a significant, moderate or low drinking water threat is dependent on the vulnerability score of the IPZ as well as the combination of the managed land percentage and livestock density for the vulnerable area. In general, the greater the managed land percentage and the livestock density, the greater the risk to drinking water.

Reminder:

- The application of NASM (chemical threats 37 to 54), and handling & Storage of NASM (chemical threats 1409 to 1432) are designated based on a function of managed land percentage and livestock density;
    - Nitrogen for WHPA and IPZ, Phosphorus for IPZs only
    - Managed lands include cropland, fallow land, improved pasture, golf courses, sports fields and lawns to which ASM, NASM, or commercial fertilizer could be applied. This value was calculated based on MOE Technical Bulletin and is included in the Assessment Report.
    - Livestock density is the number of nutrient units over a given area and is expressed by dividing the nutrient units by the number of acres in the same area.

The livestock density value was calculated based on MOE Technical Bulletin and is included in the Assessment Report.

- The application of NASM (pathogen threats 1970,1971) / and the handling & storage of NASM (Pathogen threats 1965 to 1968) is tied to material source; not managed land percentage or livestock density

Nitrogen is a concern for both surface and groundwater. Total phosphorous is only considered a drinking water threat in intake protection zones (IPZ) and in wellhead protection areas where the groundwater is under the direct influence of surface water (i.e. WHPA-E). This is because excessive inputs of total phosphorous in surface water results in eutrophication and can cause toxic algae blooms both of which impair water quality.

Table 3.1 and 3.2 identify where these activities are or would be significant, moderate or low drinking water threats based on the MOE Tables of Drinking Water Threats (2008, as amended in 2009). Please note that the information in these tables about the existing threats has been taken from the Assessment Report and is subject to change with ongoing field verification.

Table 3.1 - Application of Non-Agricultural Source Material to Land

Vulnerable Area		**V.S.**	**Significant**	**Moderate**	**Existing Significant Threats**
DeCew Falls	Main Intake IPZ -1	8.0	P	C	
	Lake Gibson Emergency Intake IPZ-1	8.0	P	C	
	Hwy 406 Control Structure IPZ-1	8.0	P	C	
	Main Intake IPZ-2	6.4		P	
	Lake Gibson Emergency Intake IPZ-2	6.4		P	
Port Colborne	IPZ-1	9.0	C, P	C, P	
	IPZ-2	8.1	P	C	
Niagara Falls	IPZ-1	8.0	P	C	
	IPZ-2	6.4		P	
Welland	IPZ-1	7.0		C, P	
Fort Erie	IPZ-1	7.0		C, P	

Table 3.2 - Storage and Handling of Non-Agricultural Source Material to Land

Vulnerable Area		V.S.	Significant	Moderate	Existing Significant Threats
DeCew Falls	Main Intake IPZ -1	8.0	P	C, P	
	Lake Gibson Emergency Intake IPZ-1	8.0	P	C, P	
	Hwy 406 Control Structure IPZ-1	8.0	P	C, P	
	Main Intake IPZ-2	6.4		P	
	Lake Gibson Emergency Intake IPZ-2	6.4		P	
Port Colborne	IPZ-1	9.0	C, P	C, P	
	IPZ-2	8.1	P	C, P	
Niagara Falls	IPZ-1	8.0	P	C, P	
	IPZ-2	6.4		P	
Welland	IPZ-1	7.0		C, P	
Fort Erie	IPZ-1	7.0		C, P	

C – Indicates a chemical threat

P – Indicates a pathogen threat

V.S. – means Vulnerability Score

Note: NPCA Intake protection zones with a vulnerability score of 5.6 or less, not listed as not applicable to significant and moderate storage and handling of NASM threats

4. Applicable legislation, policies and programs

a) National

Fisheries Act

In general the *Fisheries Act* is enforced by Fisheries and Oceans Canada; however, the section that applies to contamination is under the authority of Environment Canada. The deposition of any deleterious substance (contaminant) is in contravention of the legislation. Section 36(3) of the *Fisheries Act* states that "… no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water." For example, the latter case would apply if a licensed applicator spread NASM on land near a river and the NASM subsequently washed into the river.

b) Provincial

Environmental Protection Act
Prior to January 1, 2011 the transportation, storage and land application of NASM was regulated through certificates of approval issued by the Ontario Ministry of the Environment (MOE) under Part V of the *Environmental Protection Act*. A certificate of approval was required for each specific site (called an Organic Soil Conditioning Site) where NASM was land applied. In addition, a Waste Management System was required to haul the NASM. As of January 1, 2011, the land application of NASM will be regulated under the *Nutrient Management Act*. Existing certificates of approval will remain valid until the earlier of the date they are suspended, revoked or December 31, 2015. A Waste Management System Certificate of Approval will continue to be required for the transportation of NASM.

Section 39 of the *Environmental Protection Act*, which relates to the approval of certificates of approval, is a prescribed instrument under the *Clean Water Act*.

The MOE has published a "Guide for Applying for Approval of a Hauled Sewage (Septage) or Processed Organic Waste (Biosolids) Waste Disposal Site" (November 1999) that outlines the extensive documentation required to support an application for a certificate of approval. The supporting information includes, but is not limited to: source and type of material to be applied, waste analysis report, soil analysis report, terrain description, surface physiology and geology, depth to water table, water wells, separation distances, application areas, crops, schedule of use, notification to adjacent landowners, and confirmation from the municipality that NASM can be applied (i.e. no municipal restrictions).

The MOE, in conjunction with the Ontario Ministry of Agriculture, Food and Rural Affairs, also prepared a document called "Guidelines for the Utilization of Biosolids and Other Wastes on Agricultural Land" (March 1996) that outlines the criteria that must be met before biosolids and other waste materials (e.g. pulp sludge) can be considered for use on agricultural land. The minimum requirements in this document have generally been carried over to *Ontario Regulation 267/03 – General*, under the *Nutrient Management Act* (see below).

Nutrient Management Act and Ontario Regulation 267/03 – General
Sections 15.2 and 28 of Ontario Regulation 267/03 – General are prescribed instruments under the *Clean Water Act*. These sections relate to the approval of, and compliance with, NASM plans. Ontario Regulation 267/03 – General will be the principal piece of legislation related to the application and on-farm storage of NASM. As of January 1, 2011, Amendment 267/03 will take effect. The new amendment will establish consistent standards and requirements across the province. These will focus on the quality of the material being applied (Table 4.1), ensuring it meets strict criteria and is beneficial to the soil. They also include greater consideration of the material quality and potential odour generation and will cover any Ontario farm where NASM will be applied. The new regulation now includes references to 11 metals. A local Source Protection Committee would have to add these metals as an MOE approved local (non-prescribed) threat in their Assessment Report prior to creating policies relating to these specific metals.

NASM Plans.

The "Nutrient Management Protocol" (OMAFRA, September 2009) provides technical standards and procedures related to O. Reg. 267/03 – General.

A NASM plan is similar to a nutrient management plan, except that it only covers those fields where the NASM will be applied instead of the entire farm unit. Therefore it is possible that a farm could require a NMS/NMP and NASM Plan. According to the Protocol, a NASM Plan must contain numerous components including information about the nutrients that will be applied (source, type, content, application rate); the fields where the nutrients will be applied; cropping practices, crop rotation and yields; and on-farm storage (if applicable). The required contingency plan covers topics such as receiving more nutrients than addressed in the nutrient management plan, and unanticipated release of nutrients (e.g. spills).

The purposes of NASM plans are:

- To optimize the relationship between the land-based application of nutrients, farm management techniques and crop requirements; and
- To minimize adverse impacts to the environment by ensuring that fields and storage meet regulatory requirements.

With the recent amendment, NASMs are divided into three categories based on the source of the materials and the level of risk associated with them (Table 4.1).

Table 4.1 – Plan requirements based on category of NASM

Category	Examples of material	Plan requirements
1	unprocessed plant material such as leaf and yard waste, and culled vegetables	NASM plan not required
2	processed plant material, bakery waste, organic matter that does not contain fish or meat	NASM plan registration with OMAFRA for NASM with low metal content; approval by OMAFRA for NASM with high metal content
3[1]	sewage biosolids, pulp and paper biosolids, washwater and waste from a process that involves animal products	NASM plan approval by OMAFRA

[1] Category 3 NASM are specified in the MOE Tables of Drinking Water Threats for pathogen threats.

NASM plans will address the land application of NASM and the storage of NASM on farms, and will be required for any farm where these activities would occur, regardless of the number of nutrient units generated. The plans can be prepared for one to five year periods, and are subject to annual review and summary by the operator.

Individuals who prepare NASM plans must be certified through the Ministry of Agriculture, Food and Rural Affairs (OMAFRA). People who apply nutrients to a field that will require a NASM plan, but who do not own, operate or work as an employee for the farm, must have a Nutrient Application Technician Licence.

Requirements for the Application of NASM

Before NASM is approved for land application, the operator must demonstrate to the Ontario Ministry of Agriculture Food and Rural Affairs (OMAFRA) that the NASM will have a beneficial use for agriculture. For example, it must increase organic matter, increase soil pH, contain plant available nutrients (nitrogen, phosphorus, potassium), or be a source of water between June 15 and September 30. OMAFRA may seek the advice of the Biosolids Utilization Committee (BUC) in determining the suitability of a NASM for land application. BUC is an advisory body, with agricultural and environmental expertise, to MOE and OMAFRA.

There are restrictions on the application of NASM based on time of year, slope and application rate, application method, incorporation, crop residue, and distances from surface water. For example, NASM generally cannot be applied to land when the soil is snow-covered or frozen or from December 1 and March 31. There are exceptions to these rules which relate to the type of NASM applied and the method of application (S. 52.5(3)).

The minimum setback requirements for the application of NASM to land are listed in Table 4.2. These setbacks reflect the amendments to *O. Reg. 267/03 – General* that came into effect on January 1, 2011, and are similar to those specified in the "Guidelines for the Utilization of Biosolids and Other Wastes on Agricultural Land" (MOE and OMAFRA, 1996). OMAFRA will provide a notice of NASM plan approval to the municipality. For the application of category 3 NASM or category 2 that is CM2, the MOE must be notified at least 24 hours before application begins.

Table 4.2 - Minimum setback requirements for the application of NASM to land

Feature	**Value**
Minimum soil depth to bedrock	0.3 m [1]
Minimum depth to groundwater table	0.3 m or 0.9 m[2]
Minimum distance to municipal wells	100 m
Minimum distance to drilled wells (>15 m deep)	15 m
Minimum distance to all other wells including dug wells	30 m or 90 m[2]
Minimum distance to individual residences	25 to 450 m[3]
Minimum distance to residential areas, commercial, community or institutional uses	50 m to 900 m[3]
Minimum distance to watercourses	20 m[4]

[1] NASM cannot be applied if the soil depth to bedrock is less than 0.3 m. There are restrictions to the application of NASM for soil depth between 0.3 m and 1 m.
[2] This requirement is dependent on the type of NASM and the method of application.
[3] This distance depends on the odour classification of the NASM.
[4] The minimum distance to a watercourse is dependent on slope, presence of vegetative buffer, method of incorporation into soil, a specified amount of crop residue, or if it is applied to a living crop (such as in a pasture).

The minimum distances to other land uses such as residential areas relates to the odour associated with the NASM.

O. Reg. 267/03 restricts the use of high trajectory irrigation guns to land apply liquid manure or NASM on all farms regardless of whether or not they have a nutrient management strategy, nutrient management plan or NASM plan. The regulation also contains rules for the land application of anaerobic digestion output from regulated mixed anaerobic digesters on farms regardless of whether or not they have a nutrient management plan. The minimum setback requirements listed in Table 4.2 generally apply to the application of anaerobic digestion output where it is considered to be a NASM.

Requirements for the Storage of NASM
NASM may be stored on-farm under the standards in O.Reg. 267 provided all the NASM is land applied at that farm unit and:

- is stored in a permanent nutrient storage facility constructed after June 30, 2003 in accordance with the standards in the regulation or;
- it is stored in a temporary field nutrient storage site (solid NASM only) in accordance with the standards in the regulation
- Dewatered sewage is stored for no more than 10 days.

Note: NASM with a high odour potential that is classified as OC3 under the regulation may not be stored on-farm under the NASM regulation.

On-farm NASM storage facilities that transfer NASM off the farm unit, are stored in facilities constructed prior to June 2003 or that are OC3 may be stored on-farm subject to approval under the Environmental Protection Act.

The minimum setback requirements for a new permanent nutrient storage facility are listed in Table 4.3. Temporary field nutrient sites must also meet setback requirements if solid NASM is

to be stored on the site for more than 24 hours (value in brackets if different). These setbacks reflect the amendments to O. Reg. 267/03 – General that came into effect on January 1, 2011.

Table 4.3 – Location Requirement for NASM Permanent Nutrient Storage

Feature	**Value**
Minimum distance to municipal wells	100 m
Minimum distance to drilled wells (>15 m deep) and water tight casing >6m.	15 m (45 m)
Minimum distance to all other wells including dug wells	90 m
Minimum distance to field drainage tiles or piped municipal drains	15 m
Minimum flow path to surface water or tile inlet	50 m

The minimum distances to other land uses such as residential areas relates to the odour associated with the NASM.

Under O. Reg. 267/03, a permanent solid NASM storage facility must have a runoff management system to handle all of the runoff generated by the facility (e.g. solid NASM piled on a concrete base). The system must consist of at least one of the following:

- A roof used to prevent the entry of precipitation, assuming that any water upstream of the facility has been diverted away from the facility
- Vegetated filter strip systems
- Properly sized runoff collection and storage systems
- A permanently vegetated area (PVA), if runoff from the facility is generated from an area less than 300 sq. m. The location requirements for a PVA are similar to those for the nutrient storage facility (see Table 4.2).
- A sewage works approved under the OWRA or a sewage system approved under the Ontario Building Code.

Compliance

Compliance and enforcement of the *Nutrient Management Act* is the responsibility of the MOE. According to "Complying with Environmental Legislation on Farms" (MOE, September 2009), the MOE's on-farm compliance program uses a problem-solving approach to help farmers comply with the law and manage environmental issues through education and outreach. Minor violations can be addressed through voluntary abatement plans, authorizing document amendments (to the nutrient management strategy and/or plan), and provincial officer orders. Enforcement, including *Provincial Offences Act* summons and investigation and prosecution, would be used in situations where serious issues are identified.

Canada-Ontario Environmental Farm Plan
The Environmental Farm Plan (EFP) is delivered locally through the Ontario Soil and Crop Improvement Association with expertise provided by the Ontario Ministry of Agriculture and Food. It is a voluntary educational program for farmers delivered through local workshops. Participants are provided instruction on how to progress through the risk assessment and action plan development contained in the EFP workbook. Limited funds (either a 50/50 or 30/70 cost share depending on project) are available to help address areas identified in the plan as needing improvement. The application and storage of NASM is a component of the Canada-Ontario Environmental Farm Plan.

c) Municipal Tools

Municipal Act
Municipalities have the ability to pass by-laws about the economic, social and environmental well-being of the municipality, and about the health, safety and well-being of people, under the *Municipal Act*.

The CWA states that the municipality must implement the policies imposed on it by the Source Protection Plan. S. 39 to 40 address conflicts and the supremacy of the SPP or that which is more protective of the source of drinking water. This is reiterated in s. 105. As such, if the SPP includes a policy prohibiting the storage or land application of NASM within a municipality's boundaries, and if this policy conflicts with a provision of the NMA, the municipality is legally bound to implement that policy.

Minimum Distance Separation Formulae
Agricultural activities can include livestock facilities (e.g. barns and manure storage), and are generally permitted by municipalities on lands that are designated and zoned for agricultural and rural use. In order to reduce incompatibility concerns about odour from livestock facilities, provincial minimum distance separation (MDS) formulae are used by municipalities to separate land uses.

Different formulae are applied to new or expanding non-agricultural uses (such as houses) that could impact existing livestock facilities (MDS I), and to new or expanding livestock facilities that could impact existing non-agricultural uses (MDS II). The formulae are applied to lands subject to most types of *Planning Act* applications and to activities that require building permits. The MDS I formulae are applied to low-intensity uses (e.g. industry, one house) proposed within a 1 km radius of the livestock facility, and to high-intensity uses (e.g. a subdivision) proposed within a 2 km radius.

The MDS formulae do not apply to NASM storage facilities. However, the MDS formulae do apply to ASM storage facilities, which can be converted and used for NASM storage.

Conservation Authorities Act RSO 1990 as amended (August 2002)
Under the Conservation Authorities Act, local Conservation Authorities are given their mandate and direction in the making and administration of land use planning. Conservation Authorities have established Regulations pursuant to Section 28 under which they may:

- Restrict and regulate the use of water in or from rivers, streams, inland lakes, ponds, wetlands and natural or artificially constructed depressions in rivers or streams;
- Prohibit, regulate, or require the permission of the authority to straighten, change, divert, or interfere in any way with the existing channel of a river, creek , stream, or watercourse, or change or interfere with any wetland; and
- Prohibit, regulate or require the permission of the authority for development if, in the opinion of the authority, the control of flooding, erosion, dynamic beaches or pollution or the conservation of land may be affected by development.

In light of these Regulations, the construction of any storage facility would be subject to Conservation Authority requirements. Although review by the Authority is typically triggered by a building permit or Planning Act application, the regulations apply to site alterations.

d) Other Jurisdictions / Programs

Manitoba Water Stewardship
The Government of Manitoba has launched a public education campaign to encourage its residents to go phosphorus-free in terms of household cleaning products in order to help address the province's water quality issues, especially in Lake Winnipeg. At the same time it is lobbying for a national approach restricting phosphorus content in household cleaning products. This concept is important since the content of sewage biosolids is based on what people put down their drains.

5. Gaps in existing legislation, policies and programs

- The minimum 3 m vegetated buffer zone adjacent to surface water is considered to be a best management practice; however, it is substantially less than what is required for land development and site alteration (15 m to 30 m) under the Conservation Authorities Act (Ontario Ministry of Natural Resources, 2010) which is designed to specifically address the protection of fish habitat and not source water. Should a setback be proposed, further research would be needed in order to determine the appropriate setback to protect source water.
- The Environmental Farm Plan program is voluntary and confidential, which makes it enticing for farmers and is a good way to have existing problems corrected; however, there is no way to track if and how action plans are being implemented.

6. Policy considerations

- REMINDER: The main consideration for reducing or eliminating drinking water threats related to the application, handling and storage of agricultural source material is to make sure that it does not enter surface water and/or groundwater.
- Each section of the source protection plan will need to include a high-level policy approach ("a catch-all policy") to address those "would be" drinking water threats that are unlikely to occur in a given vulnerable area. For example, a general policy may be appropriate in an urban setting even if it is unlikely that NASM would be applied or stored there.

7. Examples of risk management measures and policy ideas

For discussion purposes, this section of the report provides examples of risk management measures and policy ideas that could be applicable to the application of NASM to land, and to the handling and storage of NASM. It is not an exhaustive list.

The examples are categorized by the types of policy tools that can be used to meet the source protection plan objectives. The MOE Water Quality Risk Management Measures Catalogue (Version 2, 09/07/2010) was reviewed as part of this exercise and measures were incorporated where appropriate.

Table 7.1 – Examples of risk management measures and policy ideas for NASM

Policy Tool	Examples
Education and Outreach	• Area-wide education and outreach programs targeted to haulers/spreaders and agricultural/rural landowners on the importance of respecting separation requirements and of monitoring the impact of NASM on water quality. • Promote widespread adoption of best management practices (i.e. for haulers/spreaders, pre-treatment of septage, method of incorporation into soil, timing of application). • Area-wide education program about crop nutrient requirements to reduce the excess use of NASMs. • Area-wide program for farmers to improve the design and maintenance of on-farm subsurface tile drainage systems. • Host annual workshops with farmers, giving them the opportunity to network with other farmers and government organizations.
Incentive Programs	• Area-wide incentive programs for agricultural/rural landowners to establish buffers of a suitable width based on site specific considerations on lands for which there are certificates of approval or NASM plans to apply NASM. • EFP Cost-Share Program should include funds to help implement projects from the action plan for areas in IPZs and WHPAs.

