

Keeping Chemicals Out of Our Drinking Water Sources

What can I do to help?

Always dispose of hazardous wastes properly.

- Take batteries, paint and other hazardous waste from your home or property to your municipal hazardous waste site or waste disposal days or participating businesses if they collect these materials. Contact your local municipal office for dates or visit this website: dowhatyoucan.ca

- If you need to buy cleaners, find the least toxic variety and then only buy what you need to do the job. Look for natural and safe alternatives like vinegar. Check your home to see if you have any already before buying a new supply.



Your efforts to keep chemicals out of our water will help keep this and future generations safe.

- Talk to your local store or supplier. Ask about alternatives that don't contain harmful chemicals.

- Check the labels on products in your home. If a product is flammable or corrosive or hazardous in any other way, it may contain chemicals that could contaminate a drinking water source – and you need to properly dispose of it.

- If you're a small or medium-sized business (fewer than 500 employees), located in a vulnerable area, you may be eligible for a free, voluntary, confidential pollution prevention review.

Visit sourcewaterinfo.on.ca to find out more or phone us at the phone numbers on this brochure.

Keep Out!

Some of these chemicals may be on your property – thank you for properly disposing of them at hazardous waste days or approved sites or participating businesses to keep these toxins out of our drinking water sources.

Types of products	Common names or uses	Some chemical examples
Degreasers	<ul style="list-style-type: none"> • Varsol • Turpentine 	<ul style="list-style-type: none"> • Acetone • Methyl hydrate
Paints Paint thinners Furniture strippers Paint removers Coolants, cleaners	<ul style="list-style-type: none"> • Acetone • Turpentine • Various others 	<ul style="list-style-type: none"> • Tetrachloroethylene (PCE) / Perchloroethylene (PCE) • Trichloroethylene (TCE) • Chlorinated solvents • Toluene
Enamels and lacquers	<ul style="list-style-type: none"> • Varathane 	<ul style="list-style-type: none"> • Hydrocote • Toluene
Glues and adhesives	<ul style="list-style-type: none"> • Epoxy 	<ul style="list-style-type: none"> • Polyurethane
Resins	<ul style="list-style-type: none"> • PVC resin 	<ul style="list-style-type: none"> • Urea formaldehyde
PCBs	<ul style="list-style-type: none"> • Polychlorinated Biphenyls 	<ul style="list-style-type: none"> • Industrial
Creosote	<ul style="list-style-type: none"> • Coal and tar distillates • Wood production 	<ul style="list-style-type: none"> • Benzene • Toluene • Ethylbenzene • Xylenes • PAHs
<p><i>These are just some of the chemical threats that you can help keep out of water sources.</i></p>		

What types of chemicals are threats?

The Ontario Ministry of the Environment has identified 21 main activities that could, in certain circumstances, pose a potential threat to drinking water sources from chemicals, pathogens or dense non-aqueous phase liquids (DNAPLs).

The following is a partial list some of the chemical and/or DNAPL potential threats which may exist on your property and on your shelves:

- **Pesticides**
(Sources may include lawn care, residential or agricultural application, forestry management, or other sources).
- **Inorganic contaminants**
(Sources may include inorganic fertilizers, road salt or other sources).
- **Chlorinated solvents**
(Sources may include dry cleaning fluids, metal degreasers and many more mixtures commonly found in residential, municipal, agricultural or industrial and commercial properties).
- **Dense non-aqueous phase liquids**
Please see accompanying fact sheet on DNAPLs to find out why these hard-to-detect, hard-to-remove heavy liquids are of particular concern.

The Province of Ontario Table of Threats has identified that handling and storage of DNAPLs could, in certain circumstances, have the potential to contaminate drinking water.

These dense liquids include:

- **Dioxane-1,4**
- **Polycyclic Aromatic Hydrocarbons (PAHs)**
- **Tetrachloroethylene (PCE)**
- **Trichloroethylene (TCE)**
- **Vinyl chloride (VC)**

PCE, TCE and VC include any product that breaks down to these chemicals.

