



REMOVING THE STAIN

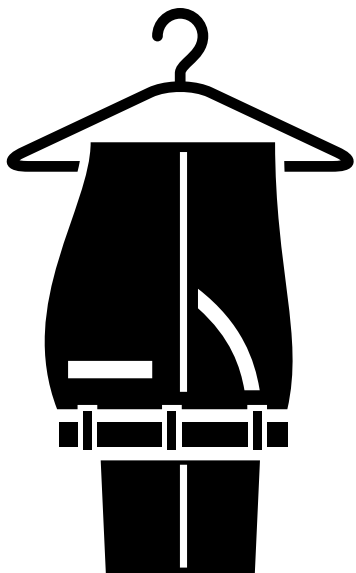
**GETTING CANCER-CAUSING
CHEMICALS OUT OF YOUR
CLOTHES**

November 2015



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ACKNOWLEDGEMENTS



Removing the Stain: Getting cancer-causing chemicals out of your clothes

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ABOUT ENVIRONMENTAL DEFENCE

ENVIRONMENTAL DEFENCE is Canada's most effective environmental action organization. We challenge, and inspire change in government, business and people to ensure a greener, healthier and prosperous life for all.



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EXECUTIVE SUMMARY

Tetrachloroethylene, more commonly known as perchloroethylene, (often shortened to PERC), is an organic, colourless, non-flammable liquid widely used for dry cleaning of fabrics. PERC acts as an effective solvent and stain remover for organic materials, making it one of the most popular chemicals used in dry cleaning in North America since the 1950s.¹ Unfortunately it is also very toxic to human health and the environment. While steps have been taken in the U.S. to restrict or phase out the use of PERC, it remains an all-too common chemical in the Canadian dry cleaning industry, and action is needed to protect the health of Canadians.

Short-term exposure to PERC can cause symptoms like dizziness, headaches, nausea, skin, eye, and lung irritation. Long-term exposure has been linked to various forms of cancer and reproductive health issues.² When spilled onto the ground, the chemical can even find its way into our drinking water.³ Studies suggest an association between PERC exposure from drinking water and increased risk of several cancers, including lung cancer, breast cancer, non-Hodgkin's lymphoma, and leukemia.⁴

PERC QUICK FACTS

- Toxic chemical linked to multiple forms of cancer and other serious health issues
- Poses risk to workers as well as residents living near dry cleaning operations
- Used widely in Canada's dry cleaning industry, even though sustainable, non-toxic alternatives are available
- Simply restricting PERC use can encourage businesses to switch to alternatives that are also toxic, so steps must be taken to encourage a switch to truly environmentally friendly options
- Experience in the U.S. shows that the right policy mix is needed to ensure switch from PERC to non-toxic alternatives

PERC usage in Canada's dry cleaning industry is widespread. According to the City of Toronto, which is the only municipality in Canada to track PERC usage and emissions, PERC is the number two dry cleaning pollutant in the city. Its release is only exceeded by volatile organic compounds (VOCs), which are

released from gas-fired boiling water in dry cleaning facilities and when hydrocarbon cleaning, a toxic alternative to PERC, is used. Businesses in Toronto using more than 100 kg of PERC per year (regardless of emissions) are required to report usage through the City’s ChemTRAC program. Most recent data shows that 42 per cent of the PERC used in the city’s dry cleaning facilities were released into outdoor air.⁵

The use of PERC by dry cleaners also produces hazardous waste. Additional releases to the environment result from inefficient machines and unsafe storage and handling. Language barriers and a lack of training and familiarity with safety standards can exacerbate the risks dry cleaning workers face.

COMPARISON OF PERC EXPOSURES

DRY CLEANING WORKERS	RESIDENTS LIVING NEAR DRY CLEANING OPERATIONS	DRY CLEANING CUSTOMERS
Workers are exposed via inhalation of emissions from dry cleaned clothes and equipment	The indoor air of homes, businesses and schools in close proximity to cleaners using PERC can be polluted with the chemical	Clothing that has been cleaned with PERC can potentially off-gas small amounts of PERC when brought home by customers

HEALTH RISKS:

- Acute health effects include skin irritation, headaches and dizziness.
- With long term exposure, elevated risk of cancer (e.g. liver and kidney cancers) and reproductive health issues.