Municipal Tools and Land Use Planning	• Prohibit the land application, handling and storage of NASM within their IPZs and WHPAs where it can be a significant drinking water threat, in official plans and zoning by-laws or through the Municipal Act • Prohibit the land application of NASM within 30 m of surface water • Prohibit the storage of NASM within 50 m of surface water • Require a minimum 15 m vegetated buffer adjacent to surface water
Prescribed Provincial Instruments	• Require/encourage (depending on level of threat) OMAFRA and MOE to take extra care in its review of proposed NASM plans and certificate of approval applications for farms within and adjacent to intake protection zones and wellhead protection areas, and to require reporting back to OMAFRA or MOE (i.e. status of sites, sampling and monitoring programs). • Require/encourage OMAFRA to review approved NASM plans to ensure compliance with the Source Protection Plan. • Require/encourage MOE to prioritize inspections for these areas, and to conduct regular inspections.
Municipal Operations / Infrastructure	• Corporate policy about the land application of a municipality's NASM that goes beyond the Provincial requirements that would be enforced through the contract between the municipality and the hauler/spreader. The policy could cover topics such as: adjacent landowner notification (so that they are reminded to test their well water frequently), restrictions on sites (no application in IPZs and WHPAs).
Land Securement	• Purchase or place easements on land in IPZs and WHPAs.
Risk Management Plans	• Require risk management plans to address site specific restrictions of NASM application in areas where threat to drinking water could be significant.
Prohibition	• Prohibit the application, handling and storage of NASM in IPZs and WHPAs where these activities are or would be significant drinking water threats.
Restricted Land Uses	• Flag agricultural land uses (that are associated with the application, handling and storage of NASM) as restricted land uses in IPZs and WHPAs where these activities are or would be significant drinking water threats so that municipal planners and building official ensure the proposed use is reviewed by RMO and risk is mitigated so that it will not become a significant threat.

Appendix – A Reference List

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DRINKING WATER SOURCE PROTECTION
Niagara Peninsula Source Protection Area

NIAGARA PENINSULA CONSERVATION AUTHORITY

Drinking Water Source Protection Background Document

Prescribed Drinking Water Threat 8:
The Application of Commercial Fertilizer to Land

Prescribed Drinking Water Threat 9:
The Handling and Storage of Commercial Fertilizer

May 25, 2011

Table of Contents

Note: We would like to thank Cataraqui Region Conservation Authority and Conservation Ontario for the use of their background research documents in preparing these reports.

Threat 8: The Application of commercial fertilizer to land

Threat 9: The handling and storage of commercial fertilizer

The main consideration for reducing or eliminating drinking water threats related to the land application, handling and storage of commercial fertilizer is to make sure it does not enter surface water and/or groundwater.

1. Definition

Commercial fertilizer is a synthetic substance containing nitrogen, phosphorus, potassium or other plant food intended for use as a plant nutrient. For the purposes of the drinking water source protection initiative, commercial fertilizer does not include agricultural source material or non-agricultural source material.

The majority of commercial fertilizers contain nitrogen, phosphorus and potassium. Nitrogen is important for leaf development; phosphorus promotes good root development and plant growth especially during establishment; and potassium contributes to the general vigour of a plant including drought tolerance and winter hardiness.

From the literature, the main problems associated with commercial fertilizer appear to be its improper use. Two examples include: (1) application without consideration for nutrients available in the soil and plant requirements, and (2) inappropriate timing of application for plant growth cycles and weather conditions. Problems associated with the storage of commercial fertilizers are leaks and spills as a result of aging infrastructure or improper storage. For both storage and application of commercial fertilizer, it should be noted that the movement of phosphorus is often, but not exclusively, associated with runoff and soil erosion.

The main consideration for reducing or eliminating drinking water threats related to the land application, handling and storage of commercial fertilizer is to make sure it does not enter surface water and/or groundwater sources.

2. What causes this activity to be a drinking water threat?

The Ontario Ministry of the Environment (MOE) Tables of Drinking Water Threats (2008, as amended in 2009) identify nitrogen and total phosphorus as substances that could make their way into surface and groundwater as a result of the application of commercial fertilizer to land (circumstances 19 to 36), and through spills resulting from the handling and storage of fertilizer (circumstances 1273 to 1288). These nutrients could threaten the safety of drinking water sources in certain situations due to runoff or spills.

3. What is the local scale of the drinking water threat?

Application of Fertilizer

The application of commercial fertilizer to land is associated with a majority of land uses including agricultural, active recreational, institutional, industrial, commercial and residential. In general, this activity can occur now and in the future in all types of vulnerable area. Table 3.1 identifies those areas where the application of fertilizer is or would be a significant or moderate drinking water threat based on the MOE Tables of Drinking Water Threats and how many threats are currently evaluated. The count for existing significant threats has been taken from the Assessment Report, where existing threats were determined based on current land uses and interpretation of aerial photography.

The classification of this activity as a significant, moderate or low drinking water threat is dependent on the location as well as the combination of the managed land percentage and livestock density for the vulnerable area. In general, the greater the managed land percentage and livestock density, the greater the risk to drinking water.

Table 3.1 identifies those areas where the application of fertilizer has been identified as a threat based on the MOE Tables of Drinking Water Threats. The application of fertilizer has been identified as a significant threat in the Port Colborne IPZ-1. There are no existing significant threats. The count for existing significant threats has been taken from the Assessment Report, where existing threats were determined based on current land uses and the interpretation of aerial photography. Please note that this information is subject to change based on ongoing field verification.

Table 3.1 - Application of Fertilizer

Vulnerable Area		V.S.	Significant	Moderate	Existing Significant Threats
DeCew Falls	Main Intake IPZ -1	8.0		C	
	Lake Gibson Emergency Intake IPZ-1	8.0		C	
	Hwy 406 Control Structure IPZ-1	8.0		C	
	Highway 406 IPZ-2	5.6			
Port Colborne	IPZ-1	9.0	C	C	
	IPZ-2	8.1		C	
Niagara Falls	IPZ-1	8.0		C	
Welland	IPZ-1	7.0		C	
Fort Erie	IPZ-1	7.0		C	

V.S. – Indicates Vulnerability Score
C – Indicates a chemical threat
P – Indicates a pathogen threat
Note: NPCA Intake protection zones with a vulnerability score of 6.4 or less, not listed as they are not applicable to significant and moderate application of fertilizer threats

Reminder:

- Managed lands include cropland, fallow land, improved pasture, golf courses, sports fields and lawns to which agricultural source material, non-agricultural source material, or commercial fertilizer could be applied. This value was calculated based on MOE Technical Rules and is included in the Assessment Report.
- Livestock density is the number of farm animals in a given area. Livestock density is standardized to nutrient units per acres since different types of animals produce different amounts of manure with different nutrient values. A nutrient unit is based on the manure equivalent of nutrients contained in 43 kg of nitrogen or 55 kg of phosphate. The livestock density value was calculated based on MOE Technical Rules and is included in the Assessment Report.

Handling and Storage of Fertilizer

The storage of commercial fertilizer is divided into two categories in the MOE Tables of Drinking Water Threats (2008, as amended in 2009): (1) storage at a facility where it is manufactured or process, or from which it is wholesaled, and (2) storage for retail sale or in relation to its application to land.

Manufacturing, processing and wholesale activities are generally permitted on lands that are zoned for industrial uses in order to provide separation between industrial establishments and incompatible land uses. Future industrial land uses ('would be' threats) would likely occur in the same location as existing industries because these are the only locations zoned for this use in our municipalities. Municipalities have strict control over where these activities can occur within their municipal boundaries.

Commercial fertilizer can be stored, inside or outside, for retail sale or in relation to its application to land throughout the Source Protection Area since this activity is associated with a majority of land uses including agricultural, active recreational, institutional, industrial, commercial and residential. Although storage for these purposes can occur year-round, the greatest volume of fertilizer is stored in the spring before the growing season begins and application occurs.

The classification of this activity as a significant, moderate or low drinking water threat is dependent on the location as well as the quantity of fertilizer stored. The circumstances in the MOE Tables of Drinking Water Threats (2008, as amended in 2009) are divided into four groups: less than 25 kg, between 25 kg and 250 kg, between 250 kg and 2500 kg, and greater than 2500 kg product containing fertilizer stored. In general, the greater the amount of fertilizer stored on-site, the greater the risk to drinking water.

Table 3.2 identifies those areas where the handling and storage of fertilizer is or would be a significant or moderate drinking water threat based on the MOE Tables of Drinking Water Threats. The handling and storage of fertilizer has not been identified as a significant threat in any of the SPA's IPZs. The count for existing significant threats has been taken from the Assessment Report, where existing threats were determined based on current land uses and interpretation of aerial photography. Please note that the information in this table is subject to change with ongoing field verification.

Table 3.2 - Handling and Storage of Fertilizer

Vulnerable Area		V.S.	Significant	Moderate	Existing Significant Threats
DeCew Falls	Main Intake IPZ -1	8.0		C	
	Lake Gibson Emergency Intake IPZ-1	8.0		C	
	Hwy 406 Control Structure IPZ-1	8.0		C	
Port Colborne	IPZ-1	9.0		C	
	IPZ-2	8.1		C	
Niagara Falls	IPZ-1	8.0		C	

V.S. – Indicates Vulnerability Score
C – Indicates a chemical threat
P – Indicates a pathogen threat
Note: NPCA Intake protection zones with a vulnerability score of 7.0 or less, not listed as not applicable to significant and moderate handling and storage of fertilizer threats

4. Applicable legislation, policies and programs

a) National

Fisheries Act

In general the *Fisheries Act* is enforced by Fisheries and Oceans Canada; however, the section that applies to contamination is under the authority of Environment Canada. The deposition of any deleterious substance (contaminant), including commercial fertilizer, is in contravention of the legislation. Section 36(3) of the *Fisheries Act* states that "… no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water." This could result from the improper application, handling and storage of commercial fertilizer and from spills.

b) Provincial

Environmental Protection Act

The *Environmental Protection Act* (EPA), which is enforced by the MOE, prohibits the discharge of contaminants into the natural environment. A person who uses or stores commercial fertilizer must ensure that discharges and spills do not occur.

Nutrient Management Act and Ontario Regulation 267/03 – General

Sections 10, 14, 15.2 and 28 of Ontario Regulation 267/03 – General are prescribed instruments under the *Clean Water Act*. These sections relate to the approval of nutrient management strategies and NASM plans, and to compliance with nutrient management strategies, plans and NASM plans that are in force. More information about these documents can be found in Background Reports 3 and 4 (Application of ASM and Handling and Storage of ASM).

With respect to commercial fertilizer, O. Reg. 267/03 states that nutrients cannot be applied to land for which a nutrient management plan is required within 100 m of a municipal well or within 3 m of any other type of water well. Nutrient management plans and non-agricultural source material plans must take into account all sources of nutrients that would be applied to land including commercial fertilizer since one of the purposes of the plans is to optimize the relationship between the land-based application of nutrients, farm management techniques and crop requirements.

Canada-Ontario Environmental Farm Plan

The Environmental Farm Plan (EFP) is delivered locally through the Ontario Soil and Crop Improvement Association with expertise provided by the Ontario Ministry of Agriculture, Food and Rural Affairs. It is a voluntary educational program for farmers delivered through local workshops. Participants are provided instruction on how to progress through the risk assessment and action plan development contained in the EFP workbook. Limited funds are available to address areas identified in the plan as needing improvement. More information about the EFP program can be found in Background Reports 3 and 4 (Application of ASM and Handling and Storage of ASM).

One of the 23 areas assessed through the EFP is the handling and storage of fertilizer. The information sheet on this activity suggests the following actions to address existing issues:

- Relocate fertilizer mixing/loading and storage areas away from surface water and wells
- Increase the flow path distance between surface water and mixing/loading and storage areas
- Relocate well away from mixing/loading and storage areas

- For existing mixing/loading and storage areas which have an impermeable floor, a curb installed to collect spills and floors that are not cracked or leaking, test the well water at least once a year
- Construct a mixing/loading and storage areas with impermeable floor, curb and permanent roof to exclude rainfall
- Storage in one designated area
- Mixing/loading done at field site using temporary plastic-lined berms for containment
- Use a separate tank to supply water to the fertilizer tank to prevent the potential for backflow into well or surface water source
- Prepare a written emergency plan and have spill clean-up equipment available

c) Municipal *Municipal*

Tools Application of

Fertilizer

Municipalities have the ability to pass by-laws about the economic, social and environmental well-being of the municipality, and about the health, safety and well-being of people, under the section 11(2) of the *Municipal Act*.

The CWA states that the municipality must implement the policies imposed on it by the Source Protection Plan. S. 39 to 40 address conflicts and the supremacy of the SPP or that which is more protective of the source of drinking water. This is reiterated in s. 105. As such, if the SPP includes a policy prohibiting the land application of fertilizer within a municipality's boundaries, and if this policy conflicts with a provision of the NMA, the municipality is legally bound to implement that policy.

Storage of Fertilizer

As mentioned above, manufacturing, processing and wholesale activities are generally permitted on lands that are zoned for industrial uses. Future industrial land uses ("would be" threats) would likely occur in the same location as existing industries because these are the only locations zoned for this use in our municipalities. In drafting policies though, consideration should be given for potential changes to zoning by-laws to accommodate changes in existing land uses.

The location and type of storage used for retail sale or for the purpose of application could be addressed through site plan control provided that the municipality has enabled this tool for this use in these areas. Under the Municipal Planning Act, municipalities may use site plan approvals to prior to further address the details of the layout of the site, such as the location of internal roadways, storage areas, building and septic envelopes, etc., the issuance of a building permit. Site plan control, where it is required, is considered applicable law under the *Building*

Code Act, and the municipality is able to ensure these details are agreed upon prior to issuing a building permit.

Guideline D-6: Compatibility between Industrial Facilities and Sensitive Land Uses

The MOE document "Guideline D-6: Compatibility between Industrial Facilities and Sensitive Land Uses" (July 1995) is supposed to be used by municipalities as a land use planning tool to determine suitable locations for industrial activities. It defines the term *sensitive land uses* such as residential uses and daycares and describes the classification of industrial facilities to which the potential influence areas and minimum separation distances should be applied.

Sensitive land uses include buildings or associated amenity areas where people or the natural environment could be adversely affected by the emissions of a nearby industrial facility. These include residences, retirement homes, schools, daycares, hospitals, churches, campgrounds, etc.

There are three classes of industrial facilities. Class I facilities are generally referred to as light industrial facilities. Class II facilities involve medium scale processing and manufacturing with outdoor storage of wastes or materials. Class III facilities are large scale manufacturing or processing plants that have outside storage of raw and finished products, large production volumes and continuous movement of products and employees. There are frequent emissions that could be considered major annoyances. The potential influence area (i.e. areas within which adverse effects may be experienced) for Class III facilities is 1000 m (minimum separation distance of 300 m). The manufacturing and processing of fertilizer would likely be a Class III industrial facility, based on the description given in the guideline.

This guideline also considers ground borne vibration, but does not deal with other emissions into the soil or ground and surface water. These other matters are addressed through the *Environmental Protection Act*. As it is currently written, this guideline likely would not apply to the protection of drinking water sources.

d) Other Jurisdictions / Programs

Manitoba Water Stewardship

Since January 1, 2009, Manitobans have been prohibited from using fertilizers containing phosphorus on their lawns with few exceptions. In addition, no fertilizer of any kind for any purpose can be applied:

- within 3 metres of rivers, streams, creeks, wetlands and storm water retention ponds;
- within 15 metres from lakes, reservoirs, springs and wells;
- within 15 metres of vulnerable rivers; or
- within 30 metres of vulnerable lakes.

Urban Fertilizer Council

The Canadian Fertilizer Institute established the Urban Fertilizer Council to work with fertilizer suppliers to communicate the importance of responsible nutrient use to protect water quality. Their web site offers an information library as well as resources on best management practices.

Golf Course Best Management Practices

Voluntary best management practices (BMPs) identified by the Ontario Allied Golf Associations for the use and storage of fertilizer at golf courses include:

- The use of slow release fertilizers in environmentally sensitive areas;
- Basing fertilizer application rates on soil tests;
- Naturalizing out-of-play areas;
- Increased buffer areas along watercourses and ponds;
- Keeping records of all fertilizer applications; and
- Storage of fertilizers in enclosed structures to keep the product dry, away from the elements and manageable in the event of a spill.

Canadian Fertilizer Industry Storage and Handling Guidelines

The Canadian Fertilizer Institute has "Canadian Fertilizer Industry Storage and Handling Guidelines" (2001) to help those in the industry to determine what changes they can make to their existing or planned facilities to maintain or improve the level of safety associated with the handling and storage of fertilizers. The guidelines are based on regulatory requirements and industry best practices, and include aspects such as:

- Locating all new facilities a minimum of 50 m from surface water and environmentally sensitive areas;
- Locating liquid fertilizer facilities a minimum of 50 m from private wells and 300 m from sources of public water supply unless there is a hydro-geological assessment prepared that permits a closer setback;
- Requiring an emergency response plan that addresses how to contain emergency response water (e.g. from a fire);
- Design specifications for fertilizer containment areas and the collection of runoff water;
- Employee training; and
- Emergency response planning and practice, including local emergency response officials.

5. Gaps in existing legislation, policies and programs

- Under Ontario Regulation 267/03, nutrient management strategies and nutrient management plans are only required for farms that meet specific criteria, leaving many farms unregulated.
- The minimum 3 m vegetated buffer zone adjacent to surface water is considered to be a best management practice; however, it is significantly less than what is required for development and site alteration (15 m to 30 m) in the Natural Heritage Reference Manual (Ministry of Natural Resources, 2010) which is designed to specifically address the protection of fish habitat and not source water. Should a setback be proposed, further research would be needed in order to determine the appropriate setback to protect source water.
- The Environmental Farm Plan program is voluntary and confidential, which makes it appealing for farmers and is a good way to have existing problems corrected; however, there is no way to track if and how action plans are being implemented.

6. Policy considerations

- REMINDER: The main consideration for reducing or eliminating drinking water threats related to the application and storage of commercial fertilizer is amount of managed land in the vulnerable areas and the quantity of fertilizer being applied or stored.

- The application of commercial fertilizer to land would be a significant drinking water threat in Port Colborne's IPZ-1.

- The handling and storage of fertilizer has not been identified as a significant threat in any of the SPA's IPZs.

7. Examples of risk management measures and policy ideas

For discussion purposes, this section of the report provides examples of risk management measures and policy ideas that could be applicable to the application of commercial fertilizer to land, and to the handling and storage of commercial fertilizer. It is not an exhaustive list.

The examples are categorized by the types of policy tools that can be used to meet the source protection plan objectives. The MOE Risk Management Measures Catalogue was reviewed as part of this exercise and measures were incorporated where appropriate.