Other non-aqueous phase liquid threats also appear in other sections of the provincial threats table (such as establishment, operation or maintenance of a waste disposal site).

The source protection committee in your region may also request the addition of local activities and circumstances to address any threats not already included in the threats table.

Chemicals related to application of pesticides to land include:

- **Atrazine**
- **Dicamba**
- **Dichlorophenoxy Acetic Acid (D-2,4)**
- **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**

Chemicals related to the handling and storage of fuel include:

- **BTEX**
- **Petroleum Hydrocarbons**

Chemicals related to the handling and storage of an organic solvent include:

- **Carbon tetrachloride**
- **Chloroform**
- **Methylene chloride**
- **Pentachlorophenol**

For more information visit sourcewaterinfo.on.ca or visit the Province of Ontario's Drinking Water Ontario website at: ontario.ca



Ausable Bayfield
Maitland Valley
Source Protection
Region

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Dense Non-Aqueous Phase Liquids

What are DNAPLs?

... and why is it so important that I help to keep them out of our water sources?

You have an important role to play helping keep contaminants out of drinking water sources.

It is especially important to keep dense non-aqueous phase liquids out of water sources.

Many of these liquids are proven, or suspected, of being carcinogenic (cancer causing). That's reason enough to keep them out of the water. There is another important reason:

DNAPLs are denser than water. Therefore, they can sink into the ground, below the water table, and pollute an entire aquifer. Monitoring wells may not detect their presence as they are found at the bottom of aquifers instead of floating on top.

Spills of dense non-aqueous phase liquids are even more difficult to handle than spills of petroleum products. It is extremely expensive and difficult – or even impossible – to clean up DNAPLs once they have contaminated water sources. Except in large cities, drinking water is rarely tested for these contaminants (according to an Environment Canada fact sheet).

These liquids could be present in some commercial dry cleaning operations or they could be in your house, farm or business.

Even nail polish in your home could contain DNAPLs. These dense non-aqueous phase liquids can be found in spot removers, glues and adhesives, varnishes, furniture stripper, aerosols, degreasers, coolants and automotive products or cleaners. They are also used in the production of pesticide mixtures applied on



Dense non-aqueous phase liquids may be found in furniture stripper and other products. These heavy liquids can sink below the water table and are hard to detect and remove. Your efforts to keep DNAPLs and other toxic chemicals out of water sources is vital to preserve healthy, clean water.

homes, farms or other properties.

One way you can help keep these toxic chemicals out of our water sources is to make sure you dispose of all hazardous wastes properly. Find out if a local business is accepting certain hazardous wastes. Contact your local municipality to ask if there is a hazardous waste disposal site, or when your next hazardous waste day occurs, or visit dowhatyoucan.ca

Trained staff are now contacting owners of properties near municipal wells and intakes to update information on potential chemical, pathogen and DNAPL activities near our drinking water sources.

The source protection committee in your region will develop plans by 2012 to reduce risks to your water. For information on the assessment of drinking water threats in your area, source protection plans or financial assistance opportunities, call us.

The contact information is located on the accompanying brochure 'Keeping Chemicals Out of Our Drinking Water Sources' or by phoning **1-888-286-2610**.



Don't throw your hazardous waste out in the garbage! Take it to a municipal hazardous waste site or disposal day or qualified business.

What are examples of DNAPLs?

Dense non-aqueous phase liquids (DNAPLs) are threats to human health. They are also particular threats to drinking water sources because they are heavier than water – which allows them to sink below the water table, making them hard to detect and hard to remove from drinking water sources.



Prevention is the safest and most cost-effective way to keep these toxic chemicals out of your water.

DNAPLs can be found in anything from nail polish to dry cleaning fluid to aerosols to electronics to woodworking products to automotive products like coolants or other fluids. These liquids include chlorinated solvents and cleaners and polychlorinated biphenyls (PCBs).