At the federal level, Canada is lagging behind the United States when it comes to regulatory action. In Canada, federal *Dry Cleaning Regulations* require efficient machines that reduce emissions and regulate the use and disposal of PERC.⁶ But even when used efficiently, PERC still enters the environment via airborne emissions. In comparison, the U.S. Environmental Protection Agency (EPA) has taken additional steps to limit the exposure to PERC by requiring a mandatory phase out of dry cleaning facilities located in residential buildings by 2020.⁷

Despite its appeal a simple ban on the use of PERC could have unintended consequences. Several popular PERC alternatives also contaminate the environment and impact air quality. Most prominent among them is hydrocarbon cleaning. This method is slightly less toxic than PERC, but it is still a potent source of pollution that contributes to smog.

Jurisdictions at the city, state and federal level in the U.S. have implemented a host of policies and programs to phase out PERC with varying degrees of success. However, examination of efforts to eliminate PERC in California makes it clear that without robust programs to encourage safer substitution, PERC businesses may switch to hydrocarbon cleaning.



Dry cleaning businesses don't have to substitute one toxic method for another. Non-toxic alternatives to PERC and hydrocarbon cleaning that yield equal cleaning results are available. These are wet cleaning and liquid carbon dioxide. Wet cleaning is the safest and most cost-effective option, and therefore recommended by Environmental Defence. While safe, the costs of CO₂ cleaning are prohibitive, and therefore not economically feasible.

Key barriers to adoption of wet cleaning are the requirement for new equipment and additional staff training. However, experiences with various incentive and training programs in the U.S. have shown that a successful transition from PERC to a genuinely environmentally friendly alternative is possible.

For a successful phase-out of PERC to an environmentally friendly alternative, the right policy mix will be essential. Financial incentives to replace dry cleaning with wet cleaning equipment, coupled with training and mentoring programs, increase transition success. It is also essential to assess the need for training material and resources to be available in additional languages to maximize the reach of programs.

Canadians deserve to breathe clean air and be protected from chemicals linked to cancer. Moving Canada's dry cleaning industry away from the harmful chemical PERC and towards non-toxic, sustainable alternatives like wet cleaning is one important step. A look south of the border shows that Canadians don't have to risk their health for stain-free clothing.

KEY RECOMMENDATIONS

Government Decision Makers/Regulators

FEDERAL: **Phase out PERC**

Initiate a federal phase-out of PERC that gives businesses a reasonable time period to switch to non-toxic cleaning methods. Combine the phase-out of PERC with measures to encourage safer substitution with non-toxic alternatives. Improve sharing of PERC use and enforcement data with other levels of government.

PROVINCIAL: **Let Customers Know**

Institute “Right to Know” measures, including the placement of window signs for dry cleaning operations that disclose the type of dry cleaning chemicals being used. This will inform customers and increase demand for non-toxic cleaning methods.

MUNICIPAL: **Understand the Problem**

Assess dry cleaning chemical uses and pollution through programs like ChemTRAC and develop targeted education and incentive programs to support the shift away from using hazardous dry cleaning chemicals.



Businesses

CLEANERS: **Be the Change**

Replace aging PERC dry cleaning equipment with new wet cleaning technology.

DEPOTS (DROP-OFF ONLY): **Make the Switch**

If you run a dry cleaning business that only accepts, but doesn't process garments on site, ask your cleaning provider to use wet cleaning or switch to a cleaner who offers wet cleaning.