Table 7.1 – Examples of risk management measures and policy ideas for commercial fertilizer

Policy Tool	**Examples**
Education and Outreach	• Area-wide education and outreach programs targeted at fertilizer application technicians and homeowners on the importance of fertilizer-free buffers around wells and surface water. • Area-wide education program about grass and crop nutrient requirements to reduce the excess use of fertilizers. • Promote a reduction in the use of phosphorus. • Promote voluntary nutrient management strategies and plans for farms that do not qualify under O. Reg. 267/03.
Incentive Programs	• Area-wide incentive programs for agricultural/rural landowners to establish buffers of a suitable width based on site specific considerations on lands adjacent to surface water. • EFP Cost-Share Program should include funds to help implement projects from the EFP action plans for farms in IPZs.
Municipal Tools and Land Use Planning	• Prohibit the land application and storage of commercial fertilizer within the IPZs where it can be a significant drinking water threat, in official plans and zoning by-laws and / or through municipal by-laws. • Prohibit the land application, handling and storage of commercial fertilizer within a specified distance of surface water (and/or require a minimum sized vegetated buffer). • Ensure extra consideration is given for new development in vulnerable areas that includes the storage of commercial fertilizer.
Prescribed Provincial Instruments	• Require/encourage (depending on level of threat) OMAFRA and MOE to take extra care in its review of proposed nutrient management strategies and plans for farms within and adjacent to intake protection zones and to require reporting back to OMAFRA or MOE (i.e. status of sites, sampling and monitoring programs). • Require/encourage OMAFRA to review approved nutrient management strategies and plans to ensure compliance with the Source Protection Plan. • Require/encourage MOE to prioritize inspections for these areas, and to conduct regular inspections.
Municipal Operations / Infrastructure	• Evaluate municipal fertilizer storage locations for potential impact on drinking water sources, and address identified problems. • Require buffers of a suitable width based on site specific considerations that are fertilizer-free zones along surface water on municipal properties. • Emergency response plans – consideration for how and where to contain emergency response water (e.g. water used to fight a fire).
Land Securement	• Purchase or place easements on land in IPZs.

Risk Management Plans	• Require risk management plans for the storage of commercial fertilizer in IPZs where this activity is or would be a significant drinking water threat.
Prohibition	• Prohibit the application and storage of commercial fertilizer in IPZs where this activity is or would be a significant drinking water threat.
Restricted Land Uses	• Flag land uses that are associated with the application and storage of commercial fertilizer (such as agricultural, active recreational, municipal public works) as restricted land uses in IPZs where these activities are or would be significant drinking water threats so that municipal planners and building official consider implications of proposed uses.

Appendix – A Reference List

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DRINKING WATER SOURCE PROTECTION
Niagara Peninsula Source Protection Area

NIAGARA PENINSULA CONSERVATION AUTHORITY

Drinking Water Source Protection Background Document

Prescribed Drinking Water Threat 10: The Application of Pesticide to Land

Prescribed Drinking Water Threat 11: The Handling and Storage of Pesticide

February 10, 2011

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Note: We would like to thank Cataraqui Region Conservation Authority and Conservation Ontario for the use of their background research documents in preparing these reports.

Threat 10: The application of pesticide to land

Threat 11: The handling and storage of pesticide

The main consideration for reducing or eliminating drinking water threats related to the land application, handling and storage of pesticides is to make sure it does not enter surface water and/or groundwater.

1. Definition

Pesticides are typically chemicals, but could be organisms, that are used to control undesirable pests, such as weeds, insects, and fungi. All of the pesticides considered through the drinking water source protection initiative are chemicals used to control weeds or fungi.

Since 2009, there is a cosmetic pesticide ban in effect in Ontario that could have the effect of reducing the amount of pesticides that make its way into sources of drinking water. This provincial ban prohibits the application of pesticides for cosmetic purposes on lawns, vegetable and ornamental gardens, patios, driveways, cemeteries, and in parks and school yards.

In the Niagara Peninsula Source Protection Area, the application of pesticides to land, as well as the handling and storage of pesticides, is most commonly associated with agricultural, recreational, public works, and retail land uses (storage only).

2. What causes this activity to be a drinking water threat?

There are eleven (11) chemicals listed in the Ontario Ministry of the Environment (MOE) Tables of Drinking Water Threats (2008, as amended in 2009) that could make their way into surface and groundwater as a result of the application of pesticides to land (circumstances 55 to 87), and through spills resulting from the improper handling and storage of pesticides (circumstances 1113 to 1200). These chemicals are listed below.

- Atrazine
- Dicamba
- Dichlorophenoxy Acetic Acid (2,4-D)
- Dichloropropene-1,3
- Glyphosate
- MCPA (2-methyl-4-chlorophenoxyacetic acid)
- MCPB (4-(4-chloro-2-methylphenoxy)butanoic acid)
- Mecoprop
- Metalaxyl
- Metolachlor or s-Metolachlor
- Pendimethalin

These substances are active ingredients in post-emergent herbicides, with the exception of Dichloropropene-1,3 and Metalaxyl which are fungicides.

3. What is the local scale of the drinking water threat?

Application of Pesticides

The application of pesticides to land is associated with a majority of land uses including agricultural, active recreational, institutional, industrial, commercial and residential. It is assumed that pesticides could still be applied even though there is a cosmetic pesticide ban. In general, this activity can occur now and in the future in the intake protection zones (IPZ).

The classification of this activity as a significant, moderate or low drinking water threat is dependent on the area of land to which the pesticide is applied: less than 1 ha, 1 to 10 ha, or greater than 10 ha. In general, the greater the application area, the greater the risk to drinking water.

Through the Assessment Report, this activity has been identified as a significant threat in Port Colborne. Table 3.1 identifies those areas where the application of pesticides is or would be a significant or moderate drinking water threat based on the MOE Tables of Drinking Water Threats and how many threats are currently evaluated. The count for existing significant threats has been taken from the Assessment Report, where existing threats were determined based on current land uses and interpretation of aerial photography. Please note that the information in these tables about the existing threats is subject to change with ongoing field verification. For this treat, no existing significant threats have been identified at this time.

Table 3.1 - Application of Pesticides

Vulnerable Area		V.S.	Significant	Moderate	Existing Significant Threats
DeCew Falls	Main Intake IPZ -1	8.0		C	
	Lake Gibson Emergency Intake IPZ-1	8.0		C	
	Hwy 406 Control Structure IPZ-1	8.0		C	
	Main Intake IPZ-2	6.4		C	
	Lake Gibson Emergency Intake IPZ-2	6.4		C	
Port Colborne	IPZ-1	9.0	C	C	
	IPZ-2	8.1	C	C	
Niagara Falls	IPZ-1	8.0		C	
	IPZ-2	6.4		C	
Welland	IPZ-1	7.0		C	
Fort Erie	IPZ-1	7.0		C	

C – Indicates a chemical threat
P – Indicates a pathogen threat
V.S. – stands for vulnerability score
Note: NPCA Intake protection zones with a vulnerability of 5.6 or less, not listed as not applicable to significant and moderate application of pesticide threats

Handling and Storage of Pesticides

The storage of pesticides is divided into two categories in the MOE Tables of Drinking Water Threats (2008, as amended in 2009): (1) storage at a facility where it is manufactured or process, or from which it is wholesaled, and (2) storage for retail sale or extermination.

Manufacturing, processing and wholesale activities are generally permitted on lands that are zoned for industrial uses to provide separation between industrial establishments and incompatible land uses. Future industrial land uses ('would be' threats) would likely occur in the same location as existing industries because these are the only locations zoned for this use in our municipalities. In Port Colborne, the only IPZ with a significant vulnerability score, 5 industrial parcels have been identified in IPZ-1 and 4 have been identified in IPZ-2. None of these are currently storing fertilizer.

Pesticides can be stored for retail sale or for use in extermination (such as application to land) throughout the Niagara Peninsula Source Protection Area since this activity is generally associated with agricultural, active recreational, and commercial land uses, and public works (roads and utility corridors). Although storage for these purposes can occur year-round, the greatest volume of pesticides is stored in the spring before the growing season begins and application occurs.

The classification of this activity as a significant, moderate or low drinking water threat is dependent on the location as well as the quantity of fertilizer stored. The circumstances in the MOE Tables of Drinking Water Threats (2008, as amended in 2009) are divided into four groups: less than 25 kg, between 25 kg and 250 kg, between 250 kg and 2500 kg, and greater than 2500 kg of product containing pesticide stored at the location. In general, the greater the amount of pesticide stored on-site, the greater the risk to drinking water.

Through the Assessment report, this activity has been identified as a significant threat in Port Colborne. Table 3.2 identifies those areas where the handling and storage of pesticides is or would be a significant or moderate drinking water threat based on the MOE Tables of Drinking Water Threats and how many threats are currently evaluated. The count for existing significant threats has been taken from the Assessment Report, where existing threats were determined based on current land uses and interpretation of aerial photography. Please note that the information in these tables about existing threats has been taken from the Assessment Report and is subject to change with ongoing field verification. For this treat, no existing significant threats have been identified at this time.

Table 3.2 - Handling and Storage of Pesticides

Vulnerable Area		**V.S.**	**Significant**	**Moderate**	**Existing Significant Threats**
DeCew Falls	Main Intake IPZ -1	8.0		C	
	Lake Gibson Emergency Intake IPZ-1	8.0		C	
	Hwy 406 Control Structure IPZ-1	8.0		C	
Port Colborne	IPZ-1	9.0	C	C	
	IPZ-2	8.1		C	
Niagara Falls	IPZ-1	8.0		C	
Welland	IPZ-1	7.0		C	
Fort Erie	IPZ-1	7.0		C	

C – Indicates a chemical threat

P – Indicates a pathogen threat

Note: NPCA Intake protection zones with a vulnerability score of 6.4 or less, not listed as not applicable to significant and moderate handling and storage of pesticide threats

4. Applicable legislation, policies and programs

a) National

The federal government is responsible for registering and evaluating new pesticides, and for protecting human health and the natural environment from certain aspects of pesticide contamination. Federal legislation relevant to pesticides includes: *Pest Control Products Act*, *Food and Drugs Act*, *Fisheries Act*, *Migratory Birds Convention Act*, and *Transportation of Dangerous Goods Act*.

Pest Control Products Act and Regulations

Pesticides imported into, sold, or used in Canada are regulated nationally under the *Pest Control Products Act* (PCPA) and Regulations. Pesticides are registered for use following an evaluation of scientific data to ensure that the product has merit and value, and that any human health and environmental risks associated with its proposed use are deemed to be acceptable.

Sometimes additional restrictions are placed on a pesticide to lessen risks, which can affect its use. For example, certain pesticide registrations may outline buffer zones, timing and frequency of applications, or rate at which the product must be applied.

Before a pesticide can be sold or used in Ontario, it must be registered under the federal PCPA, and any types of use must follow all conditions outlined in its registration. The province is able to place additional conditions or prohibitions on its use.

Fisheries Act

In general the *Fisheries Act* is enforced by Fisheries and Oceans Canada; however, the section that applies to contamination is under the authority of Environment Canada. The deposition of any deleterious substance (contaminant), including commercial fertilizer, is in contravention of the legislation. Section 36(3) of the *Fisheries Act* states that "… no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water." This could result from the improper application, handling and storage of pesticides and from spills.

Agrichemical Warehousing Standards Association

The Agrichemical Warehousing Standards Association (AWSA) consists of Canadian warehouse operators, manufacturers, distributors, and governments that cooperatively establish standards to ensure that crop protection products, such as pesticides, are stored in certified warehouses. They also inform, educate and communicate with stakeholders and provide other services as required.

The AWSA Certified Warehousing Standards apply to products based on their federal registration classification and their user. Currently, the standards apply to the storage facilities

of vendors of all pesticides classified as agricultural or industrial, and to the storage facilities of custom applicators (e.g. ground or aerial crop sprayers). This would include Ontario's class 1, 2, 3, 4, 5, 8, 9, and 10 class pesticides. There is no distinction based on the volume or weight of pesticides in storage or on the length of time that they are in storage.

The standards do not apply to the storage facilities of someone who is only an end user (such as a farmer or golf course operator), unless they are also a vendor. For example, a farmer who is also a dealer must follow the standards while a normal farmer would be exempt.

In general, the standards address and manage 11 areas of potential storage-related risk such as spills, floods, and shipping and receiving design safety. To address these potential risk areas, the standards have three primary components:

- Construction and structural requirements
- Employee training
- Documentation

Structural requirements incorporate the National Fire Code, National Building Code and Canadian Electrical Code, which are established standards that must already be met by agrichemical dealers. For instance, new pesticide storage facilities can only be built in certain areas, and precautions such as dyking and containment must be taken to prevent potential contamination of environmentally sensitive areas. If provincial or municipal governments have more rigorous legislation, regulations, by-laws or codes, then these standards supersede the AWSA's Warehousing Standards.

Warning and emergency signs must be clearly posted at all storage facilities. For flammable and combustible products, special storage precautions must be provided. Every warehouse employee must be trained in the safe handling of pesticide products, first aid and emergency procedures. Emergency response planning for each storage facility is mandatory.

Warehouses are audited every two years by independent auditors who are specially trained and certified. The standards are enforced through the issuing and withdrawing of certificates by AWSA. Agrichemical manufacturers will not ship product to uncertified warehouses, and the AWSA maintains a database for certification and compliance tracking.

Approximately 300 certified warehouses exist in Ontario. No warehouses have been identified in any of Niagara's IPZs.

b) Provincial

The provincial government is responsible for regulating the sale, use, transportation, storage, and disposal of pesticides in Ontario. This is done through a classification system, based on reviews and recommendations from the Ontario Pesticides Advisory Committee (OPAC), and administered through the Ontario Ministry of Environment (MOE). Products must be classified before they can be sold or used in Ontario.

The purpose of the *Pesticides* Act is to protect Ontario's land, and surface and ground water resources from damage due to improper use of pesticides. Sections 7 and 11 of the *Pesticides Act* are prescribed instruments under the *Clean Water Act*. These sections relate to issuance, renewal and revocation of permits for land extermination, structural exterminations and water exterminations. It is noted that most agricultural use of pesticides is not covered by Sections 7 and 11, and the provincial instrument tools are not applicable to regulate this use.

Pesticide management has been standardized through the *Pesticides Act* and Regulation 63/09 (Cosmetic Pesticides Ban), which controls the use, sale, storage, display, disposal and transportation of pesticides and fertilizers containing pesticides. Under the *Act*, pesticides are classed into 11 categories, and must be used accordingly. These restrictions supersede any local by-laws.

This Pesticide Classification Guideline for Ontario is intended to provide details on the classification system set out in sections 3 to 8 of the Regulation. These sections outline the decision-making framework for classifying pesticides and describe the eleven classes of pesticides. The classifications are as follows:

Class 1:
The pesticide is designated under the Pest Control Products Act (Canada) as a pesticide of the Manufacturing class. Class 1 pesticides are manufacturing concentrates used to formulate pesticide products or to be incorporated into other manufactured products.

Class 2:
The pesticide is designated under the Pest Control Products Act (Canada) as a pesticide of the Commercial or Restricted class. The pesticide meets the description of Very Hazardous in the Guideline mentioned in subsection 4(5). The pesticide does not meet the description of a Controlled Sales pesticide in the Guideline mentioned in subsection 4(5).

Class 3:
The pesticide is designated under the Pest Control Products Act (Canada) as a pesticide of the Commercial or Restricted class. The pesticide meets the description of Moderately Hazardous in the Guideline mentioned in subsection 4(5). The pesticide does not meet the description of a Controlled Sales pesticide in the Guideline mentioned in subsection 4(5).

Class 4:
The pesticide is designated under the Pest Control Products Act (Canada) as a pesticide of the Commercial or Restricted class. The pesticide meets the description of Less or Least Hazardous in the Guideline mentioned in subsection 4(5). The pesticide does not meet the description of a Controlled Sales pesticide set out in the Guideline mentioned in subsection 4(5).

Class 5:
The pesticide is:
i. designated under the Pest Control Products Act (Canada) as a pesticide of the Domestic class and meets the description of Less Hazardous in the Guideline mentioned in subsection 4(5), or ii. registered under the Fertilizers Act (Canada) and the size of its container is greater than 1 kilogram or 1 liter.

If the pesticide may be used in, on or over land,
i. the only pesticide ingredient it contains is a Class 11 pesticide, or
ii. every use set out on

Class 6:
The pesticide is:
i. designated under the Pest Control Products Act (Canada) as a pesticide of the Domestic class and meets the description of Least Hazardous in the Guideline mentioned in subsection 4(5), or
ii. registered under the Fertilizers Act (Canada)and the size of its container is less than or equal to 1 kilogram or 1 liter.

If the pesticide may be used in, on or over land,
i. the only pesticide ingredient it contains is a Class 11 pesticide, or
ii. every use set out on the pesticide's label is a use mentioned in subsection 7.1 (2) of the Act.

Class 7:
The pesticide is designated under the Pest Control Products Act (Canada) as a pesticide of the Domestic or Restricted class. The pesticide may be used in, on or over land. The pesticide meets the description of a Controlled Sales pesticide set out in the Guideline mentioned in subsection 4(5).

Class 8:
The pesticide is designated under the Pest Control Products Act (Canada) as a pesticide of the Domestic class or is registered under the Fertilizers Act (Canada). The pesticide may be used in, on or over land. The pesticide contains a Class 9 pesticide.

The pesticide meets one of the following descriptions:
i. Its label does not set out any of the uses mentioned in subsection 7.1 (2) of the Act.
ii. If its label sets out a use mentioned in paragraph 4 of subsection 7.1 (2) of the Act, the label does not meet the description of a Controlled Sales pesticide set out in the Guideline mentioned in subsection 4 (5).

Class 9:
The pesticide is an ingredient in a Class 2, 3, 4, 5, 6, 7 or 8 pesticides. The label of the

Class 2, 3, 4, 5, 6, 7 or 8 pesticide sets out at least one use that is not a use mentioned in subsection 7.1 (2) of the Act. The pesticide does not meet the description of a Category I pesticide in the Guideline mentioned in subsection 4(5).

Class 10:
The pesticide is a Class 9 pesticide. The pesticide meets the description of a Category II pesticide in the Guideline mentioned in subsection 4(5).

Class 11:
The pesticide is an ingredient in a Class 2, 3, 4, 5, 6 or 7 pesticides. The pesticide meets the description of a Category I pesticide in the Guideline mentioned in subsection 4(5).

The pesticides listed in the MOE Tables of Drinking Water Threats (2008, as amended in 2009) fall into the classes as set out below.

Table 4.1 - Description of pesticide classes

Class	Description	Contaminants
Class 1	Components used in pesticide manufacturing.	Dicamba, Dichlorophenoxy Acetic Acid (2,4-D), Glyphosate, MCPA, Mecoprop
Class 2, 3, 4	Products only allowed for commercial activities.	Atrazine, Dicamba, Dichlorophenoxy Acetic Acid (2,4-D), Dichloropropene-1,3, Glyphosate, MCPA, MCPB, Mecoprop, Metalaxyl, Metolachlor, Pendimethalin
Class 5 & 6	Products allowed for domestic use.	Dichlorophenoxy Acetic Acid (2,4-D)
Class 7	Products have controlled sales only.	Glyphosate
Class 8	Products banned from sale in Ontario.	Dicamba, Glyphosate, MCPA, Mecoprop
Class 9	Ingredients banned for use.	Glyphosate, MCPA, Mecoprop
Class 10	Ingredients banned for use, except for health and safety purposes.	Glyphosate
Class 11	Ingredients allowed for cosmetic use, but a green notice sign must be posted.	Dichlorophenoxy Acetic Acid (2,4-D)

Some contaminants fall into multiple classes, depending on the products they contribute to. Others may be banned, but could still be used under certain exceptions. For instance, Glyphosate is banned from sale (Class 8), but could still be used for health and safety purposes under exemptions in the act.

Enforcement of the Pesticides Act

The Minister of the Environment appoints a Director or Directors to administer the Act. In addition to other powers, all licenses and permits are issued or revoked by the authority of the Director.

Provincial officers are designated by the Minister of the Environment to enforce the Pesticides Act and Regulation 63/09. These provincial officers have power of, inspection, seizure, and evacuation and may make use of local and provincial police forces when deemed necessary.

Cosmetic Pesticide Ban

Ontario's cosmetic pesticides ban took effect April 22, 2009. The requirements of the ban are detailed in Ontario Regulation 63/09 of the Pesticides Act, which was amended by the Cosmetic Pesticides Ban Act, 2008.

The provincial ban supersedes local municipal pesticides bylaws to create one clear, transparent and understandable set of rules across the province. The ban prohibits the application of pesticides for cosmetic purposes on lawns, vegetable and ornamental gardens, patios, driveways, cemeteries, and in parks and school yards. There are no exceptions for pest infestations (insects, fungi or weeds) in these areas. Banned pesticides cannot be sold, and only licensed vendors can sell controlled pesticides. Vendors are required to inform pesticide purchasers of the circumstances in which the pesticide can and cannot be used.