These toxic, hard-to-detect, hard-to-remove liquids may be present in many homes, industrial and commercial businesses, farms and municipal operations such as landfill sites. That's why we are encouraging you to dispose of your hazardous wastes properly.

Where might DNAPLs be found?

These potential threats are used in the production of drugs, in some dry cleaning operations, in metal degreasing, in the creation of pesticides, paint stripping, in manufacturing of cars, steels and aircraft and the manufacturing of electronics – and other processes.

The “handling and storage of a dense non-aqueous phase liquid” is one of the 21 drinking water threat activities under the General Regulation (*Ontario Regulation 287/07*) of the *Ontario Clean Water Act, 2006*. The DNAPL category of the provincial threats table itemizes some key chemical threats related to the handling and storage of these chemical mixtures:

- **Dioxane-1,4**
- **Polycyclic Aromatic Hydrocarbons (PAHs)**
- **Tetrachloroethylene (PCE)**
- **Trichloroethylene (TCE)**
- **Vinyl chloride (VC)**

DNAPLs aren't the only threats. Other toxic chemicals can be found in other categories of the threats table – for instance, under waste disposal site operation or pesticide handling, storage and application. See accompanying brochure, “*Keeping Chemicals Out of Our Drinking Water Sources.*”

What are LNAPLs?

Light Non-Aqueous Phase Liquids

Now that you know more about DNAPLs, we would like to take this opportunity to introduce you to another set of drinking water threats: LNAPLs. These are ‘light non-aqueous phase liquids.’

These include all hydrocarbons, like oil and gas. Like DNAPLs, these liquids don't generally mix with water. However, unlike the denser liquids, LNAPLs are less dense than water. They generally float on top of the water – not sink to the bottom. But – they're still highly toxic.

LNAPL contaminants include:

- **Benzene**
- **Toluene**
- **Ethylbenzene**
- **Xylenes (total).**

Common products that may contain DNAPLs or LNAPLs

Common products on local properties that may contain light or dense non-aqueous phase liquids include:

- Cleaners and manufacturing solvents
- Glues and adhesives
- Dry cleaning fluids in some operations
- Paint removers and strippers
- Aerosols and metal degreasers
- Printing inks
- Cosmetics, nail polish or nail polish remover
- Auto engine coolant or brake cleaner
- Many others ...

Trained staff are creating an inventory of pathogens, chemicals, and DNAPL activities near municipal wells and intakes for assessment reports.

That information will assist the local Ausable Bayfield Maitland Valley Drinking Water Source Protection Committee in the creation of drinking water source protection plans.

Chemicals, including non-aqueous phase liquids, can threaten both groundwater and surface water sources and human health. That's why your continued efforts to properly store and dispose of these chemicals is so important.

What chemicals might be located on my property?

Dense non-aqueous phase liquids (DNAPLs) are usually toxic, heavier than water, and can sink below the water table.

* Asterisk denotes chemicals listed in the CWA threats table category for DNAPLs. Other chemicals may appear in other categories such as pesticides or waste sites.

Chlorinated solvents are used in: • Electronics manufacturing • Solvent production • Pesticide/herbicide manufacturing • Dry cleaning • Instrument manufacturing • Solvent recycling • Engine and steel product manufacturing • Chemical production • Rocket engine/fuel manufacturing • Aircraft cleaning/engine degreasing. • Other home, municipal, farm and business uses. **They are used in processes such as:** • Metal cleaning and machining • Tool and die operations • Vapour and liquid degreasers • Paint stripping (NOTE: Some of these chemicals may no longer be in common use.)

