

10.10 DENSE NON-AQUEOUS PHASE LIQUID (DNAPL) AND ORGANIC SOLVENT

Definition of DNAPLs

The handling and storage of a dense non-aqueous phase liquid (DNAPL) is a prescribed drinking water threat under O. Reg. 287/07 under the *Clean Water Act, 2006*.

A DNAPL is an organic liquid that is denser than water and tends to be insoluble in water, meaning that it does not mix with water. When released into the environment, DNAPLs sink through to the bottom of groundwater aquifers (until they hit bedrock, for example) as well as through surface water bodies. However, after 'sinking', a DNAPL will continue to flow through the ground, at which time it will only then start to mix with water. Water that is contaminated with DNAPLs can spread over a number of kilometres and persist over a long period of time, as DNAPLs can be present in the aquifer for decades or centuries before they have been completely depleted. This accounts for their 'special' status in Source Water Protection evaluation (i.e., the fact that they are considered to be a significant threat in the 5-year time of travel zone or WHPA-C).

DNAPLs have been readily used in vast quantities for decades in industrial and commercial applications such as dry cleaning, cleaning/degreasing solvents, electronics, aerosols, plastics, pesticides, pharmaceuticals, wood preservation, asphalt operations, varnishes and the repair of motor vehicles and equipment. These chemicals can also be found in small quantities in common household products such as adhesives and cleaners. 'Handling' of DNAPLs is not specifically defined in regulations.

Why are DNAPLs a Threat to Drinking Water Sources?

A number of chemicals from the handling and storage of DNAPLs could make their way into drinking water sources. The Ministry of the Environment and Climate Change's *Tables of Drinking Water Threats* identifies the following sub-threat activities:

- The handling of a DNAPL (see circumstances #102-111)
- The storage of a DNAPL (see circumstances #1098-1112)

The Ministry of the Environment and Climate Change’s *Tables of Drinking Water Threats* identify the specific chemicals that could make their way from DNAPL handling and storage into drinking water sources, which include:

- Dioxane-1,4 (a stabilizer)
- Polycyclic aromatic hydrocarbons (PAHs)
- Tetrachloroethylene (also known as Perchloroethylene or PCE) (dry cleaning solvent, de-grease metals, paint strippers)
- Trichloroethylene (TCE) (industrial applications)
- Vinyl chloride (VC) (polymer production)

There is no minimum quantity for a DNAPL – any amount of a DNAPL is considered a significant drinking water threat in specific vulnerable areas.

See **Table 10-12** for when and where the handling and/or storage of a DNAPL may be a significant drinking water threat. Note: to determine if a specific activity is a significant drinking water threat consult the *Tables of Drinking Water Threats* for the specific circumstances that must be met for the activity to be a threat.

Prescribed Drinking Water Threat	DNAPL Threat Sub-Category	Area and Vulnerability Score (VS)
The handling and storage of a dense non-aqueous phase liquid	The handling of a dense non-aqueous phase liquid	<ul style="list-style-type: none"> • WHPA-A • WHPA-B • WHPA-C • WHPA-E (VS = 10)
	The storage of a dense non-aqueous phase liquid	<ul style="list-style-type: none"> • WHPA-A • WHPA-B • WHPA-C • WHPA-E (VS = 10)

Table 10-12: When/where a DNAPL may be a significant drinking water threat

Definition of Organic Solvents

The handling and storage of an organic solvent is a prescribed drinking water threat under O. Reg. 287/07 under the *Clean Water Act, 2006*.

Organic solvents are liquid organic compounds (i.e., containing carbon) with the power to dissolve solids, gases, or liquids. Most organic solvents have a lower density than water, which means they are lighter and will sit as a separate layer on top of water. Organic solvents have been readily used in vast quantities for decades in industrial and commercial applications such as paints, cleaning/degreasing, dry cleaning, electronics, aerosols, plastics, pesticides, pharmaceuticals, wood preservation, asphalt operations, varnishes and the repair of motor vehicles and equipment. Organic solvents can also be found in small quantities in common household products such as cleaners.

Why are Organic Solvents a Threat to Drinking Water Sources?