Under the ban, there are exceptions for:

- Public health and safety (plants and animals that may be poisonous or cause structural damage to buildings)
- Natural resources (control invasive species, protect a native plant, animal or rare ecosystem)
- Golf courses (accredited for Integrated Pest Management, publically accessible annual report)
- Sports fields (hosting national or international sports competitions)
- Specialty turf (accredited for Integrated Pest Management, publically accessible annual report)
- Agriculture (business related use)
- Forestry (control competing vegetation)
- Public works (maintain safe conditions along transportation and utility corridors)

All pesticide manufacturers, operators, and vendors must be certified, and they are required to follow certain storage and disposal procedures. They must also provide yearly notification to the local fire department outlining their pesticide storage locations.

It is illegal to store pesticides under unsafe condition. Regulation 63/09 gives safe storage requirements for storage facilities.

The requirements are:

- Pesticides must be stored away from food, drinks and pet food.
- Pesticides must be inaccessible to the public when left in an unattended parked vehicle. Pesticides in a locked compartment of the vehicle.
- The pesticide storage should be isolated from children and livestock, and from any area where human food or animal feed is stored.
- The area should be dry. Moisture may cause labels and some types of packaging to break down. Avoid sites where there is any chance that runoff or drainage water from the pesticide storage may enter surface or ground water. Also, avoid flood areas.

Class 2 pesticides must be stored in an area used primarily for pesticides. The area or building used for pesticide storage must have a floor that does not allow seepage and a concrete or asphalt floor is the best. The area must be able to be securely locked. A sign must be posted with the words “Pesticide or Chemical storage – Authorized Persons Only – Warning In Case of Fire Use Extreme Caution.” Emergency equipment, protective clothing and personal protective equipment must be available close to the storage area.

Unsold pesticides or unused surplus pesticide concentrate must be disposed of in accordance with O. Reg. 63/09 and Regulation 347 (General Waste Management) under the *Environmental Protection Act*. Generally, all pesticide wastes must be disposed of at a waste disposal facility that has been approved by the MOE, and can only be transported by a waste management company that has obtained the appropriate approvals from the MOE.

The MOE manages its approach to compliance and enforcement through education and outreach, inspections, response to incidents, voluntary abatement, orders, tickets and prosecutions. In the case of the pesticides ban, the MOE will focus its initial efforts on education when responding to reports of suspected non-compliance.

Ontario Pesticide Education Program

Under O. Reg. 63/09 all pesticide operators and vendors must be certified. Certification programs are conducted through the Ontario Pesticide Education Program. Three major categories exist:

1) **Certified Farmers and Trained Assistants:** Farmers, as defined under O. Reg. 63/09, require certification to buy or use Class 2 or 3 pesticides on the land they farm. To become certified, they must attend the Grower Pesticide Safety Course (GPSC) and pass the GPSC exam. Certificates are valid for five years. Certified Farmers cannot spray as a business or sell pesticides.

   Pesticide safety training is also mandatory for any assistant, such as a farm employee, farm family member, or seasonal foreign worker, who handles Class 2 or 3 pesticides. Trained Assistants cannot buy Class 2 or 3 products and may only handle these products under the supervision of a Certified Farmer. To become trained, a farm assistant can either attend a GPSC and not write the exam, or attend an on-farm training session presented by a qualified Assistant Instructor. Training is valid for five years.

2) **Certified Vendors:** Under O. Reg. 63/09 pesticide vendors require certification. Vendors become certified by taking a two-day Pesticide Vendor Course that provides information on how to sell, store, and handle pesticides properly. They must also pass an exam. Once certified, vendors can apply for a "General Vendor License" from the MOE that allows them to sell class 2 and 3 products.

3) **Licensed Exterminators and Technicians:** Anyone who applies pesticides commercially is considered an "exterminator." Exterminators include farmers who custom apply pesticides for other farmers and charge a fee for the service. Exterminators become certified by taking a course and passing an exam. They must also hold an Operator's License from the MOE. Licenses are valid for five years.

   Technicians can mix, load or apply Class 3 to 7 pesticides and most Class 2 pesticides, under the indirect supervision of a Licensed Exterminator. Technicians become certified by taking a course and passing an exam, and by completing practical training with a licensed exterminator. Technician cards are valid for two years. Unlicensed assistants

who do not train to become technicians must be directly supervised by licensed exterminators at all times.

Integrated Pest Management Accreditation Program

The IPM Council of Canada consists of industry associations, government regulators and advisors, and other interested parties. According to the IPM Council of Canada, integrated pest management (IPM) is a process that uses all necessary techniques to suppress pests effectively, economically and in an environmentally sound manner. IPM employs a two-pronged approach: managing the plant environment to prevent problems and using thresholds to decide how and when to treat pests.

Golf courses, specialty turf (such as lawn bowling, cricket, lawn tennis or croquet), and certain public works (related to health and safety) are provided an exemption under Ontario's cosmetic pesticide ban. However, these groups are required to be accredited under the IPM Accreditation Program through the IPM Council of Canada.

Accredited organizations are able to apply Class 9 pesticides for uses related to their specific exemption. For example, a golf course could only apply a Class 9 product to the playing surface, not any lawns, gardens, patios or other outdoor areas associated with the facility.

To become accredited, exterminators must take an IPM course and write an exam. They must also produce an annual report detailing their use of pesticides, why they were used, and how future uses could be reduced.

Golf courses must meet additional registration and auditing requirements. Independent certified environmental auditors conduct desk Review Audits and On-Site Audits.

Environmental Protection Act, Ontario Regulation 347

Part V of the *Environmental Protection Act* regulates the disposal of pesticide concentrate, and the requirements for "pesticide container depots". These are locations that receive containers originally used to hold commercial pesticides.

Procedures and requirements are described for owning or operating a depot, including restricting access to the depot and ensuring that workers are familiar with safe pesticide handling and storage practices. Additional provisions describe methods of safe handling and storage, such as labeling, security, inspection, ventilation, and record keeping.

Best Management Practices for Industrial Sectors

XCG Consultants Ltd. (2007) prepared a number of documents for the Ministry of the Environment that describe various best management practices (BMPs) to achieve pollution prevention and a reduction of specific contaminants that may be present in the effluent

discharges of specific facilities. The sectors that are targeted include: textiles, fabricated metal products, motor vehicle parts manufacturing, automotive repair and maintenance, dry cleaning and laundry services, and chemical manufacturing. The BMPs for the pesticide, fertilizer and other agricultural chemical manufacturing sector focus on the manufacture of pesticides, and ways to reduce risks posed by their component chemicals.

The Pesticide Label

Each registered commercial product has a label. A pesticide label displays important information such as: the active ingredient, what the hazards are when you use the product, how dangerous the pesticide is, how to use it safely, the rates at which the product should be used, what to do in case of an accident.

The label also shows the pesticide is registered by Pest Management Regulatory Agency **(**PMRA), Health Canada. If all the required information can't fit on the label, the company may include a booklet or pamphlet with the pesticide.

A pesticide label is a legal document. It tells how the product should be used. It is against the law to use the product in any other way, or to use it in an unsafe way.

Guideline D-6: Compatibility between Industrial Facilities and Sensitive Land Uses

The MOE document "Guideline D-6: Compatibility between Industrial Facilities and Sensitive Land Uses" (July 1995) is supposed to be used by municipalities as a land use planning tool to determine suitable locations for industrial activities. It defines the term sensitive land uses and describes the classification of industrial facilities to which the potential influence areas and minimum separation distances should be applied.

Sensitive land uses include buildings or associated amenity areas where people or the natural environment could be adversely affected by the emissions of a nearby industrial facility. These include residences, retirement homes, schools, daycares, hospitals, churches, campgrounds, etc.

There are three classes of industrial facilities. Class I facilities are generally referred to as light industrial facilities. Class II facilities involve medium scale processing and manufacturing with outdoor storage of wastes or materials. Class III facilities are large scale manufacturing or processing plants that have outside storage of raw and finished products, large production volumes and continuous movement of products and employees. There are frequent emissions that could be considered major annoyances. The potential influence area for Class III facilities is 1000 m (minimum separation distance of 300 m). The manufacturing and processing of fertilizer would likely be a Class III industrial facility, based on the description given in the guideline.

This guideline also considers ground borne vibration, but does not deal with other emissions into the soil or ground and surface water. These other matters are addressed through the Environmental Protection Act. As it is currently written, this guideline likely would not apply to the protection of drinking water sources.

Canada-Ontario Environmental Farm Plan

The Environmental Farm Plan (EFP) is delivered locally through the Ontario Soil and Crop Improvement Association with expertise provided by the Ontario Ministry of Agriculture and Food. It is a voluntary educational program for farmers delivered through local workshops. Participants are provided instruction on how to progress through the risk assessment and action plan development contained in the EFP workbook. Limited funds (50/50 cost share) are available to address areas identified in the plan as needing improvement. More information about the EFP program can be found in Background Reports 3 and 4 (Application of ASM and Handling and Storage of ASM).

One of the 23 areas assessed through the EFP is the handling and storage of pesticides. The information sheet on this activity suggests the following actions to address existing issues:

- Relocate permanent mixing/loading and storage areas away from surface water and wells
- Increase the flow path distance between surface water and mixing/loading and storage areas
- Relocate wells away from mixing/loading and storage areas
- For existing mixing/loading and storage areas which have an impermeable floor, a curb installed to collect spills and floors that are not cracked or leaking, test the well water at least once a year
- Construct a mixing/loading and storage areas with impermeable floor, curb and permanent roof to exclude rainfall, and a collection sump.
- Mix and load pesticide products at site of spray application away from surface water and wells. No regular mixing/loading area at one location.
- Storage in one designated area
- Mixing/loading done at field site using temporary plastic-lined berms for containment
- Use a separate tank to supply water to the pesticide tank to prevent the potential for backflow into well or surface water source
- Apply rinsate to crops listed on label at adequate separation distances from surface water and wells
- Have pesticides custom applied
- Prepare a written emergency plan and have spill clean-up equipment available

c) Municipal

Education and Outreach

In Ontario, the *Pesticides Act* and Regulation 63/09 (Cosmetic Pesticides Ban) render local municipal pesticides bylaws inoperative in order to create one clear set of rules across the province. However, some municipalities provide outreach and education programs to ensure the safe use of allowable pesticides, and to encourage more natural forms of gardening. For example, the Niagara Region provides online information on organic lawn and garden care through their Smart Gardening Program.

Land Use Planning

As mentioned above, manufacturing, processing and wholesale activities are generally permitted on lands that are zoned for industrial uses to provide separation between industrial establishments and incompatible land uses. Future industrial land uses ('would be' threats) would likely occur in the same location as existing industries because these are the only locations zoned for this use in our municipalities. Municipalities have strict control over where these activities can occur within their municipal boundaries, and the majority of IPZs.

The location and type of storage used for retail sale or for the purpose of extermination could be addressed at the site plan control and/or building permit stage for new construction.

The CWA states that the municipality must implement the policies imposed on it by the Source Protection Plan. S. 39 to 40 address conflicts and the supremacy of the SPP or that which is more protective of the source of drinking water. This is reiterated in s. 105. As such, if the SPP includes a policy prohibiting the land application of Fertilizer within a municipality's boundaries, and if this policy conflicts with a provision of the NMA, the municipality is legally bound to implement that policy.

d) Conservation Authorities Act RSO 1990 as amended (August 2002)

Under the Conservation Authorities Act, local Conservation Authorities are given their mandate and direction in the making and administration of land use planning. Conservation Authorities have established Regulations pursuant to Section 28 under which they may:

i. Restrict and regulate the use of water in or from rivers, streams, inland lakes, ponds, wetlands and natural or artificially constructed depressions in rivers or streams;
ii. Prohibit, regulate, or require the permission of the authority to straighten, change, divert, or interfere in any way with the existing channel of a river, creek , stream, or watercourse, or change or interfere with any wetland; and
iii. Prohibit, regulate or require the permission of the authority for development if, in the opinion of the authority, the control of flooding, erosion, dynamic beaches or pollution or the conservation of land may be affected by development.

In light of these Regulations, the construction of any storage facility would be subject to Conservation Authority requirements; however, the application of Pesticides to land would not trigger a review under the Conservation Authorities Act.

<u>Other Programs</u>

Safe Pesticide Education

Both the federal and provincial government provide information on the proper storage, disposal, and application of pesticides for domestic use. For example, the federal government publishes "Homeowner Guidelines for Pesticide Use" and "Proper Use of Pesticides."

Natural Gardening Outreach and Education Programs

Many voluntary education-based programs promote eco-friendly lawn and garden care that does not rely on pesticides. Eco-friendly management includes using mowing, aeration, watering, fertilization and seeding techniques to produce a healthy lawn that discourages weeds and better resists insect infestations. The Ontario government provides links to useful information through their "add it up" website, and the federal government also provides information to interested community members. Many non-governmental organizations are also involved in communicating this information.

Trouts Unlimited Canada runs a nationwide environmental education program which helps remind community members of the potential environmental consequences of using harmful products, and encourages the use of gentler products.

5. Gaps in existing legislation, policies and programs

- The Environmental Farm Plan program is voluntary and confidential, which makes it appealing for farmers and is a good way to have existing problems corrected; however, there is no way to track if and how action plans are being implemented.

- Under the Pesticides Act there are no legislated requirements for the application of pesticides to be set back a specified distance from surface water and wells.

6. Policy considerations

- REMINDER: The main consideration for reducing or eliminating drinking water threats related to the application and storage of pesticides is to make sure that it does not enter surface water and/or groundwater.

- The application of pesticides to land, and the storage of pesticides for retail sale or for application, can occur throughout the Source Protection Area. These activities have been identified as a significant threat in Port Colborne.

- The source protection plan will need to include a high-level policy approach ("a catch-all policy") to address those "would be" drinking water threats that are unlikely to occur in a given vulnerable area.

7. Examples of risk management measures and policy ideas

The measures that have been identified in the Risk Management Catalogue for the handling and storage of pesticides are by and large based on best practices. These include, but are not limited to:

- Spill and containment reporting and response in stormwater management systems
- Location of farm containment systems, down slope of wells
- Usage of filter strips and riparian zones
- Spill contingency plans
- Minimization of risk through source reduction
- Enhanced environmental monitoring within highly sensitive areas
- Proper container storage, by following labels and directions
- Establish a buffer zone to ensure location of chemical storage is a minimum distance from watercourses.
- Monitoring as well as implementation of preventative measures
- In general better standards for design and installation of pesticide equipment and storage containers.

For discussion purposes, this section of the report provides examples of risk management measures and policy ideas that could be applicable to the application of pesticides to land, and to the handling and storage of pesticides. It is not an exhaustive list.

The examples are categorized by the types of policy tools that can be used to meet the source protection plan objectives. The MOE Risk Management Measures Catalogue was reviewed as part of this exercise and measures were incorporated where appropriate.

Table 7.1 – Examples of risk management measures and policy ideas for pesticides

Policy Tool	**Examples**
Education and Outreach	• Area-wide education and outreach programs promoting integrated pest management; alternative pest control particularly for farms, golf courses and sports fields. • Retail education program and requirement for spill contingency plans • Using pesticides in accordance with the manufacturer's product label • Lawn care maintenance for pesticide reduction
Incentive Programs	• Area-wide incentive programs for agricultural/rural landowners to establish buffers of a suitable width based on site specific considerations on lands adjacent to surface water. • Area-wide program for farmers to improve the design and maintenance of on-farm subsurface tile drainage systems • EFP Cost-Share Program should include funds to help implement projects from the EFP action plans for farms in IPZs.
Municipal Tools and Land Use Planning	• Prohibit the storage of pesticides within the IPZs where it can be a significant drinking water threat, in official plans and zoning by-laws. • Require the use of filter strips or riparian buffers adjacent to surface water. • If the manufacturing and processing of pesticides, and wholesale storage is not permitted, encourage municipality to continue restriction in future. • Ensure extra consideration is given for new development that includes the storage of pesticides.
Prescribed Provincial Instruments	• Require/encourage (depending on level of threat) MOE to take extra care in its review of applications for permits under the *Pesticides Act* for people or businesses that sell pesticides and/or apply pesticides commercially • Require/encourage MOE to review approved permits to ensure compliance with the Source Protection Plan. • Require/encourage MOE to prioritize inspections for these areas, and to conduct regular inspections.
Municipal Operations /	• Evaluate municipal pesticide storage locations for potential impact on drinking water sources, and address identified problems.

Infrastructure	• Reduce the volume of pesticides used along roads and utility corridors through integrated pest management. • Emergency response plans – consideration for how and where to contain emergency response water (e.g. water used to fight a fire).
Land Securement	• Purchase or place easements on land in IPZs.
Risk Management Plans	• Require risk management plans for the application and/or storage of pesticides in IPZs where this activity is or would be a significant drinking water threat. The RMPs could cover topics such as those described above under the Ontario Environmental Farm Plan.
Prohibition	• Prohibit the application and storage of pesticides in IPZs where this activity is or would be a significant drinking water threat.
Restricted Land Uses	• Flag land uses that are associated with the application and storage of pesticides (such as agricultural, active recreational, public works) as restricted land uses in IPZs where these activities are or would be significant drinking water threats so that municipal planners and building officials consider implications of proposed development.

Appendix – A Reference List

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DRINKING WATER SOURCE PROTECTION
Niagara Peninsula Source Protection Area

NIAGARA PENINSULA CONSERVATION AUTHORITY

Drinking Water Source Protection Background Document

Prescribed Drinking Water Threats #12 and #13: The application, handling and storage of road salt

March 1, 2011

Table of Contents

Note: We would like to thank Cataraqui Region Conservation Authority and Conservation Ontario for the use of their background research documents in preparing these reports.

1. Definition

This paper provides background information for **prescribed drinking water threat 12 – the application of road salt** and **prescribed drinking water threat 13 – the handling and storage of road salt.**

The main consideration to reduce or eliminate drinking water threats related to the application, handling and storage of road salt is to eliminate or reduce sodium and chloride entering surface water and/or groundwater.

Road salt as a drinking water threat means any product used to maintain roads and pedestrian areas that contain one or both of sodium and chloride. The majority of road salt is used as a deicer or an ice prevention agent, but limited use for dust suppression does occur. The most commonly used products are sodium chloride and calcium chloride because they are effective and inexpensive.

Winter road salt application works by breaking the bond formed between the pavement and the ice/compacted snow. As snow accumulates on the road and is compacted by traffic, it forms a bond with the pavement, making it difficult to remove with plows. In these situations, salt is advantageous to break through the snow to prevent this bond from forming. The salt reacts with moisture to create a layer of salty water called brine between the snow or ice layer and the road. This brine layer has a freeze point below zero degrees Celsius, and breaks the bond, thereby permitting the snow and ice to be plowed from the road.

A widely used technique for keeping the salt on the road and increasing the speed of the melt action is “pre-wetting”. Pre-wetting involves spraying liquid salt brine onto the solid salt as it is being spread. This has two benefits. The first is that it makes the salt sticky, increasing its adhesion to the road. The second is that the salt is already wet and therefore starts to form the brine that is needed to break the ice-road bond more quickly. Studies have shown that pre-wetting can increase the retention of salt on the road to 96% as compared to about 70% with dry salt application. Some jurisdictions also use straight brine applied on its own in advance of snow accumulation (direct liquid application). The pre-wetting chemicals often include near-saturation solutions of calcium chloride brine, or and magnesium chloride brine, with corrosion inhibiting additives. Direct liquid application is used extensively on all provincial highways. Niagara Region has also been piloting the use of a pre-wetting sugar beet juice compound added to brine in select areas (Niagara-on-the-Lake, Wainfleet and West Lincoln) to reduce the amount of salt applied by as much as 30%. Negative environmental effects in the select areas have not been identified from the addition of beet juice. A general summary of road salt used is listed on Table 1.0.