Customers

Choose Safer Cleaning Methods

Ask your dry cleaner about their cleaning methods and if available, insist on wet cleaning. Check out the joint Toronto Environmental Alliance/Environmental Defence pocket guide with more tips at environmental-defence.ca/drycleaning

Help Gather Data

If you live in the Toronto area, help collect information. Just ask your local dry cleaner to participate: torontoenvironment.org/dryclean_scorecard

Add Your Voice

Demand greater transparency about toxic chemicals in goods and services, such as window signs in dry cleaning businesses that disclose the chemicals used. **Take action at** environmentaldefence.ca/label



INTRODUCTION TO PERC

Imagine working in a business where you are exposed every day to a chemical linked to cancer – just by breathing. Imagine businesses that are allowed to release the very same harmful chemical into your city’s air. What sounds like something from a bygone era is actually the reality in many dry cleaning businesses across Canada that are still using toxic 1950s chemistry: perchloroethylene, more commonly known as PERC.

HEALTH IMPACTS

PERC is an organic, colourless liquid widely used for dry cleaning of fabrics. The non-flammable chemical is also volatile, meaning it evaporates (or can “off-gas”) at room temperature. Since the 1950s it has been the most widely used solvent in the dry cleaning industry in Canada.⁸ PERC acts as an excellent solvent and stain remover for organic materials.



PERC threatens the environment through direct release into the air during the dry cleaning process, but also from hazardous waste and spills that can contaminate soil and drinking water.

Unfortunately, PERC is highly toxic to both human health and the environment. PERC can be released into the environment directly as an air pollutant during the dry cleaning process and from contaminated waste and spills, which can find their way into soil and drinking water. All of these pose a health risk to the general public.⁹ The health of dry cleaning workers is threatened by releases of PERC into indoor air.

But residents of homes located near dry cleaning facilities or co-located with facilities (within the same building) are also at risk from PERC emissions. Some residents are more at risk than others, including individuals who stay at home over extended periods such as children, stay-at-home parents or the elderly. Dry-cleaned garments can also potentially emit PERC fumes into the homes of customers.

WHO IS AT RISK? CO-LOCATED FACILITIES

CO-RESIDENTIAL:



A dry cleaning operation and residents share a building or a common wall.

CO-SENSITIVE:



A dry cleaning operation and a facility like a hospital, kindergarten, nursing home, school or similar institution share a building or common wall.

Human health effects associated with PERC exposure vary with frequency, duration and amount of exposure. A high level of exposure over a short period can cause damage to the central nervous system and brain. This can lead to dizziness, headaches, sickness, skin, eye and lung irritation, as well as loss of short-term memory and focus. Moreover, long-term exposure can lead to problems in human reproduction and development.¹⁰ In rodent studies, inhaling or ingesting PERC has caused various forms of cancer including leukemia and those of the liver and kidney. PERC has been qualified as “probably carcinogenic to humans” by the International Agency for Research on Cancer and “likely a human carcinogen” by the United States Environmental Protection Agency (EPA).¹¹ Workers who undergo long-term exposure to PERC are also at increased risk of asthma, skin irritation and liver damage.¹²

Once released into the air, PERC breaks down into chemical components which have been suspected to contribute to the depletion of the ozone layer.¹³ In addition, aquatic animals are negatively affected by the concentration of PERC within their tissues. PERC is also known to be toxic to plants.¹⁴