Chemicals from organic solvents could make their way into drinking water sources. The Ministry of the Environment and Climate Change's *Tables of Drinking Water Threats* identifies the following sub-threat activity:

- The handling and storage of an organic solvent (see circumstances #1225-1272)

The Ministry of the Environment and Climate Change's *Tables of Drinking Water Threats* identify the following four chemicals that could make their way from the handling and storage of organic solvents into water sources, which include:

- Carbon tetrachloride
- Chloroform
- Dichloromethane
- Pentachlorophenol

The assessment of potential threats to drinking water sources from the handling and storage of organic solvents is dependent on the location; the chemicals of concern in the solvent; where it is stored above, below, or partially below grade; and the quantity stored.

See **Table 10-13** for when and where the handling and/or storage of an organic solvent may be a significant drinking water threat. Note: to determine if a specific activity is a significant drinking water threat consult the *Tables of Drinking Water Threats* for the specific circumstances that must be met for the activity to be a threat.

Prescribed Drinking Water Threat	Organic Solvent Threat Sub-Category	Area and Vulnerability Score (VS)
The handling and storage of an organic solvent	The handling and storage of an organic solvent	<ul style="list-style-type: none"> • WHPA-A • WHPA-B (VS = 10) • WHPA-E (VS = 10)

Table 10-13: When/where an organic solvent may be a significant drinking water threat

Policy ID	Threat Description	Implementing Body	Legal Effect	Policy	Where Policy Applies	When Policy Applies	Related Policies	Monitoring Policy
DNAP-1	Handling and Storage of a Dense Non-Aqueous Phase Liquid	RMO	G	<p>Part IV, s.57, s.58</p> <p>Where the handling and storage of a DNAPL is, or would be, a significant drinking water threat, the following actions shall be taken:</p> <p>1) The handling and storage of a DNAPL in any quantity (excluding incidental quantities for personal use) is designated for the purpose of s.57 under the <i>Clean Water Act</i>, and is therefore prohibited where the threat would be significant in any of the following areas:</p> <ul style="list-style-type: none"> • WHPA-A (future); or • WHPA-B (future); or • WHPA-C (future); or • WHPA-E (VS = 10) (future). 	See Maps 2.1 - 2.21	Future: Immediately (T-5)	GEN-1	MON-2
			H	<p>2) The handling and storage of a DNAPL in any quantity (excluding incidental quantities for personal use) is designated for the purpose of s.58 under the <i>Clean Water Act</i>, requiring risk management plans, where the threat is significant in any of the following areas:</p> <ul style="list-style-type: none"> • WHPA-A (existing); or • WHPA-B (existing); or • WHPA-C (existing); or • WHPA-E (VS = 10) (existing). 		Existing: 1 year/ 5 years (T-6)	GEN-1 GEN-2	MON-2

Policy ID	Threat Description	Implementing Body	Legal Effect	Policy	Where Policy Applies	When Policy Applies	Related Policies	Monitoring Policy
DNAP-2	Handling and Storage of a Dense Non-Aqueous Phase Liquid	Municipality MOECC	E K	<p>Education and Outreach</p> <p>The municipality shall deliver education and outreach materials and programs where the handling and storage of a DNAPL is, or would be, a significant drinking water threat, targeted towards:</p> <p>a) an individual for personal use to promote the use of non-toxic products and additional opportunities for participation in household hazardous waste disposal and to advise the owner/tenant about the actions to take to ensure that the activity ceases to be, or does not become, a significant drinking water threat; and</p> <p>b) industrial and commercial users to promote the use of alternatives to DNAPLs (including non-toxic products), pollution prevention approaches, best management practices, and safe disposal; in any of the following areas:</p> <ul style="list-style-type: none"> • WHPA-A (existing, future); or • WHPA-B (existing, future); or • WHPA-C (existing, future); or • WHPA-E (VS = 10) (existing, future). <p>Where appropriate education and outreach materials prepared by the Ministry of the Environment and Climate Change are available, the municipality shall deliver those materials.</p>	See Maps 2.1 - 2.21	Existing & Future: Implement within 2 years (T-10)	GEN-8	MON-1 MON-4
DNAP-3	Moderate/Low Threats Handling and Storage of a Dense Non-Aqueous Phase Liquid	Municipality	J	<p>Specify Action</p> <p>Where the handling and storage of a DNAPL is, or would be, a moderate or low drinking water threat, the municipality is encouraged to specify and promote best management practices for the handling and storage of a DNAPL for Industrial, Commercial and Institutional (ICI) land uses in any of the following areas:</p> <ul style="list-style-type: none"> • WHPA-D (existing, future); or • WHPA-E (VS ≥ 4.8 and <10) (existing, future); or • HVA (existing, future); or • SGRA (VS = 6) (existing, future). 	See Chapter 5 of the respective Assessment Report	Existing & Future: Consider within 2 years (T-15)	N/A	N/A