Ferrocyanide salt is also used as an anti-clumping agent that is added to road salt. When it is dissolved in solution and exposed to light it converts to cyanide (Riversides, 2004). In addition,

calcium chloride mixed with water is often used as a dust suppressant on non-paved roads during dry months.

Table 1.0 Summary of Deicers and Ice Prevention Agents (Riversides, 2006 and A. Palilionis, 2010)

Deicers and Ice Prevention Agents	**Lowest Effective Temp.**	**Environmental Impact[1]**	**Corrosiveness[2]**	**Used As:[3]**	**Where Used**	**Notes**
Sodium chloride ("rock salt") (NaCl)	-7°C	H	H	D, A, P	Roadways, bridges, parking lots	Most commonly used for winter road maintenance
NaCl with corrosion inhibitors	-20°C	M	M	D, A, P	Roadways, bridges, parking lots	Can leave a slippery residue, refreezes quickly, difficult to store
Calcium Chloride (CaCl)	-23°C	H	H	D, A, P	Walkways, drive, parking lots	Can leave a slippery residue, refreezes quickly, difficult to store
Magnesium Chloride (MgCl)	-15°C	M	M-H	A,P	Roadways, bridges, parking lots	Can leave a slippery residue, refreezes quickly, difficult to store
MgCl with crop-based additives	-35°C		M	D, A, P	Roadways, parking lots	Can leave a slippery residue, refreezes quickly, difficult to store
Potassium Chloride (KCl)	-4°C	M	M	D	Parking lots	Can result in over fertilization
Urea	-4°C	H	L	D	Airports	Common fertilizer nutrient
Calcium Magnesium Acetate (CMA)	-7°C	M	L	D, A, P	Roadways, bridges, parking lots	Very effective, environmentally responsible alterative to rock salt, 30 times the cost of rock salt
Potassium Acetate	-26°C	M	L	D, A, P	Parking lots, automatic spray systems, airports	Biodegradable liquid often mixed with a corrosion inhibitor
Sand/Salt Blends	n/a	M	L-M	D	Roadways, parking lots	50 to 90% of sand remains in the environment after cleanup, little traction improvement

[1] H = high corrosive potential, highly destructive to cars, pavement, clothing
M = moderate corrosive potential, rusting and corrosion to cars, pavement, clothing
L = low corrosive potential, but will cause slow corrosion of materials after contact

[2] H – High impact of receiving environment
M = Moderate impact, but still potentially lethal to organisms
L = Low impact, but still should be used sparingly

[3] D = Deicer
P = Pre-wetting agent
A = Anti-icing agent

Note: Other compounds not listed in detail include: ammonium sulphate and alpha methyl glucoside

2. What causes this activity to be a drinking water threat?

The Ontario Ministry of the Environment (MOE) Tables of Drinking Water Threats (Ontario Ministry of the Environment, 2009) identify sodium and chloride as contaminants that could make their way into surface and groundwater from road salt application, storage and handling (circumstances in the Tables related to road salt include 88 to 95 and 1433 to 1444, respectively). Sodium and chloride could threaten drinking water sources in certain situations by making it unpalatable or unsafe.

Ontario Drinking Water Objectives (Ontario Ministry of the Environment, 2006)

The aesthetic Ontario Drinking Water Objective (ODWO) for sodium is 200 mg/L. However, since sodium intake can present a health issue for some people, the local Medical Officer of Health should be notified when concentrations are greater than 20 mg/L. At a concentration of 250 mg/L, chloride imparts a salty taste to drinking water (also an aesthetic objective).

The circumstances within the MOE Tables of Drinking Water Threats (MOE, 2008, as amended 2009), are divided into application and handling/storage with sub-considerations for impervious area, volume and storage practices as described below.

Road Salt Application

The application of road salt (resulting in sodium or chloride in groundwater or surface water) is divided into four circumstances based on the impervious cover (per square kilometer) in a vulnerable area being:

- less than or equal to one percent;
- greater than one percent, but less than or equal to eight percent;
- greater than eight percent, but less than or equal to 80 percent; and
- greater than 80 percent impervious.

Impervious surfaces may include paved roads, concrete surfaces and parking areas.

Road Salt Handling and Storage

The handling and storage or road salt (resulting in sodium or chloride in groundwater or surface water) where it is either exposed to precipitation and snow melt or protected from it and is divided into four circumstances based on the following volume ranges:

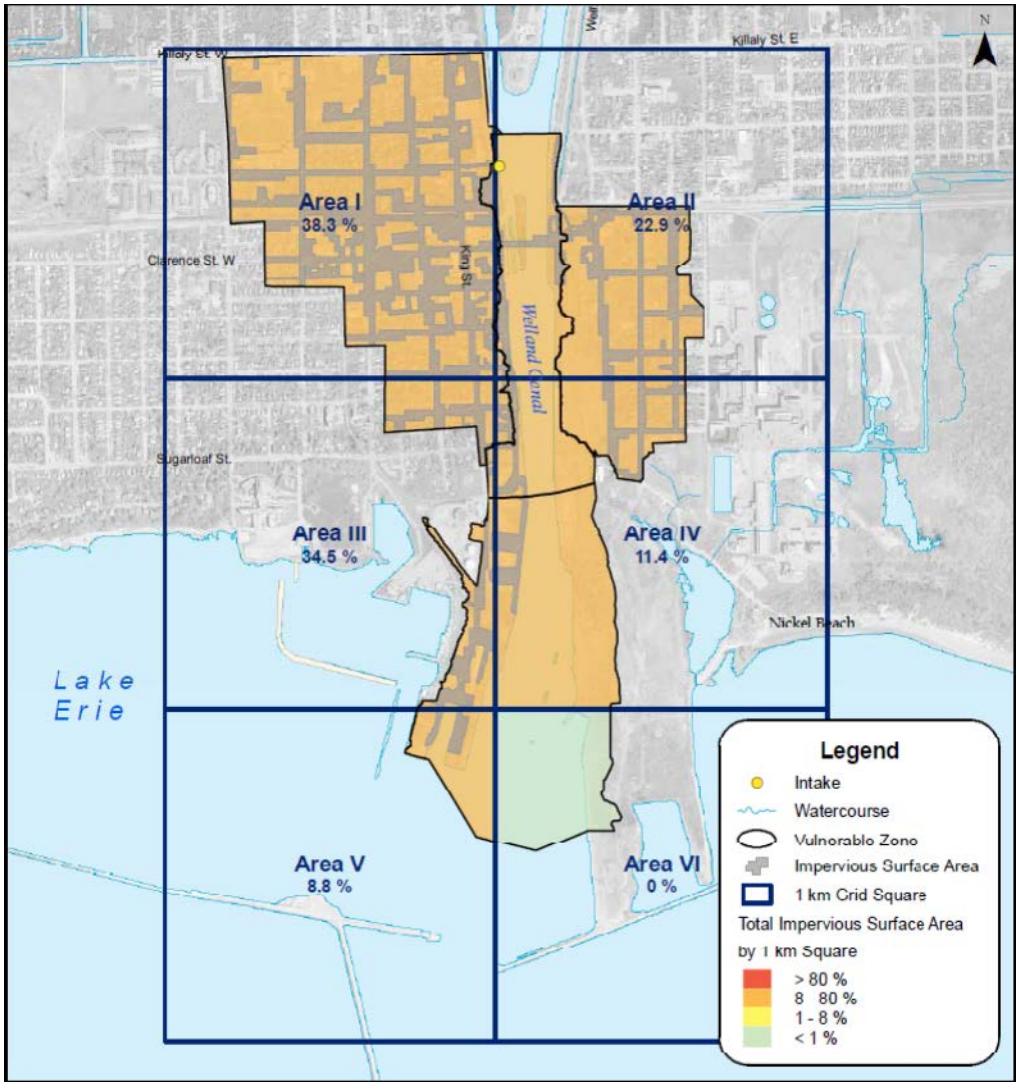
- less than 500 tonnes;
- equal to or greater than 500 tonnes, but less than 5,000 tonnes; and
- greater than or equal to 5,000 tonnes.

3. Understanding the nature of the drinking water threat

By the nature of the activity, there is widespread use and storage of road salt. The majority of the material is handled by road authorities such as municipalities and the Ontario Ministry of Transportation. However, private businesses and residential areas also store and use a limited quantity.

Road Salt Application

The application of road salt is only a significant threat in the Port Colborne IPZ-1 with a vulnerability score of 9 (Table 3.1). However it is not an existing threat as the maximum percent impervious per square kilometer is 38 % (shown below). The percent impervious area is calculated as the percent of the IPZ that is impervious within a 1 km square (including water).



Road Salt Handling and Storage

The handling and storage of road salt is a significant threat in the Port Colborne IPZ-1 with a vulnerability score of 9 (Table 3.2). However it is not an existing threat as no open storage of road salt above 5,000 tonnes was identified within the IPZ-1.

Table 3.1 - Application of Road Salt

Vulnerable Area		VS	Max % IMP	Significant	Moderate	Existing Significant Threats
Port Colborne	IPZ-1	9.0	38	>80%	<80%	
	IPZ-2	8.1	38		>1%	
Niagara Falls	IPZ-1	8.0	17			
DeCew Falls	Main Intake IPZ -1	8.0	15			
	Lake Gibson Emergency Intake IPZ-1	8.0	12			
	Hwy 406 Control Structure IPZ-1	8.0	13			
Welland	IPZ-1	7.0	34		>80%	
Fort Erie	IPZ-1	7.0	2		>80%	

NOTES:

VS – Vulnerability Score, Max % IMP-Percent Impervious

80% – Application threat percent impervious criterion

Intake protection zones with a vulnerability score of 6.4 or less are not listed as not applicable to significant and moderate application of road salt threats.

Table 3.2 - Handling and Storage of Road Salt

Vulnerable Area		VS	Significant	Moderate	Existing Significant Threats
Port Colborne	IPZ-1	9.0	Note 2	Note 3	
	IPZ-2	8.1		Note 1	
Niagara Falls	IPZ-1	8.0			
DeCew Falls	Main Intake IPZ -1	8.0			
	Lake Gibson Emergency Intake IPZ-1	8.0			
	Hwy 406 Control Structure IPZ-1	8.0			
Welland	IPZ-1	7.0			
Fort Erie	IPZ-1	7.0		Note 2	

NOTES:

VS – Vulnerability Score,

1- Either (i) open storage or (ii) salt dome with >5,000 tonnes

2–Open storage and >5,000 tonnes

3–Either (i) open storage and < less 5,000 tonnes or (ii) salt dome and >500 tonnes

Intake protection zones with a vulnerability score of 6.4 or less are not listed as not applicable to significant and moderate handling and storage of road salt threats.

4. Applicable legislation, policies and programs

This section identifies the legislation, policies and programs that apply to road salt.

a) Federal

Canadian Environmental Protection Act (Government of Canada, 1999)

The listing of road salts (i.e. sodium chloride, calcium chloride, magnesium chloride, potassium chloride and ferrocyanide salts) on Schedule 1 of the *Canadian Environmental Protection Act* has been discussed. Road salts would be listed as toxic substances because of the adverse local environmental effects to groundwater and to plant and animal life, but not to human health. Section 64 of the *Act* defines a substance as toxic if it is entering or may enter the environment in a quantity or concentration or under conditions that:

(a) have or may have an immediate or long-term harmful effect on the environment or its biological diversity
(b) constitute or may constitute a danger to the environment on which life depends; or
(c) constitute or may constitute a danger in Canada to human life or health.

A listing of these salts on Schedule 1 would trigger regulations, guidelines and codes of practice to be considered. They have not yet been listed due to concern by road authorities and the salt industry with regard to the impact of the listings and the validity of the scientific research conducted in support of the listings.

Canada Fisheries Act (Government of Canada, 1985)

In general, the *Fisheries Act* is enforced by Fisheries and Oceans Canada; however, the section that applies to contamination is under the authority of Environment Canada. The main objective of the *Act* is to protect fish including their habitat and other life requirements. The deposition of any deleterious substance (contaminant) is in contravention of the legislation.

Section 36(3) of the *Fisheries Act* states that: "… no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water."

Road salts can be considered deleterious substances that readily enter watercourses and water bodies. Chloride is especially a concern since it is very stable and therefore almost all chloride that enters the environment reaches surface water and stays in solution.

Environment Canada Guidance

Environment Canada is working to address road salt management on public roadways managed by the provinces/territories and municipalities, as well as privately owned roads, parking lots and sidewalk. In 2004 two documents were published to educate each of the sectors. A "Code of Practice" is written for the public sector while a "Best Practices Report" is for private businesses and property owners. The key content of each document is discussed below.

Code of Practice for the Environmental Management of Road Salts (Environment Canada, 2004)

The intent of this voluntary code of practice is for road authorities to develop salt management plans and implement best management practices to ensure environmental protection while maintaining safe roadways. Currently about 250 municipalities are participating which represent 90 percent of the population in Canada.

It is recommended that any road authority that uses more than 5,000 tonnes of road salt in a year or that applies salt in a vulnerable area (Annex 'B' to the Code) complete a salt management plan which should include:

- Best management practices;
- Training;
- Equipment enhancement;
- Technical support for application;
- Storage and snow disposal;
- Monitoring; and
- Reporting (voluntary annual report to Environment Canada).

Annex 'A' contains information about chloride concentrations and what levels are environmental concerns. These thresholds could be helpful for monitoring the effectiveness of salt management plans.

Annex 'B' generally defines a vulnerable area as any place that is particularly susceptible to the effects of road salt (e.g. sources of drinking water, groundwater recharge zones, and provincially significant wetlands). Additional salt management measures should be considered for these areas including:

- Further reduce volumes;
- Use road salt alternatives;
- Increase monitoring of chlorides;
- Locate works yards and work yard and snow disposal site outside of the vulnerable area; and
- Protect sensitive areas where future road development/upgrades could occur.

Annex 'C' provides a framework for road authorities to track road salt use, BMP implementation and concentrations of road salt in the environment.

A five-year review of the Code is currently underway. A multi-stakeholder working group is reviewing the effectiveness of the code. The review will be completed by mid-December 2010, however it is anticipated that the release date will be some time thereafter (L. Trudel, Environment Canada, personal communication, September 2010).

Best management practices to reduce salt loss in the form of salt dust, brine runoff or wastage through improper handling are available at all points of the salt handling cycle. Salt spills during spreader loading are the main source of salt loss (Transportation Association of Canada, 2003)

(see the photo in Figure 4.1). Figure 4.2 and Table 4.1 outline the salt handling cycle and the best management practices to reduce salt impacts.

Figure 4.1 Salt loading (www.kmenterpriseskelowna.com)

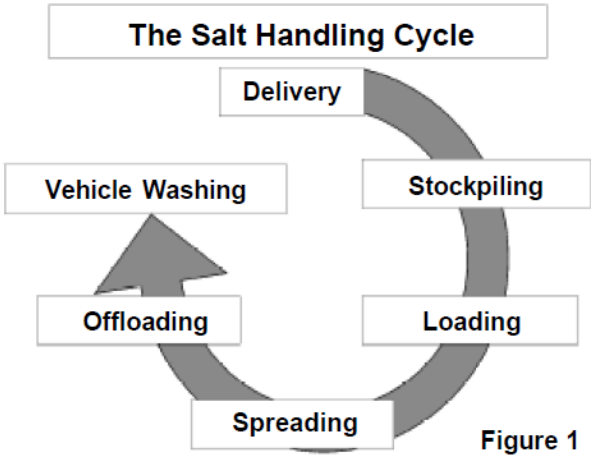


Figure 4.2 (Transport Association of Canada, 2003)

Table 4.1 Best Management Practices for Road Salt Storage, Handling and Application (Transportation Association of Canada, 2003)

	Common Area for Improvement	Best Management Practice
Delivery	• Delivered salt is dumped into a pile, then loaded or blown into storage	• Deliver directly into storage • Deliver during good weather • Clean up the delivery area
Stockpiling	• Outdoor storage	• Store all salt and sand and salt mix under cover
Loading	• Overloading	• Avoid frozen blocks of salt • Do not overload – salt will spill
Spreading	• Increase application rate to use full load	• "Right time – Right amount" • Check spreader calibrations • Offload the unused salt (i.e. don't spread it to get rid of it)
Offloading	• Spills during transfer	• Offload directly into storage • Clean up the offloading area
Vehicle Washing	• Vehicles are washed without regard for salt laden runoff	• Sweep equipment before washing to remove solids • Wash where runoff can be properly managed (e.g. used for brine solution or sent to the sanitary sewer) and away from salt sensitive areas • Direct wash water through oil grit separators

Best Practices for Salt Use on Private Roads, Parking Lots and Sidewalks
(Environment Canada, 2004)

Best practices for the storage and application of road salt are detailed in this document including:

- Materials storage and handling;
- Salt application;
- Snow storage and disposal;
- Materials;
- Equipment;
- Decision-making tools;
- Operational considerations; and
- Training.

Synthesis of Best Practices Road Salt Management (Transportation Association of Canada, 2003)

- Salt Management Plans
  - Guide road authorities toward the development of a successful salt management plan

- Pavements and Salt Management
  - Provide information on methods to mitigate the environmental and pavement impact of road salt and pavement-related salt management considerations (e.g. asphalt and concrete heat and cool differently).

b) Provincial

Ontario Environmental Protection Act (Government of Ontario, 1990)

Section 14 of the Ontario *Environmental Protection Act* prohibits the discharge of a contaminant into the natural environment if the discharge causes or may cause an adverse effect. This term is defined by Ontario Regulation 339:

"Adverse effect means one or more of:

(a) impairment of the quality of the natural environment for any use that can be made of it,

(b) injury or damage to property or to plant or animal life,

(c) harm or material discomfort to any person,

(d) an adverse effect on the health of any person,

(e) impairment of the safety of any person,

(f) rendering any property or plant or animal life unfit for human use,

(g) loss of enjoyment of normal use of property, and

(h) interference with the normal conduct of business".

As of 2006, no cases related to road salt have been successfully prosecuted under the *Act.* Also, if a road authority can demonstrate "all reasonable care" to prevent the adverse effect (i.e. voluntary compliance with the Code of Practice for Environmental Management of Road Salts) acquittal from all charges would be provided (Riversides Alliance, 2006).

Ontario Regulation 339 of the Environmental Protection Act: Classes of Contaminants – Exemptions (Government of Ontario, 1990)

Regulation 339 prevents the Ontario *Environmental Protection Act* from being applied to any road authority where a contaminant is applied to create safe driving conditions. Regulation 339 conflicts with the *Ontario Water Resources Act* (discussed below), which does not exempt road salt from its provisions.

Ontario Water Resources Act (Government of Ontario, 1990)

Section 30 of the *Ontario Water Resources Act* prohibits the discharge of any material into the water that may impair the quality of the water. As of 2006 no cases related to road salt have been successfully prosecuted under the *Act* and it is likely that the "all reasonable care" standard would also apply here (Riversides Alliance, 2006).

Procedure B-4 Guidelines for Snow Disposal and Deicing Operations in Ontario (Ontario Ministry of the Environment, 1994)

Procedure B-4 is made under Section 30 of the *Ontario Water Resources Act* and Sections 5 and 6 of the Ontario *Environmental Protection Act.* It is an updated and less detailed version of an earlier Guideline B-4-1 (circa 1975). The purpose of the guideline is to minimize the impact of snow collection/disposal and deicing operations.

The requirements of Procedure B-4 are very general and guide road authorities to apply sodium chloride and other deicing compounds conservatively, especially in sensitive areas (orchards, parks), and to protect stockpiles from precipitation and runoff. The 1975 version is referenced in the newer document; it also includes recommendations for avoiding certain rust inhibitors, cleaning out catch basins, and keeping records about salt application.