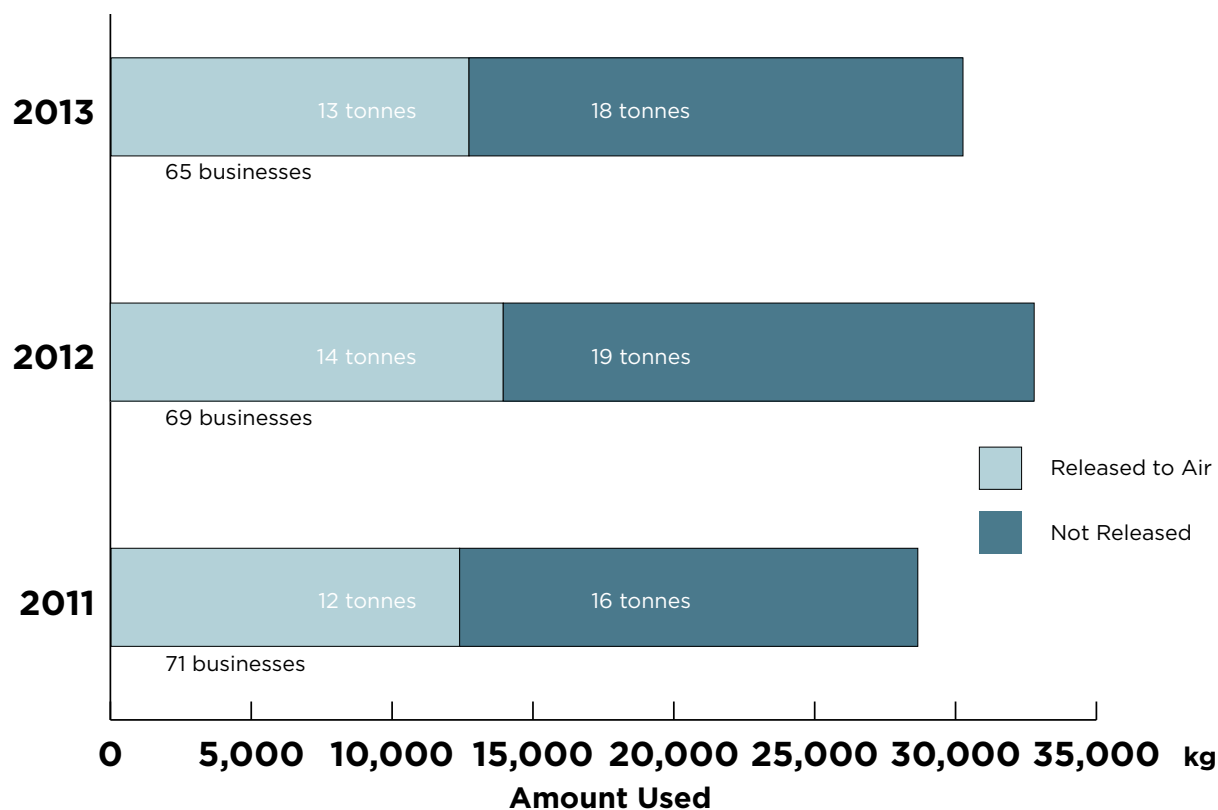
SITUATION IN TORONTO

PERC use is widespread in Canada’s dry cleaning industry, and major cities are no exception. Unfortunately, on the municipal level, only the City of Toronto tracks PERC use and emissions. Data from the City’s ChemTRAC reporting program give valuable insights about the PERC situation in Canada’s largest city.

The chemical continues to play a crucial role in Toronto’s dry cleaning industry. According to the ChemTRAC data, after volatile organic compounds (VOCs), PERC is the number two pollutant from dry cleaning businesses both in terms of consumption and emissions.

Out of approximately 90 dry-cleaners (it varies slightly by year) that report chemical uses and releases to the City of Toronto, the majority use PERC.¹⁵

REPORTED PERC USAGE AND EMISSIONS IN TORONTO



Between 65 and 71 businesses reported an average combined PERC usage of 31 tons annually for 2011-2013. 42 per cent ended up polluting Toronto's air as emissions.^{16, 17} Only businesses that use more than 100 kg of PERC are obliged to report their use and emissions to the City of Toronto ChemTRAC program. Facilities that operate below the threshold can submit reports voluntarily, but only around ten businesses do so every year. This makes it impossible to quantify the exact number of facilities using PERC. Additionally, many storefront dry cleaning businesses are merely depots, meaning they send clothing from customers offsite to larger facilities for cleaning.



In Toronto, 42 per cent of reported PERC usage is released into the air.

Data from the Ontario Ministry of Environment and Climate Change's Hazardous Waste Information Network gives some hints about the size of the PERC problem.¹⁸ PERC usage seems to be rather constant based on the total amount of annual PERC hazardous waste from Toronto dry cleaners, mirroring stable consumption numbers from the City of Toronto ChemTRAC system. However, the number of dry cleaners with hazardous PERC waste is 74 per cent higher than those reporting PERC usage under ChemTRAC, pointing to a large reporting gap. See Appendix C for detailed data.