Common present or past uses	Common names or trade names	Chemical names
Solvent that removes grease from metal parts. • dry cleaning • extractions • chlorinated solvent • industrial solvent • metal degreaser	TCE • Trichlor • Trike • Tricky • Tri • Trimar • Trilene • ethinyl trichloride • Tri-Clene • Trielene • Trichloran • Trichloren • Algylen • Trimar • Trethylene • Westrosol • Chlorylen • Gemalgene • Germalgene	• Trichloroethylene (TCE) *
Dry cleaning • metal cleaning • intermediates in processes • brake cleaner • paint remover • textile production processes	Tetrachloroethylene • ethylene • tetrachloride • Nema • Tetracap • Tetropil • Perclene • Ankilostin • PerSec	• Tetrachloroethylene (PCE) * Also: Perchloroethylene (PCE)
Automotive coolant • manufacturing solvent • soaps, shampoos, baby lotions • cosmetics • fumigants	Underground-storage DNAPL	• Dioxane – 1,4 *
Byproducts of fuel burning • Found in oil and coal deposits	PAHs • benzo[a]pyrene is an example • naphthalene and phenanthrene are other examples	• Polycyclic Aromatic Hydrocarbons (PAHs) *
Widely used plastic • aerosols • pipes • bottles • hair spray	• VCM • Used to create polymer polyvinyl chloride (PVC) • Vinyl chloride monomer • chloroethene • chloroethylene	• Vinyl chloride *

Other potential threats appear in other categories of the provincial threats table - e.g., operation of a waste disposal site. Local committees may also request additions. Here are other DNAPL or chemical contaminants to keep out of our water:

Thermometers • barometers • phosphorous tubes	Element HG • A toxic metal in liquid form • “The ultimate DNAPL.” – highly dense	• Mercury (HG)
Paint stripper • metal cleaning • pharmaceuticals • aerosols • acetate films • electronics • urethane foam	DCM • methylene chloride • methylene dichloride • methylene bichloride	• Dichloromethane (DCM)
Metal cleaning • adhesives • aerosols • inks • cold cleaning • electronics • aerosol paint concentrates	TCA • methyl chloroform • Chlorothene • Solvent 111 • Tri-ethane	• 1,1,1 –Trichloroethane (TCA)
Solvent • degreaser • pesticide formulation	Organic halogen compound	• Chlorobenzene
Fluorocarbon synthesis • fire extinguishers • refrigeration • electronics • sterilization	Carbon chloride • methane tetrachloride • benziform • perchloromethane • tetrachloroethane • Benzinoform • Freon 10 • Halon 104 • Tetraform • Tetrasol	• Carbon tetrachloride (CTC)
Solvent • Insecticide • Used in pesticides	Ortho-dichlorobenzene • organic comp. • benzene der.	• 1,2 – Dichlorobenzene
Solvent • chemical intermediate for dyes, pigment • commonly used in agrochemicals • insecticide • fungicide	M-dichlorobenzene • an organic halogen compound	• 1,3 – Dichlorobenzene
Fumigant • gasoline additive • pesticide • used in dye and wax preparation	Ethylene dibromide • ethylene bromide	• 1,2 – Dibromoethane (EDB)
Solvent • Used in herbicide, pigment, dye production	Chlorination of benzene results in this byproduct	• 1,2,4 – Trichlorobenzene [also: 1,1,2 Tri.]
Chlorinated solvent • Creation of semiconductors	DCE • An organochloride	• Dichloroethylene (DCE)
Solvent for fats, greases • fire extinguishers	Carbon tetrachloride • Benziform • Carbon chloride • Methane tetrachloride • Perchloromethane • Carbon tet • Benzinoform • Tetraform • Tetrasol • Freon 10 • Halon 104	• Tetrachloromethane
Fluorocarbon synthesis • pharmaceuticals • Re-agent • solvent for adhesives, fats, rubbers, oils, pesticides • dyes	Part of group of compounds called trihalomethanes • methyl trichloride	• Chloroform, Trichloromethane (TCM)

Polychlorinated Biphenyls (PCBs) PCBs may also have been mixed with aschlorobenzenes and/or mineral oil – as “carrier fluids.”

PCBs (Polychlorinated Biphenyls)	Congeners, <i>Aroclor (1221, 1232, 1242, 1248, 1254)</i>	PCBs (Polychlorinated Biphenyls)
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More chemicals listed on back of this page.

What other chemicals might be located on my property?