Ontario Ministry of Transportation – Salt Management (Ontario Ministry of Transportation, 2005)

The Ontario Ministry of Transportation is responsible for the provincial highways. The Ministry has a salt management plan developed in 2005 that applies to all roads under their authority. Salt is all stored indoors and yards must be cleaned up after a salt delivery. Over time, new salt storage structures are replacing the existing ones so that all loading/offloading takes place inside.

c) Municipal

Municipalities have the ability to pass by-laws about the economic, social and environmental well-being of the municipality, and about the health, safety and well-being of people, under the Ontario *Municipal Act*. For example, municipalities could require that only alternative deicers be used in parking lots and driveways in intake protection zones where chloride or sodium levels are elevated.

Salt Management plans were requested from local agencies in NPCA that could be associated with significant or moderate road salt application or storage and handling threats. Plans were received and reviewed from the Ministry of Transportation (December 2005), Niagara Region (June 2004), City of Port Colborne (June 2005), City of Niagara Falls (February 2005) and Town of Fort Erie (February 2005). The City of Thorold has not yet prepared a Salt Management Plan and Niagara Parks Commission does not have one.

<u>Waterloo Region – Smart about Salt Program</u>

The Regional Municipality of Waterloo noted that chloride levels and to a lesser extent sodium levels were increasing in the groundwater aquifers that it uses as a source of drinking water. The voluntary 'Smart about Salt Program' was created to reduce the impacts of winter road maintenance activities on the aquifer by training and certifying snow removal contractors (and facility operators who perform their own winter maintenance operations) on how to properly apply road salt. See Appendix B for a weblink to program website. Benefits of program participation include:

- Potential reduction in insurance costs;
- Dedicated weather forecasts;
- Road Weather Information System;
- Competitive advantage;
- Use of the 'Smart Salt' logo and promotion on the Region's Water Services website; and
- Cost savings.

Private residents can refer to a booklet and other on-line resources to reduce salt use for winter driveway/walkway maintenance.

5. Gaps in existing legislation, policies and programs

- Salt management plans are not mandatory.
- There is no Schedule 1 listing under the *Canadian Environmental Protection Act* for road salts and the Ontario *Environmental Protection Act* does not apply to road salts.
- There are no specific location requirements for salt storages with respect to wells, significant groundwater features or surface water.
- Some municipal official plans and the associated zoning by-laws permit works yards (including road salt storage) under the umbrella of 'public uses'. This enables facilities to be

developed in areas that could be sensitive to the activities that occur at the works yards. Conversely, there are often no setback requirements between new residential uses and existing works yards (G. McRae, Ministry of Transportation, personal communication, October 8, 2010).

6. Policy considerations

- REMINDER: The main consideration for reducing or eliminating drinking water threats related to road salt storage and application is to reduce or eliminate chloride and sodium entering surface and groundwater.
- Application of road salt happens everywhere.
- Storage of larger quantities of road salt is in works yards of road authorities.
- All policy tools (except prescribed instruments) are available to address this drinking water threat with the caveat that risk management plans, prohibition and the related restricted land use options only apply to significant drinking water threats.
- The source protection plan will need to include a high-level policy approach ("a catch-all policy") to address those "would be" drinking water threats that are unlikely to occur in a given vulnerable area.
- Existing Salt Management Plans could be amended to respect the intake protection zones and target application rate reductions in those areas.

7. Examples of risk management measures and policy ideas

For discussion purposes, this section of the report provides examples of risk management measures and policy ideas that could be applicable to road salt. It is not an exhaustive list.

The examples are categorized by the types of policy tools that can be used to meet the source protection plan objectives. The MOE Risk Management Measures Catalogue (2010) was reviewed as part of this exercise and measures were incorporated where appropriate; many of the measures in the catalogue are already required by applicable provincial instruments.

Table 7.1 – Risk Management Measures for Road Salt Application and Storage

Policy Tool	Example
Education and Outreach	• Provide information about responsible salt storage and application to the public at large. • Encourage road authority employees to attend salt management sessions. • Meet with road authorities to identify vulnerable areas.
Incentive Programs	• Funding program to assist municipalities to develop, implement and monitor the effectiveness of salt management plans.
Land Use Planning	• Zone lands such that road salt storages are outside of vulnerable areas. • Create a land use designation for municipal works yards.
Prescribed Provincial Instruments	• Not applicable.
Municipal Operations / Infrastructure	• Amend salt management plans to include identification of vulnerable areas, i.e. IPZs with significant and moderate threats. • Clean out catch basins on a schedule sufficient to prevent flushing trapped road salts into surface water.
Land Securement	• Purchase or place an easement on lands within IPZs.
Risk Management Plans	• For significant drinking water threats.
Prohibition	• Prohibit circumstances that would be significant (e.g. open storage and handling >5,000 tonnes in the Port Colborne IPZ-1).
Restricted Land Uses	• Flag private and public works yards as restricted land uses in IPZs where these activities are or would be significant drinking water threats so that municipal planners and building official consider implications of proposed development.

Table 7.2 - Road Salt Threats and Circumstances – Policy Consideration Analysis

Threat	Threat is significant			Risk decreased to moderate:	Risk decreased to low:
	Vulnerable Area	Vulnerability Score	Circumstance		
The handling and storage of salt:	IPZ	9	When quantity of salt stored is > 5000 tonnes	If salt still stored in manner where it is/may be impacted by precipitation or surface run-off: • Decrease amount of salt stored to 5000 tonnes or less. If still store > 5000 tonnes of salt: • Store in manner that salt is not impacted by precipitation or surface run-off.	Store < 500 tonnes of salt and store in a manner that salt is not impacted by precipitation or surface run-off.
The application of road salt:	IPZ	9	Total impervious surface area is 80%+	Circumstances don't add value to policy consideration in this case – i.e. Circumstance is based on total impervious surface area which will not change/difficult to change. Moderate: if total impervious surface area is <80% Low: n/a	

Appendix A – Reference List

Environment Canada. 2004. Code of Practice for the Environmental Management of Road Salts. www.ec.gc.ca/nopp/roadsalt/cop/en/rs_main.htm

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Appendix B – Additional Resources

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2. Environment Canada- Risk Management Strategy for Road Salts (Revised 3 May, 2002). http://www.ec.gc.ca/nopp/roadsalt/reports/en/rms.cfm
3. Environment Canada- Best Practices For The Use And Storage Of Chloride-Based Dust Suppressants (2007). http://www.ec.gc.ca/nopp/roadsalt/reports/chlorideBP/en/ChlorideBPe.pdf

4. Environment Canada- The Priority substances List Assessment Report Road Salts (2001). http://www.hc-sc.gc.ca/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/contaminants/psl2-lsp2/road_salt_sels_voirie/road_salt_sels_voirie-eng.pdf

5. Environment Canada- List of Canadian Programs, Initiatives and Guidelines Related to Road Salts. www.ec.gc.ca/nopp/roadsalt/reports/en/list.cfm

6. Environment Canada- Case Studies. www.ec.gc.ca/nopp/roadsalt/cStudies/en/index.cfm

7. Environment Canada- Technical Documents for Road Salt. www.ec.gc.ca/nopp/roadsalt/en/index.cfm

8. Ministry of the Environment-Snow Disposal and De-icing Operations in Ontario (1994). http://www.ene.gov.on.ca/envision/gp/0412e.pdf

9. Ontario Good Road Association. Road Salt Management. www.ogra.org/content_details.asp?itemtypecode=OGRA-MEMSERVICES-MANAGEMENT&itemid=5879&itemType=Road%20Salt%20Management

10. Region of Waterloo - Smart About Salt Program. www.region.waterloo.on.ca/web/region.nsf/97dfc347666efede85256e590071a3d4/e74acd6b51af98e1852577ae00615f41!OpenDocument

11. Sierra Legal Defence Fund -A Low-Salt Diet for Ontario's Roads and Rivers (2006). http://www.riversides.org/index.php?cat=3&page1=8&page2=10

12. Salt Institute. References on salt for winter roadway safety and mobility. www.saltinstitute.org/Articles-references/References-on-salt-use/References-on-salt-use/References-for-use-of-road-salt#operations

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Drinking Water Source Protection Background Document

Prescribed Drinking Water Threat #14:
The Storage of Snow

February 21, 2011

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Note: We would like to thank Cataraqui Region Conservation Authority and Conservation Ontario for the use of their background research documents in preparing these reports.

1. Definition

This paper provides background information for **prescribed drinking water threat 14 – the storage of snow.**

The primary consideration for reducing or eliminating drinking water threats related to the storage of snow is to make sure contaminated runoff does not enter surface water and/or groundwater.

Snow removed (plowed) from roads and parking lots can be contaminated with salt, oil, grease and heavy metals from vehicles, litter, and airborne pollutants. Large snow banks along roads and in parking areas can create traffic hazards, and can result in localized flooding when the snow melts, especially on major roadways and in urban areas. In these situations, the excess snow must be melted on-site or transported to a location where it is either melted or stockpiled and allowed to melt. The disposal of snow in one location concentrates the potential contaminants; however, they are diluted by the larger volume of snow. Since the snow is contaminated, it must be handled and stored in ways that protect water sources.

This drinking water threat includes:

a) Snow that is pushed into large piles on a property (e.g. stored in parking lots),

b) Snow transported to a central site from other locations (e.g. snow disposal sites),

c) Large snow banks along roads that are close to municipal wellheads or surface water intakes (if accumulation meets area circumstances identified below).

The snow storage drinking water threat is closely linked to the application of road salt. Reducing the amount of salt applied to roads and parking areas could reduce the amount of road salt in stockpiled snow.

2. What causes this activity to be a drinking water threat?

The Ontario Ministry of the Environment (MOE) Tables of Drinking Water Threats identify eleven (11) substances that could make their way into surface and groundwater as a result of runoff from snow storage areas (circumstances 1445 to 1532) (Ontario Ministry of the Environment, 2009). The following chemicals could threaten the safety of drinking water sources in certain situations.

- Chloride
- Copper
- Cyanide (CN-)
- Lead
- Nitrogen
- Petroleum Hydrocarbons F1 to F4
- Sodium
- Zinc

The main source of sodium, chloride and cyanide is road salt; the other contaminants are generally from vehicle fluids, exhaust, brake linings, and tire and engine wear.

The classification of a snow storage area as either a significant, moderate or low drinking water threat is dependent on its specific location (vulnerability score). The circumstances in the MOE Tables of Drinking Water Threats are divided into four groups:

0.01 hectares (ha) to 0.5 ha;	Greater than 1 ha to 5 ha; and
Greater than 0.5 ha to 1 ha;	Greater than 5 ha.

In general, the greater the snow storage area (and therefore the volume of snow stored), the greater the inherent risk to drinking water.

3. Understanding the nature of the drinking water threat

Storage of snow at or above grade in an area greater than 1 ha can be a significant threat in an intake protection zone (IPZ) with a vulnerability score of 9 or higher, i.e. Port Colborne IPZ-1. There is sufficient land area on either side of the canal to meet the significant threat criterion threat of 1 ha (5.3 ha west bank, 4.4 ha east bank). However if federal lands are not included, there are no lands of 1 ha or greater to consider. Snow storage would be a moderate drinking water threat in areas with a vulnerability score between 6.4 and 8.1 as shown below.

Table 3.1 – Storage of Snow

Vulnerable Area		VS	Significant	Moderate	Existing Threats	
					Significant	Moderate
Port Colborne	IPZ-1	9.0	>1 ha	>0.01 ha		
	IPZ-2	8.1				
DeCew Falls	Main Intake IPZ -1	8.0				
	Lake Gibson Emergency Intake IPZ-1	8.0				
	Hwy 406 Control Structure IPZ-1	8.0				
	Main Intake IPZ-2	6.4		>5ha		
	Lake Gibson Emergency Intake IPZ-2	6.4				
Niagara Falls	IPZ-1	8.0		>0.01 ha		
	IPZ-2	6.4		>5ha		
Welland	IPZ-1	7.0		> 0.5 ha		
Fort Erie	IPZ-1	7.0				

NOTES:VS – Vulnerability Score, Intake protection zones with a vulnerability score of 5.6 or less are not listed as not applicable to significant and moderate storage of snow threats.

4. Applicable legislation, policies and programs

a) Federal

There is currently no federal legislation that directly regulates the storage of snow. Snow storage is guided by best management practices developed by government and industry.

Syntheses of Best Practices: Road Salt Management (Transportation Association of Canada, 2003)

The Transportation Association of Canada (TAC) is a national association that promotes safe and sustainable transportation services. Its membership includes a number of federal and provincial departments of transportation, municipalities, private sector firms and academic institutions.

The Association developed a Salt Management Guide (1999) to help road maintainers to develop their own salt management plans. The guide is currently being updated. It also prepared a document called Syntheses of Best Practices: Road Salt Management (September 2003). It contains a summary of best practices for snow storage and disposal that can be used in association with regulatory requirements and other guidelines (such as Ontario Ministry of the Environment Guideline B-4; see below) to minimize potential impacts on the environment. It includes best practices for:

- Site selection and preparation;
- Site drainage;
- Snow pile and melt water management;
- Off-season maintenance,
- Monitoring and record keeping;
- Site decommissioning; and
- Training.

For melt water management, TAC recommends directing site drainage and meltwater to a collection pond that is designed with an impermeable base, a forebay to collect litter and settle coarse sediments and a larger secondary area to settle finer particles. An absorbent boom can be placed in the forebay to capture any oil and grease in the site drainage. The outlet from the pond should be controlled to regulate the release of runoff to the receiving waterbody/off the property.

Best Management Practices for Salt Use on Private Roads, Parking Lots and Sidewalks (Environment Canada, 2004)

Environment Canada prepared this guidance document for property owners and contractors for consideration when developing their own policies, practices and procedures for road salt management. Best management practices relating to snow storage and disposal on private property include:

- Ensuring that site plans provide for sufficient snow storage to eliminate the need to transport snow off-site;
- Locating snow storage sites such that melt water is not directed towards salt vulnerable areas (including sources of drinking water);
- Directing melt water to sediment ponds or sanitary sewers where permitted by the local municipal sewer use by-law;
- Storing snow on-site in paved areas where the melt water will not drain into the parking area or form puddles that cause slippery conditions that require extra salting operations to maintain safety;
- Ensuring that snow does not block drains;
- Never using salt to promote rapid melting of stockpiled snow;
- Storing snow in areas where the sun will promote rapid melting;
- Snow that is removed from a facility and transported for disposal should be taken to a properly designed snow disposal site. Property owners and contractors should determine the disposal locations prior to the winter.
- Designing snow disposal sites in accordance with the Transportation Association of Canada document called Syntheses of Best Practices Road Salt Management – Snow Storage and Disposal Sites.

b) Provincial

According to Ontario Ministry of the Environment, there are no provincial instruments to directly regulate the storage of snow. Road salt storage, application and snow disposal are exempt from requiring a certificate of approval under the Ontario *Environmental Protection Act*. Winter operations are directed by guidelines, as described below.

Guideline B-4 Snow Disposal and Deicing Operations in Ontario (Ontario Ministry of the Environment, 1994) and Procedure B-4-1 (Ontario Ministry of the Environment, 1975)

The MOE has guidelines and procedures on snow disposal operations in Ontario that are prepared under the *Ontario Water Resources Act*, *Environmental Protection Act* and *Environmental Assessment Act*. The 1975 document provides the most guidance and details.

These voluntary guidelines and procedures are generally incorporated into provincial and municipal winter control plans and road salt management plans.

In order to minimize the environmental impact of snow removal and disposal, these documents state that snow removal operations shall remove snow from heavily travelled roadways as quickly as possible following a storm since the level of contaminants in snow is related to traffic density.

The direct disposal of snow to watercourses or ice-covered lakes and rivers is highly discouraged; MOE approval is required for this activity. The direct disposal of snow in lakes and watercourses can create degraded water quality conditions by introducing toxic materials such as lead and increasing the levels of dissolved salts.

Since the indiscriminate disposal of snow on land can have similar impacts on waterbodies and aquifers, MOE identifies a number of criteria that should be used to evaluate the suitability of disposal sites. The following criteria relate to potential impacts on water:

- Accessibility – the roads to the site and the site itself must be able to bear heavy truck traffic when the ground is not frozen, since this could lead to soil compaction, erosion and runoff.
- Surface drainage – The site should be remote from watercourses; berms and dykes may be required to prevent direct drainage to watercourses. The quantity of snow that can be stockpiled should be assessed in relation to estimated runoff rates and quality, the dilution capacity of the receiving watercourse, and downstream water users.
- Sub-surface drainage – A hydrogeological study is required to determine the impact of contaminants on the aquifer. If possible, sites should be located in areas where an impervious layer of strata (soil and/or rock) will prevent the migration of soluble contaminants to the aquifer.
- Impact on neighbouring drinking water wells.

The 1975 vintage procedures indicate that waste disposal sites (i.e. landfills) should not be used for snow disposal since the increase in moisture could accelerate the movement and increase the volume of leachate production. The document also encourages the use of mechanical melters with settling chambers to remove solid materials prior to discharge to a sewer system. This snow disposal method must consider the capacity of the system.

<u>Ontario Water Resources Act (Government of Ontario, 1990)</u>

A snow melt water management facility, like a stormwater management facility, requires a certificate of approval issued by the MOE under the *Ontario Water Resources Act*. The MOE "Stormwater Management Planning and Design Manual" (March 2003) provides practical information on how to design stormwater management facilities in Ontario (refer to the

Stormwater Management background document for more details about approvals under the *Act* and the manual).

Ministry of Transportation Salt Management Plan (Ontario Ministry of Transportation, 2005)

According to the Ministry of Transportation Salt Management Plan, snow is normally stored at the roadside within the right-of-way and is rarely hauled to disposal sites. The Ministry's temporary snow disposal sites are not engineered and the melt water is not managed. The plan calls for the review of the four existing sites, but which are not within NPCA, and to assess the need for snow removal and disposal on provincial roads.

c) Municipal

Winter Control Plans and Salt Management Plans

The objective of a winter control plan is to define standards to be maintained and procedures to be followed to keep a municipality's roads and sidewalks in a safe condition from snow and ice. The objective of a salt management plan is to optimize the use of road salts and sands containing chlorides on municipal roads while minimizing negative impacts on the environment, in accordance with a winter control plans or level of service policies. Salt management plans generally take into account Environment Canada's Code of Practice for the Environmental Management of Road Salts (Environment Canada, 2004).

Salt management plans address the snow removal and snow disposal management practices of a municipality and usually contain an action plan for reviewing and improving the practices. For example, assessing the future municipal snow disposal requirements and using the Transportation Association of Canada Best Practices as a guide to develop new snow disposal sites.

5. Gaps in existing legislation, policies and programs

- The runoff from snow disposal sites has the potential to contaminate surface and groundwater, however there are no regulatory requirements such as those for monitoring water quality. There is also the potential to inundate surface water/groundwater systems with large volumes of water in a short amount of time.
- There are often limited municipal resources to ensure that site plan control requirements for designated snow storage areas are being met. Also, in many cases these sites are serviced by private snow removal companies that may not be informed about the snow storage requirements.

6. Policy considerations

- REMINDER: The primary consideration for reducing or eliminating drinking water threats related to the storage of snow is to make sure contaminated runoff does not enter surface water and/or groundwater.
- The source protection plan will need to include a high-level policy approach ("a catch-all policy") to address those "would be" drinking water threats that are unlikely to occur in a given vulnerable area (such as large-scale snow storage in downtown Port Colborne).
- Are municipal snow storage sites recognized in municipal official plans, zoning by-laws, or site plan controls? And under what land use category does snow storage fall, e.g. public use and is therefore permitted in all zones.

Examples of risk management measures and policy ideas

For discussion purposes, this section of the report provides examples of risk management measures and policy ideas that could be applicable to snow storage. It is not an exhaustive list.

The examples are categorized by the types of policy tools that can be used to meet the source protection plan objectives. The MOE Water Quality Risk Management Measures Catalogue Version 2, 09/07/2010) was reviewed as part of this exercise and measures were incorporated where appropriate.