Policy ID	Threat Description	Implementing Body	Legal Effect	Policy	Where Policy Applies	When Policy Applies	Related Policies	Monitoring Policy
OS-1	Handling and Storage of an Organic Solvent	RMO	G	<p>Part IV, s.57, s.58</p> <p>Where the handling and storage of an organic solvent is, or would be, a significant drinking water threat, the following actions shall be taken:</p> <p>1) The handling and storage of an organic solvent is designated for the purpose of s.57 under the <i>Clean Water Act</i>, and is therefore prohibited where the threat would be significant in any of the following areas:</p> <ul style="list-style-type: none"> • WHPA-A (future); or • WHPA-B (VS = 10) (future); or • WHPA-E (VS = 10) (future). 	See Maps 1.1 - 1.21	Future: Immediately (T-5)	GEN-1	MON-2
			H	<p>2) The handling and storage of an organic solvent is designated for the purpose of s.58 under the <i>Clean Water Act</i>, requiring risk management plans, where the threat is significant in any of the following areas:</p> <ul style="list-style-type: none"> • WHPA-A (existing); or • WHPA-B (VS = 10) (existing); or • WHPA-E (VS = 10) (existing). 		Existing: 1 year/ 5 years (T-6)	GEN-1 GEN-2	MON-2

Policy ID	Threat Description	Implementing Body	Legal Effect	Policy	Where Policy Applies	When Policy Applies	Related Policies	Monitoring Policy
OS-2	Handling and Storage of an Organic Solvent	Municipality MOECC	E K	<p>Education and Outreach</p> <p>The municipality shall deliver education and outreach materials and programs where the handling and storage of an organic solvent is, or would be, a significant drinking water threat, targeted towards:</p> <p>a) an individual for personal use to promote the use of non-toxic products and additional opportunities for participation in household hazardous waste disposal and to advise the owner/tenant about the actions to take to ensure that the activity ceases to be, or does not become, a significant drinking water threat; and</p> <p>b) industrial and commercial users to promote the use of alternatives to these chemicals (including non-toxic products), pollution prevention approaches, best management practices, and safe disposal; in any of the following areas:</p> <ul style="list-style-type: none"> • WHPA-A (existing, future); or • WHPA-B (VS = 10) (existing, future); or • WHPA-E (VS = 10) (existing, future). <p>Where appropriate education and outreach materials prepared by the Ministry of the Environment and Climate Change are available, the municipality shall deliver those materials.</p>	See Maps 1.1 - 1.21	Existing & Future: Implement within 2 years (T-10)	GEN-8	MON-1 MON-4
OS-3	Moderate/Low Threats Handling and Storage of an Organic Solvent	Municipality	J	<p>Specify Action</p> <p>Where the handling and storage of an organic solvent is, or would be, a moderate or low drinking water threat, the municipality is encouraged to specify and promote best management practices for the handling and storage of an organic solvent for Industrial, Commercial and Institutional (ICI) land uses in any of the following areas:</p> <ul style="list-style-type: none"> • WHPA-B (VS < 10) (existing, future); or • WHPA-C (existing, future); or • WHPA-D (existing, future); or • WHPA-E (VS ≥ 4.8 and <10) (existing, future); or • HVA (existing, future); or • SGRA (VS ≥ 6) (existing, future). 	See Chapter 5 of the respective Assessment Report	Existing & Future: Consider within 2 years (T-15)	N/A	N/A