Continued from previous page

Pesticides – Here are some examples below:

Chlordane • Chloropicrin • 1,2-Dibromo-3-chloropropane • 1,2-Dichloropropane • 1,2-Dichloropropylene • Dichlorvos • Disulfoton • Ethion • Ethylene dibromide • Malathion • Parathion • Chlordane – Domestic and agricultural pesticide • Others ...

Mixed DNAPLs

A DNAPL that is composed of two or more chemical compounds is referred to as a multi-component DNAPL. Creosote and coal tar are examples.

Common present or past uses	Common names or trade names	Chemical contaminant
Solvent • feedstock • produced in making of gasoline • Toluene can be found in nail polishes, paints, lacquers	Toluene – methylbenzene	Mixed DNAPL solvents may contain: • toluene • 1,1,1-TCA • TCE • PCE • m-xylene • o,p-xylene • 1,2,4-TCB • PCB-1242 • PCB-1254

Creosote

Creosote was once used to treat wood products and in roofing and road tars. It contains many hydrocarbons and is made up of coal tar distillate.

Acid extractable	Base/neutral	Heterocyclic
phenol • cresols • pentachlorophenol • xylenols • 2,3,5-trimethylphenol	• naphthalene • methyl-naphthalenes • biphenyl • dimethylnaphthalenes • acenaphthene • fluorene • phenanthrene • anthracene • pyrene • chrysene • anthraquinone • 2,3-benzo[b]pyrene • methylanthracene • benzo[a]pyrene • diphenyldimethylnaphthylene • diphenyloxide	• quinoline • isoquinoline • carbazole • 2,4-dimethylpyridine • benzo[b]thiophene • dibenzothiophene • dibenzofuran

Coal tar

Coal tar can contain hundreds of hydrocarbons. It can be created from coal gasification or be a blast furnace coke production by-product. It can contain fractions of oils as well as anthracene oil and pitch. Coal tar compounds include: benzene • toluene • ethylbenzene • xylenes • PAHs.

Some other DNAPLs

Halogens and halogenated organics	<ul style="list-style-type: none"> • Benzyl chloride • Bromobenzene • Bromochloromethane • Bromodichloromethane Bromoform (solvent – waxes, greases, oils) • 4-Bromophenyl phenyl ether • bis(2-Chloroethyl) ether 2-Chloroethyl vinyl ether • 1-Chloro-1-nitropropane • 4-Chlorophenyl phenyl ether • Dibromochloromethane • 1,1-Dichloromethane (e.g., paint strippers) • 1,2-Difluorotetrachloroethane • 1-Iodopropane Hexachlorodibutadiene • Pentachloroethane • 1,1,2,2-Tetrabromoethane • 1,1,2,2-Tetrachloroethane • 1,2,3-Trichloropropane • 1,1,2-Trichloro-1,2,2-trifluoroethane
Substituted aromatics, phthalates, and miscellaneous organics	<ul style="list-style-type: none"> • Chloroanilines • Chlorotoluenes • Nitrotoluenes • Nitrobenzene • Benzyl butyl phthalate • Di-n-butyl phthalate • Diethyl phthalate • o-Anisidine • Phenyl ether • Tri-o-cresol phosphate

Some information courtesy Groundwater Protection and Restoration Group (University of Sheffield) [<http://www.dnapl.group.shef.ac.uk/main>] and Pankow, James F. & Cherry, John A. (eds.). *Dense Chlorinated Solvents and other DNAPLs in Groundwater*, Portland, Oregon: Waterloo Press, 1996.

Some other chemicals of concern

Common use or name	Contaminant
Nail polish remover	Acetone
Petroleum, varnishes	Benzene

Many other chemicals may also be of concern: ethylene glycol (e.g., antifreeze), methyl alcohol (e.g. windshield washer fluid), chlorodibromomethane, dichloroethane, phenol, and others. This is a partial list – please properly dispose of all hazardous wastes at municipal waste days or sites, or approved businesses.