Table 6.1 – Examples of risk management measures and policy ideas for snow storage

Policy Tool	Examples
Education and Outreach	• Raise awareness of private businesses and snow removal contractors about the importance of proper snow storage practices and encourage them to implement best management practices.
Incentive Programs	• Subsidize part of the cost to implement best management practices for snow storage and snow fences on private property.
Land Use Planning	• Require specific zoning and/or site plan controls for snow disposal sites (i.e. do not permit snow disposal site as-of-right in all zones like most public uses). • Restrict or prohibit snow disposal and storage sites in vulnerable areas. • Require designated snow storage areas on private development that take into consideration the sensitivity of vulnerable area (through the site plan control process).
Prescribed Provincial Instruments	• Require or encourage (depending on the level of threat) MOE to take extra care in its review of applications for permits under the *Ontario Water Resources Act* for melt water management facilities.
Municipal Operations / Infrastructure	• Consider municipal best management practices • Prepare or amend salt management plans that take into consideration the sensitivity of specific vulnerable areas

Policy Tool	Examples
	• Apply MOE guidelines and Transportation Association of Canada best practices when locating new snow disposal sites, and take into consideration vulnerable areas. • Establish melt water collection, retention and settling ponds at snow disposal sites • Regular sampling, monitoring, inspections • Apply best practices to design and operation of road maintenance yards • Do not allow snow to accumulate on the side of the road in close proximity to intake protection zones. • Do not dispose of snow in waterbodies or on frozen lakes or rivers • Make an annual rehabilitation assessment for the discharge area • Install traditional or living snow fences to contain snow to roadsides in order to reduce the need for mechanical snow removal activities, which reduces runoff potential.
Land Securement	• Purchase or place easements on land in IPZs
Risk Management Plans	• Require risk management plans for snow disposal and storage where this is or would be a significant drinking water threat. The RMP could cover items identified in the MOE guidelines and Transportation Association of Canada best practices
Prohibition	• Prohibit snow disposal and storage in IPZs where this is or would be a significant drinking water threat
Restricted Land Uses	• Flag those lands uses that are associated with snow storage as restricted land uses in IPZs where these activities are or would be significant drinking water threats so that municipal planners and building officials consider implications of the proposed development

Appendix A – Reference List

Environment Canada. 2004. Best Management Practices for Salt Use on Private Roads, Parking Lots and Sidewalks. www.ec.gc.ca/nopp/roadsalt/reports/ParkingLot/EN/parkinglot_E.pdf

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DRINKING WATER SOURCE PROTECTION
Niagara Peninsula Source Protection Area

NIAGARA PENINSULA CONSERVATION AUTHORITY

Drinking Water Source Protection Background Document

Precscribed Drinking Water Threat #18: The management of runoff that contains chemicals used in the de-icing of aircraft

April 7, 2011

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Note: We would like to thank Cataraqui Region Conservation Authority and Conservation Ontario for the use of their background research documents in preparing these reports.

1. Definition

This paper provides background information for **prescribed drinking water threat 18 – The management of runoff that contains chemicals used in the de-icing of aircraft.**

The primary consideration for reducing or eliminating drinking water threats related to the management of runoff that contains aircraft de-icing chemicals is to make sure it does not enter surface water and/or groundwater.

Aircraft that have frost, ice or snow on any of its critical structures (e.g. wings) are not permitted to attempt take-off under the Canadian Aviation Regulations. During weather conditions that would result in frost, ice or snow, aircraft may be sprayed with de-icing and/or anti-icing fluids prior to take-off.

Ethylene glycol or propylene glycol is the active ingredient in aircraft de-icing fluids. While other formulations have been considered it is noted that glycol continues to be the major chemical used in this application. The runoff of large volumes of de-icing fluids into surface waterbodies over a short period of time can lead to oxygen depletion which results in poor water quality and toxicity to aquatic life and mammals. The toxicity associated with the de-icing chemical can originate from both the glycol formulation as well as the additives mixed into these formulations.

2. What causes this activity to be a drinking water threat?

The Ontario Ministry of the Environment (MOE) Tables of Drinking Water Threats identify dioxane-1,4 and ethylene glycol as contaminants that could make their way into surface and groundwater as a result of runoff containing aircraft de-icing materials being discharged to land or water (circumstances 192 to 199 – Ontario Ministry of the Environment, 2009). Ethylene glycol is the active ingredient in de-icing fluids, and dioxane-1,4 may be used as an additive for its wetting or dispersing properties. These chemicals could threaten the safety of drinking water sources in certain situations (Applied Process Technology Inc, accessed December 2010).

The classification of this activity as a significant, moderate or low drinking water threat is dependent on the location of the airport (vulnerability score), and the classification of the airport as remote, small, regional or national.

3. Understanding the nature of the drinking water threat.

According to the MOE Tables of Drinking Water Threats, the management of aircraft de-icing fluid at a national airport would be a significant drinking water threat in the Port Colborne intake protection zone 1 (IPZ-1) having a vulnerability score of 9.

Table 3.1 - Aircraft De-icing

Vulnerable Area		VS	Significant	Moderate	Existing Significant Threats
Port Colborne	IPZ-1	9.0	Note 1	Notes 2, 3, 4	
	IPZ-2	8.1		Notes 1, 3, 4	
DeCew Falls	Main Intake IPZ -1	8.0		Notes 1, 3, 4	
	Lake Gibson Emergency Intake IPZ-1	8.0		Notes 1, 3, 4	
	Hwy 406 Control Structure IPZ-1	8.0		Notes 1, 3, 4	
Niagara Falls	IPZ-1	8.0		Notes 1, 3, 4	
Welland	IPZ-1	7.0		Note 1	
Fort Erie	IPZ-1	7.0		Note 1	

NOTES:

VS – Vulnerability Score
Where runoff containing de-icing materials may discharge to land or water and originates at a:
1 - National airport: national capital region, Greater Toronto Area or annual passenger traffic of 200,000 persons or more
2 – Remote airport: serves a community where air transportation is the only reliable method of year round transportation between the community and other population centres
3 – Small airport: does not have regular scheduled service to other airports and is not a remote airport (could include a helipad, note - Port Colborne hospital outside IPZ-1 and IPZ-2)
4 – Regional airport: annual passenger traffic less than 200,000 and is not a remote or small airport

Intake protection zones with a vulnerability score of 6.4 or less are not listed as not applicable to significant and moderate aircraft de-icing threats.

4. Applicable legislation, policies and programs

De-icing fluids can only be used with a containment system that prevents the fluids from entering surface water. The process must also occur in an appropriate location (i.e. not near open drains and sewers and not in general traffic areas).Deicing fluids shall be stored, handled and managed in accordance with the requirements detailed in the CCME Environmental Code of Practice for Above Ground and Underground Storage Tank Systems containing Petroleum and Allied petroleum Products (2003). In addition the storage, handling and management of the deicing fluids shall comply with all applicable Provincial and local codes.

a) Federal

Canadian Aviation Regulations

To ensure responsible environmental management of glycol-based chemicals used in deicing operations the Air Operator, Service Provider and local Airport Authority shall prepare detailed glycol management plans and procedures. Guidance for the preparation of a Glycol Management Plan is found in the Transport Canada TP 14052 - Guidelines for Aircraft Ground - Icing Operations (2005). According to these guidelines, a Glycol Management Plan is established to document specific procedures, guidelines and processes for the operation of aircraft subject to ground icing conditions to ensure that aircraft take-off without contamination adhering to critical surfaces. This plan will detail the deicing operation and the methods used to prevent environmental damage from the deicing operation. The Management plan shall be developed with input from the Airport Operator, the deicing Service Provider, and the air carriers using the airport, and the companies or individuals responsible for disposal of the used deicing fluid. A typical Plan will, as a minimum, address the following issues:

- General Information on the companies that will be operating and using the deicing facility;
- Details of the area where the deicing operation will take place;
- Details on the storage and handling of deicing fluids;
- Application Details including operator training;
- How the effluent will be contained;
- How the effluent will be disposed;
- Contingency plans for spills and accidents;
- Safety Issues;
- Deicing fluid inventory control; and
- Reporting plan - for reporting Glycol use.

Further, an Emergency Response Plan shall be developed and can be a stand-alone plan or included as part of the Glycol Management Plan. The Emergency Response Plan shall include procedures and plans to use all available resources to protect the environment in the event of an emergency, including spills, vehicle accidents involving deicing trucks, and a complete discharge of the largest holding tank at the facility.

b) Provincial

Airports and related activities are regulated by the Federal government. However some activities can be provincial, for example the Hamilton International Airport has a certificate of approval for industrial sewage works that includes details that it relies on certain propylene glycol works.

c) Municipal

Land Use Planning

Municipal official plans and zoning by-laws do not contain detailed policies on airports as they are federally regulated. However airports can require municipal conformance to their critieria such as reduced building heights near airports.

5. Gaps in existing legislation, policies and programs

- No gaps have been identified at this time.

6. Policy considerations

- REMINDER: The primary consideration for reducing or eliminating drinking water threats related to the management of runoff that contains aircraft de-icing chemicals is to make sure it does not enter surface water and/or groundwater.

- Airports and related activities are regulated by the Federal government. However it is possible to affect decision-making on airport lands, provided that the functioning of the site is not impeded. Although the federal government has immunity from provincial law, the federal government can waive that immunity by contract/agreement or conduct. Where a municipality has the responsibility for entering into Risk Management Plans (RMP), a SPP policy can direct a municipality to negotiate a RMP under the Clean Water Act with the airport authority.

- The source protection plan will need to include a policy approach to address those "would be" significant drinking water threats that may occur in a given vulnerable area, i.e. new airports.

General Policy Statements

- There are no airports located in the intake protection zones.

- According to the MOE Tables of Drinking Water Threats, any future national airport within the Port Colborne IPZ-1 requiring management of aircraft de-icing fluids would be ranked as significant drinking water threat.

Examples of risk management measures and policy ideas

For discussion purposes, this section of the report provides examples of risk management measures and policy ideas that could be applicable to the management of aircraft de-icing fluids. It is not an exhaustive list.

The examples are categorized by the types of policy tools that can be used to meet the source protection plan objectives. The MOE Water Quality Risk Management Measures Catalogue (see Appendix B for a weblink) was reviewed as part of this exercise and measures were incorporated where appropriate.

Table 6.1 – Examples of risk management measures and policy ideas for aircraft de-icers

Policy Tool	Examples
Education and Outreach	
Incentive Programs	
Land Use Planning	n/a
Prescribed Provincial Instruments	Recommend MOE consideration of intake protection zones in the approval process as applicable to airports with particular attention to conditions preventing impacts to quality.
Municipal Operations / Infrastructure	• Evaluate new and existing aircraft de-icing fluid storage locations for potential impact on drinking water sources, and address identified problems. • Update emergency and glycol management plan as necessary • Sampling, monitoring, inspections
Risk Management Plans	Municipality may enter into negotiations with airport authority to ensure appropriate containment/spill management/ contingency plans
Prohibition	n/a
Restricted Land Uses	n/a
Other	Strategic Policy

Appendix A – Reference List

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Ontario Ministry of the Environment. 2009. Tables of Drinking Water Threats. 2008, as amended in 2009. www.ene.gov.on.ca/publications/cw/7561e03.pdf

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Appendix B - Additional Resources

1. Airport Neighbors Association. Milwaukee, Wisconsin
   http://home.earthlink.net/~airportneighbors/water_pollution.html
2. Transport Canada. Part VI - General Operating and Flight Rules.
   www.tc.gc.ca/eng/civilaviation/regserv/cars/part6-602-2436.htm#602_11
3. Transport Canada. De-icing and anti-icing regulations.
   www.tc.gc.ca/eng/mediaroom/backgrounders-b07-a001-1882.htm
4. Transport Canada TP 14052 - Guidelines for Aircraft Ground - Icing Operations.
   www.tc.gc.ca/eng/civilaviation/publications/tp14052-menu-314.htm

Drinking Water Source Protection Background Document

Prescribed Drinking Water Threat 21:
Lands used for Livestock Grazing/Pasturing, Farm Animal Yards and Outdoor Confinement Areas

May 25, 2011

Table of Contents

Note: We would like to thank Cataraqui Region Conservation Authority and Conservation Ontario for the use of their background research documents in preparing these reports.

Prescribed Drinking Water Threat 21: Lands used for Livestock Grazing/Pasturing, Farm Animal Yards and Outdoor Confinement Areas

The main consideration to reduce or eliminate drinking water threats related to land used for livestock grazing and pasturing, outdoor confinement areas and farm animal yards is to ensure nutrients and pathogens from the animals (i.e. manure and dead stock) do not enter surface water.

1. Definition

Any farm where livestock are permitted to be outdoors is associated with this drinking water threat. Grazing and pasturing land is land where animals are permitted to eat growing herbaceous plants.

Outdoor confinement areas are enclosures for livestock, deer, elk or game animals. *Ontario Regulation 267/03* made pursuant to the *Nutrient Management Act* defines outdoor confinement areas as follows:

1) It has no roof, except as described below (#3);
2) It is composed of fences, pens, corrals or similar structures;
3) It may contain a shelter to protect the animals from the wind or another shelter with a roof of an area of less than 20 square metres;
4) It has permanent or portable feeding or watering equipment;
5) The animals are fed or watered at the enclosure;
6) The animals may or may not have access to other buildings or structures for shelter, feeding or watering; and
7) Grazing and foraging provides less than 50 per cent of dry matter intake.

Farm animal yards are outdoor livestock areas lined with concrete other than those meeting the definition of an outdoor confinement area. Food and water are not provided in farm animal yards. They are generally used as outdoor exercise areas or holding areas for when barns are being cleaned out., usually in association with a barn / covered structure.
Although grazing/pasturing, farm animal yards and outdoor confinement areas are different (i.e. the latter is a more concentrated animal area requiring more active management), many sections of this background report apply to all. In this report when all types of outdoor livestock areas are referred to collectively, the term “outdoor livestock areas” is used for brevity.

Although grazing/pasturing, farm animal yards and outdoor confinement areas are different (i.e. the latter is a more concentrated animal area requiring more active management) many sections of this report apply to all. In this report when all kinds of outdoor livestock areas are referred to collectively the term “outdoor livestock areas” is used for brevity.

2. What causes this activity to be a drinking water threat?

The Ontario Ministry of the Environment (MOE) Tables of Drinking Water Threats (2008, as amended in 2009) identify nitrogen, total phosphorus and pathogens as contaminants that

could make their way into surface and groundwater from outdoor livestock areas (circumstances 200 to 211, 1945 and 1946). Nitrogen is a concern for groundwater. Total phosphorous is only considered for surface water because excessive inputs result in eutrophication and can cause toxic algae blooms.

These nutrients and pathogens that are found in animal manure could threaten the safety of drinking water sources in certain situations. Generally speaking, keeping greater numbers of livestock in a space increases the risk of contamination and the requirement for more active management. As such, the ranking of drinking water threat in the MOE Tables increases proportional to the concentration of manure in a given area.

Livestock Grazing and Pasturing Land

A nutrient unit (NU) compares livestock based on the nutrient content (nitrogen and phosphorus) found in manure. A NU is the amount of nutrient that provides the lower of 43 kg of nitrogen or 55 kg of phosphate, NU's vary according to livestock type. (For example - 300 NU = 2,400 dairy goats or 210 large frame Holsteins). As nutrients from one dairy goat does not equal nutrients from one large frame dairy cow, under the Nutrient Management Act animals were all standardized to Nutrient Units so that they could be treated equitably.

The chemical circumstances (nitrogen and total phosphorus) are divided into three groups based on the number of animals on the farm and field area, standardized to nutrient units per acre per year, since different types of animals produce different amounts of manure.

- Less than 0.5 NU/ac/year
- 0.5 to 1 NU/ac/year
- Greater than 1 NU/ac/year

Outdoor Confinement Areas and Farm Animal Yards

The circumstance for pathogens applies to land where one or more animals are kept in an outdoor confinement area or farm animal yard.

The chemical circumstances (nitrogen and total phosphorus) are divided into three groups based on the number of animals confined to the area, standardized to nutrient units per hectare per year. A nutrient unit is based on the manure equivalent of nutrients contained in 43 kg of nitrogen or 55 kg of phosphate. (300 NU = 2,400 dairy goats or 210 large frame Holsteins).

- Less than 48.58 NU/ac/year (120 NU/ha/year)
- 48.58 NU/ac/year to less than or equal to 121.46 NU/ac/year (120 to 300 NU/ha/year)
- Greater than 121.46 NU/ac/year (300 NU/ha/year)

Related Aspect

Livestock mortality occurs on farms and the dead stock require disposal. Dead stock collection, on site burial, composting and incineration are the methods used. The disposal of dead stock is not a prescribed threat but can be added as a local threat.

3. What is the local scale of the drinking water threat

This activity is identified as a significant drinking water threat in Port Colborne, DeCew and Niagara Falls.

Table 3.1 identifies where these activities are or would be significant or moderate drinking water threats based on the MOE Tables of Drinking Water Threats and how many threats are currently occurring. The count for existing significant threats has been taken from the Assessment Report, where existing threats were determined based on current land uses and interpretation of aerial photography. Please note that the information in these tables about the existing threats is subject to change based on ongoing field verification.

Table 3.1 – Outdoor Livestock Area Drinking Water Threats

Vulnerable Area		**V.S.**	**Significant**	**Moderate**	**Existing Significant Threats**
DeCew Falls	Main Intake IPZ -1	8.0	P	C	3P
	Lake Gibson Emergency Intake IPZ-1	8.0	P	C	3P
	Hwy 406 Control Structure IPZ-1	8.0	P	C	2P
	Main Intake IPZ-2	6.4		P	
	Lake Gibson Emergency Intake IPZ-2	6.4		P	
Port Colborne	IPZ-1	9.0	C; P	C	
	IPZ-2	8.1	P	C	
Niagara Falls	IPZ-1	8.0	P	C	
	IPZ-2	6.4		P	
Welland	IPZ-1	7.0		C, P	
Fort Erie	IPZ-1	7.0		C, P	

V.S. – Vulnerability Score
C – Indicates a chemical threat
P – Indicates a pathogen threat
Note : Intake protection zones with a vulnerability score of 5.6or less not listed as non applicable to significant and moderate threats

4. Applicable legislation, policies and programs

This section identifies the legislation, policies and programs that apply to outdoor livestock areas in the Source Protection Area. Some of the laws apply directly to farming practices while others are applied indirectly.

a) National

Fisheries Act
In general the *Fisheries Act* is enforced by Fisheries and Oceans Canada; however, the section that applies to contamination is under the authority of Environment Canada. The deposition of any deleterious substance (contaminant) is in contravention of the legislation. Section 36(3) of the *Fisheries Act* states that "… no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water" (Government of Canada, 1985).

Manure and sediment runoff are considered deleterious substances. Manure and sediment could enter surface water as a result of unrestricted livestock access to surface water or runoff from outdoor livestock areas.

b) Provincial

There are three provincial regulations that apply to outdoor livestock areas; each is outlined below:

Environmental Protection Act
The *Environmental Protection Act* (EPA) generally prohibits anyone from polluting the environment and is enforced by the Ontario Ministry of the Environment. Sections 6 and 14 of the EPA which prohibit pollutant releases except where the discharge of a contaminant is a result of normal farming practices. The exception for normal farming practices allows activities that are necessary for raising livestock (e.g. manure to be spread on fields) without the approvals that are required for other wastes.

Section 14 and the definition of adverse effect below display the normal farming practices exemption contained in the EPA.

> 14.1 Subject to subsection (2) but despite any other provision of this Act or the regulations, a person shall not discharge a contaminant or cause or permit the discharge of a contaminant into the natural environment, if the discharge causes or may cause an adverse effect.
>
> Exceptions
> (2) Subsection (1) does not apply to,
>
> (a) a discharge that is authorized under this Act or the *Ontario Water Resources Act*, if the discharge does not cause and is not likely to cause an adverse effect; or
>
> (b) a discharge of a contaminant that arises when animal wastes are disposed of in accordance with normal farming practices, if the only adverse effect that is caused or that may be caused by the discharge is an adverse effect referred to in clause (a) of the definition of "adverse effect".

Adverse effect means,

(a) “impairment of the quality of the natural environment for any use that can be made of it”, not the other portions of the definition which are as follows:

(b) injury or damage to property or to plant or animal life,

(c) harm or material discomfort to any person,

(d) an adverse effect on the health of any person,

(e) impairment of the safety of any person,

(f) rendering any property or plant or animal life unfit for human use,

(g) loss of enjoyment of normal use of property, and

(h) interference with the normal conduct of business.

Essentially normal farming practices (i.e. a farm operation that uses proper and acceptable customs and standards as well as technology consistent with proper advanced farm management practices) are allowed to impair the quality of the natural environment in a limited sense such as nuisance impacts related to odours, but not cause any other specific impacts such as an adverse impact to a watercourse.

Ontario Water Resources Act

The Ontario Ministry of the Environment is responsible for enforcement of the *Ontario Water Resources Act* (OWRA). Two sections apply to outdoor livestock areas.

Section 30(1): “Every person that discharges or causes or permits the discharge of any material of any kind into or in any waters or on any shore or bank thereof or into or in any place that may impair the quality of the water of any waters is guilty of an offence.” This includes manure and sediment.

Under section 32 of the Act the Ministry can order a person who holds a certificate of approval to make changes if it is found that material is being discharged into the water that could impair its quality.

Nutrient Management Act and Ontario Regulation 267/03 - General

Farms are regulated under the Nutrient Management Act if the farm generates greater than 300 nutrient units annually or generate between 5 and 300 NU annually and have applied for a building permit to construct a building used to hold farm animals or manure. Nutrient management strategies and plans are used by some farms to optimize the relationship between the land-based application of nutrients, farm management techniques and crop requirements; to maximize the efficient use of on-site nutrients; and to minimize adverse impacts to the environment.

The *Nutrient Management Act* (NMA) only applies to all farm operations in the following instances:

- No high trajectory irrigation guns are to be used apply manure or non-agricultural source materials if they are able to spray more than 10 meters
- The application of anaerobic digestion output that is from a mixed anaerobic facility that is not a regulated mixed anaerobic digestion facility
- Vegetated filter strip construction and use
- Land application of non-agricultural source materials
- Farm operation receives off-farm anaerobic digestion materials for treatment through mixed anaerobic digestion in a regulated mixed anaerobic digestion facility

Compliance with the *Nutrient Management Act* is the responsibility of the MOE. According to "Complying with Environmental Legislation on Farms" (MOE, September 2009), the MOE's on-farm compliance program uses a problem-solving approach to help farmers comply with the law and manage environmental issues through education and outreach. Minor violations can be addressed through voluntary abatement plans, authorizing document amendments (to the nutrient management strategy and/or plan), and provincial officer orders. Enforcement, including *Provincial Offenses Act* summons and investigation and prosecution, would be used in situations where serious issues are identified.

Farms are selected for inspection based on risk, complaints, size and whether a previous inspection was conducted. During the inspections several "control points" (i.e. areas where there is a risk of groundwater or surface water contamination: manure storage and transfer locations, agricultural and non-agricultural source material land application) are considered. Records and buffers are also checked by the inspector.

Outdoor confinement areas (OCAs) for farms that produce at least 300 nutrient units must comply with the following rules under O. Reg. 267/03. There are no requirements for pasturing and grazing under O. Reg. 267/03.

Under the *Clean Water Act* the approval of, and compliance with, nutrient management strategies is a prescribed instrument.

The following identifies sections of the O. Reg. 267/03 related to outdoor confinement areas and farm animal yards.

> Section 55: If the farm has a nutrient management strategy it is prohibited to build a new structure or pave any load-bearing surface of an outdoor confinement area for the purpose of increasing the capacity of the area when it is within 100 m of a municipal well, 15 m of a drilled well that is at least 15 m deep with at least six m of casing, within 30 m of any other well or within 15 m of a field drainage tile.

Section 57: Animals in a high-density or permanent OCA where the farm unit generates at least 300 nutrient units cannot have access to surface water. Note that low density outdoor/non-permanent OCA animals may have access to surface water. Other legislation generally prohibits this activity, but these acts and regulations are operated on a complaint basis and therefore have limited impact.

Section 58: Animals may only be kept in a permanent OCA if there is a nutrient management strategy for the operation, the manure produced is in accordance with the strategy and a runoff management system is in place.

Section 60: Manure may be mounded (i.e. mixed with bedding material to make it more solid and manageable) in an OCA and if it's used for bedding material, as identified in an approved nutrient management strategy, it may be left (i.e. not moved to a storage facility or applied).

Section 61: Describes special requirement for applying and storing snow with manure (e.g. gentle field slopes, reduced application rate and buffers along surface water).

Section 81(2-3): All runoff from farm animal yards and outdoor confinement areas must be equipped with a runoff management system capable of managing all the runoff from the area.

Section 81(5): Permanently vegetated areas can be used to manage runoff from outdoor confinement areas, farm animal yards and small solid manure storages (less than 300 $m^{2)}$ per the requirements below.

Table 4.1 - Location Requirements for Permanently Vegetative Areas (PVAs)

Feature	Value or Comment
Minimum distance to field tile	3 m
Minimum distance to a municipal well	100 m
Minimum distance to a drilled well	15 m
Minimum distance to any other well provided that the area is used for a permanent solid nutrient storage facility that is used to store non-agricultural source materials	90 m
Minimum distance to any other well	30 m

Other requirements for permanent vegetated areas (PVA) under the Regulation include:

- Minimum soil depth of 0.5 m
- PVA for a permanent solid nutrient storage facility or yard must have a flow path that measures at least 150 m from surface water or tile inlets where it handles manure with

a dry matter content of greater than or equal to 30 percent or at least 50 m where it handles manure with a dry matter content of 50 percent or greater.

- PVA for outdoor confinement area must have a flow path that measures at least 100 meters if the outdoor confinement area is less than 500 m^2 or at least 150 if the outdoor confinement are is 500 m^2 or more.
- There must be no more than 150 NU in an outdoor confinement area using a PVA for runoff and the outdoor confinement area cannot be more than 2,000 m^2.

Part IX.2 of O. Reg. 267/03 - Vegetated Filter Strip Systems
Vegetated filter strips are a method to treat runoff from OCAs, farm animal yards and solid manure storages. The requirements important to source water protection under O. Reg. 267/03 are displayed in the following table and list.

Table 4.2 – Location Requirements for Vegetated Filter Strips

Feature	**Value or Comment**
Floodplain	Not in 1 in 100 year floodplain
Minimum soil depth over bedrock	0.5 m
Minimum depth to aquifer	0.9 m
Minimum distance to municipal well	100 m
Minimum distance to drilled wells (>15 m deep, cased >6m)	15 m
Minimum distance to any other well	30 m
Minimum flow path distance to surface water or tile inlet	50 m
Minimum distance to drilled wells (>15 m deep, cased >6m)	50 m

Other requirements for vegetated filter strips under the Regulation include:

- The strip must designed by a Professional Engineer and built to their specifications based on factors such as slope, infiltration rate for the soil, volume of runoff to be treated, etc..
- 100 percent of the flow must infiltrate the strip.
- Pretreatment of runoff to remove solids is necessary.
- The strip must be inspected at least every six months and repaired when necessary.
- Records of the design, inspections and any actions to ensure proper function must be kept.

There are other options under the NM Regs for managing runoff such as:

a) diverting up slope water away and putting a roof over the area
b) building a liquid storage facility to store the runoff (and potentially manure)
c) sewage works as approved s. 53 OWRA
d) sewage works approved under part 8 of Building Code

Canada-Ontario Environmental Farm Plan

The Environmental Farm Plan (EFP) is delivered locally through the Ontario Soil and Crop Improvement Association with expertise provided by the Ontario Ministry of Agriculture and Food.

It's a voluntary educational program for farm families delivered through local workshops. Participants are provided instruction on how to progress through the risk assessment and action plan development contained in the EFP workbook. The process is as shown in the following figure:

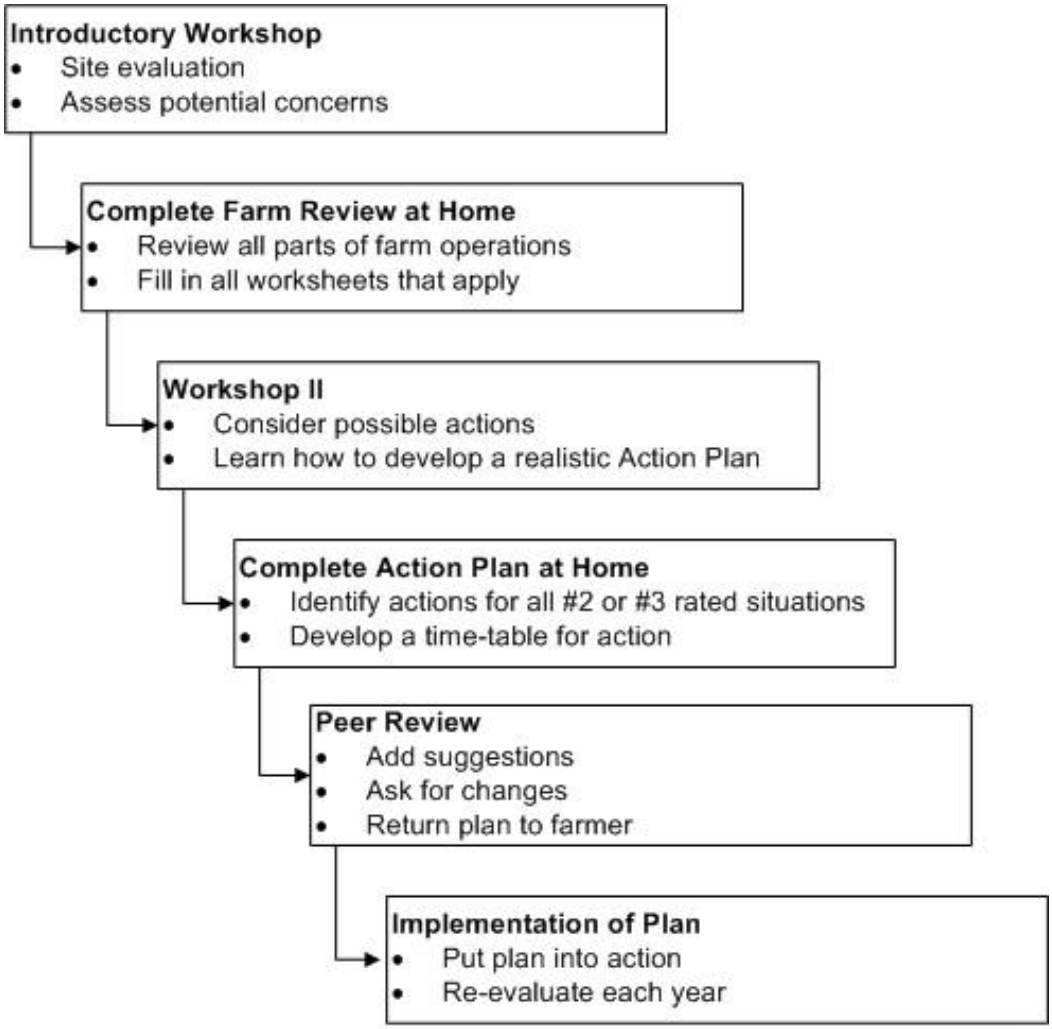

Figure 4.1 – Environmental Farm Plan Process (OSCIA, 2005)

The risk assessment (farm review) gives the opportunity to rate the current level of environmental concern in up to 23 different areas on the farm. The results of the risk assessment (i.e. filled in workbook) are confidential in that the only people that see the

information are the farmer and a local peer review group. The areas relevant to the drinking water source protection initiative include:

- Water wells
- Pesticide handling and storage
- Fertilizer handling and storage
- Storage of petroleum products
- Disposal of farm wastes
- Treatment of household waste
- On-farm storage of livestock manure
- Livestock yards and outdoor confinement areas
- Milking centre washwater
- Water efficiency
- Soil management
- Nutrient management
- Manure use and management
- Pest management
- Stream, ditch and floodplain management
- Wetlands, woodlands and wildlife

Limited federal and provincial funds are available to address areas identified in the plan as needing improvement.

The Livestock Yards and Outdoor Confinement Areas section of the EFP workbook states that these areas are a concern due to the possibility of manure impacting groundwater and surface water. It also notes situations where the risk for contamination is increased and what can be done to reduce the risk including:

- Collect, store and manage manure runoff from the yard
- Pave the yard
- Cover the yard to prevent runoff
- Check the distance to surface water and the soil texture
- Become familiar with requirements under the *Nutrient Management Act*
- Fill in the worksheet in the EFP binder to see if any changes should be made

The worksheet is essentially a series of flow charts with an end score (rating) that specifically identifies if the level of risk for contamination is low or high. The scores range from one to four where anything that rates a one or two should be reviewed. The review involves determining how to improve the situation and includes a voluntary timeline for implementation.

c) Municipal

Land Use Planning
Municipalities have the ability to pass by-laws about the economic, social and environmental well-being of the municipality, and about the health, safety and well-being of people, under the *Municipal Act*.

Municipalities have authorities to enact by-laws for specific matters within their jurisdiction and these authorities are available under the Municipal Act, or, in the case of the City of Toronto, under the City of Toronto Act. Municipalities have broad authorities to pass by-laws about the economic, social, and environmental well-being of the municipality, and about the health, safety, and well-being of people. There are limitations on these authorities which need to be taken into consideration. Very generally, these broad authorities may not conflict with specific

authorities found in other legislation. For example, any municipal by-law with respect to construction or demolition of buildings is superceeded by the Building Code Act and the Building Code. In addition, in the event of a conflict between a municipal by-law and federal and provincial legislation, the legislation prevails. For example, if a municipality wishes to enact legislation to protect its drinking water sources, the municipality must review the applicable legislation to ensure that the municipal by-law does not conflict with it. Municipalities can supplement provincial regulatory schemes, provided that the by-law does not conflict with the provincial legislation.

In a two tier system, each tier may have exclusive jurisdiction over a matter, for example, lower tiers may enact zoning by-laws whereas upper tiers may be responsible for public health. As a result, the upper tier municipality cannot use its broad authorities to pass a by-law which is specifically within the jurisdiction of the lower tier.

Municipalities may also use authorities under the Municipal Act to set up a licensing regime for businesses. The licensing system generally applies to how operators conduct the business, rather than how a product is applied. However, the municipality may determine that there are certain conditions to holding a license, such as certification or operators.

Minimum Distance Separation Formulae

Agricultural activities can include livestock facilities (e.g. barns and manure storage), and are generally permitted by municipalities on lands that are designated and zoned for agricultural and rural use. In order to reduce incompatibility concerns about odour from livestock facilities, Provincial minimum distance separation (MDS) formulae are used by municipalities to separate land uses.

Different formulae are applied to new or expanding non-agricultural uses (such as houses) that could impact existing livestock facilities (MDS I), and to new or expanding livestock facilities that could impact existing non-agricultural uses (MDS II). The formulae are applied to lands subject to most types of *Planning Act* applications and to activities that require building permits. The MDS I formulae are applied to low-intensity uses (e.g. industry, one house) proposed within a 1 km radius of the livestock facility, and to high-intensity uses (e.g. a subdivision) proposed within a 2 km radius.

In terms of drinking water source protection, the MDS has the effect of providing separation between new livestock facilities (and permanent nutrient storage facilities) and municipal and private drinking water wells. The MDS requirements may exceed the minimum well separation required under O. Reg. 267/03.

5. Gaps in existing legislation, policies and programs

- Although unrestricted livestock access to surface water is not permitted under provincial and federal legislation (i.e. *Fisheries Act, Environmental Protection Act, Ontario Water Resources Act*), the general practice of enforcement agencies is to operate on a complaint basis only.
- Inspections of the phased-in operations that require approval under Ontario Regulation 267/03 are scheduled based on complaints, the inherent risk and past communications.
- Although best management practices have been defined, grazing land and pastures are not specifically regulated under any legislation.
- No known agricultural operations in the IPZs currently required a Nutrient Management Plan or Strategy.

6. Policy considerations

- REMINDER: The main consideration for reducing or eliminating drinking water threats related to outdoor livestock areas is to make sure that contamination from the areas does not impact groundwater or surface water.
- This activity is or would be a significant threat in Port Colborne, DeCew, and Niagara Falls.
- Although Ontario Regulation 267/03 has requirements to cover concerns associated with outdoor confinement areas the majority of the farms are not subject to the Regulation because they do not meet the requirements for a nutrient management strategy.
- All policy tools are available to address this drinking water threat with the caveat that risk management plans, prohibition and the related restricted land use options only apply to significant drinking water threats.
- The source protection plan will need to include a high-level policy approach ("a catch-all policy") to address those "would be" drinking water threats that are unlikely to occur in a given vulnerable area so that they would be eliminated.

7. Examples of risk management measures and policy ideas

For discussion purposes, this section of the report provides examples of risk management measures and policy ideas that could be applicable to outdoor livestock areas. It is not an exhaustive list.

The examples are categorized by the types of policy tools that can be used to meet the source protection plan objectives. The MOE Risk Management Measures Catalogue (Version 2, 09/07/2010) was reviewed as part of this exercise and measures were incorporated where appropriate; many of the measures in the catalogue are already required by applicable provincial instruments.

Table 7.1 – Risk Management Measures for Outdoor Livestock Areas

Policy Tool	**Example**
Education and Outreach	• Provide Environmental Farm Program workshop leaders with information on source water protection to communicate to farmers. • Provide annual workshops on grazing and pasture management • Provide educational materials and other learning opportunities such as farm tours to convey the importance of runoff management and showcase local successful solutions • Develop and distribute Source Protection Area specific buffer standards pertinent to soil type, slope, farm operation, distance to municipal well or intake, etc. • Provide information on proper dead animal disposal.
Incentive Programs	• Rural clean water-type program to fund livestock restriction, animal yard runoff management, buffer establishment, etc. • Monitor impact of funding program project implementation and make changes to program guidelines as necessary.
Land Use Planning	• Require the outdoor livestock areas be setback # m from surface water and wells where a municipal intake or well could be affected and ensure proper protection measures are in place (if feasible).
Prescribed Provincial Instruments	• Recommend that MOE consider ensuring that significant threat activities governed by prescribed instruments are given priority in an inspection program. • MOE to monitor and report whether instruments conform to the SPP threat policy and whether the instrument holder/landowner carries out their permitted activity accordance to the instrument.
Municipal Operations / Infrastructure	• Address any site specific drainage issues for municipal wells adjacent to farm properties.
Land Securement	• Purchase or place an easement on land where agriculture is present.
Risk Management Plans	• Use risk management plans to manage significant risks associated with operations not covered by Ontario Regulation 273/03.
Prohibition	• Prohibit outdoor livestock areas where they are or would be significant drinking water threats.
Restricted Land Uses	• Flag agricultural land uses (that are associated with livestock) as restricted land uses in IPZs where these activities are or would be significant drinking water threats so that municipal planners and building officials can advise a proponent to obtain clearance from the RMO prior to proceeding with their application.

Appendix – A Reference List

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Changes made since SPC approved February 10, 2011 version from amendments provided by Conservation Ontario to their original submissions following review by the MOE, they include:

- Page 6 additional information on the NMA provided and some removed from page 7
- Page 12 new text provided with respect to the municipal act
- Page 13 “not permitted under provincial and federal legislation” substituted for “illegal” and “regulated” substituted for “addressed”
- Page 15 substituted (i) “Use risk management plans “ and (ii) “can advise a proponent to obtain clearance from the RMO prior to proceeding with their application.” for “consider implications of proposed uses” and (iii) new text under Prescribed Provincial Instruments