City of Toronto and Ontario government data indicate consistent usage levels of PERC, making it clear that federal regulations meant to reduce pollution are not adequate to encourage businesses to phase out the use of PERC. In addition to the data gaps regarding businesses below the reporting threshold, there is also a need to determine the number of co-located dry cleaners in Toronto. Right now the City of Toronto has no information on where and how many residents are affected from local PERC pollution from dry cleaning operations.



Right now the City of Toronto has no information on where and how many residents are affected from local PERC pollution from dry cleaning operations.

The release of other pollutants from dry cleaning is also a concern, and must be taken into account when substitutes to PERC are being considered. While the majority of Toronto's cleaners reporting to ChemTRAC are using PERC, in 2012 and 2013 the amount of PERC used and released in Toronto's dry cleaning sector was exceeded by the amount of volatile organic compounds (VOCs) from hydrocarbon cleaning, a common PERC substitute. Average usage and emissions for VOCs per business were higher compared to PERC. This can partially be explained by the fact that higher amounts of VOCs are needed per kilogram of clothing compared to PERC. Another factor is that the ChemTRAC program includes VOCs released from energy usage when cleaners of several types - including those that use PERC - use natural gas to boil water in the cleaning process.

In Toronto, the largest dry cleaners continue to rely on PERC and hydrocarbon cleaning, with only one notable exception, Careful Cleaners.¹⁹ In the 1990s, Careful Cleaners were part of the Green Clean Project, an Environment Canada initiative that aimed to explore water-based cleaning as an alternative to PERC.²⁰ In 2014, they shifted entirely to wet cleaning. Including Careful Cleaners, nine cleaning businesses in Toronto currently offer wet cleaning.

ALTERNATIVES TO PERC

OVERVIEW

The widespread use of PERC in dry cleaning is unfortunate and avoidable, as safe, effective and non-toxic alternatives exist. There are several options for dry cleaning that do not use the toxic chemical, ranging from the environmentally friendly methods of wet cleaning and carbon dioxide or CO₂ cleaning, to the environmentally unfriendly methods of hydrocarbon cleaning, and silicone-based methods.

According to the California Air Resource Board, only water-based and CO₂ cleaning systems qualify as approved non-toxic and non-smog-forming dry cleaning technologies.²¹

- Both silicone-based and hydrocarbon dry cleaning methods produce waste that is harmful to the environment.²²
- Hydrocarbon cleaning contributes to air pollution.
- Silicone-based methods release highly persistent contaminants that impact aquatic ecosystems.²³

For a detailed comparison of the relative toxicity of PERC and its alternatives, see Appendix A.

A detailed comparison of costs of various cleaning methods is provided in Appendix B. While costs vary according to the size of a business, number of staff, rental fees, and other factors, the chart provides a good overview of operating costs.

WET CLEANING

Professional wet cleaning involves both water and biodegradable detergents, and it uses computer-controlled washers and dryers that minimize the amount of detergent used. It uses the least amount of energy both in terms of electricity and natural gas.²⁴

The EPA has concluded that the primary components of the detergents in wet cleaning do not have any expected health risks.²⁵

As wet cleaning uses less electricity, and does not generate hazardous waste, some of the operating costs associated with this type of cleaning are lower than less environmentally-friendly options.



CARBON DIOXIDE CLEANING

The CO₂ cleaning process involves liquid CO₂ as the cleaning solvent. It is a non-flammable, non-toxic and naturally occurring gas at room temperature. The CO₂ used in the process is derived from industrial processes as a by-product; therefore the use of the gas itself in the cleaning process does not actively contribute to global warming.²⁶

The drawback to this method is that it is significantly more expensive than other alternatives to PERC and is therefore not economically viable.



HYDROCARBON CLEANING

Hydrocarbon solvents (also called petroleum solvents) are flammable, volatile and toxic solvents.²⁷ They can cause skin, eye and respiratory irritation, nausea, headaches and dizziness. All hydrocarbon solvents are volatile organic compounds (VOCs) that must be used in closed-loop machines to limit smog-formation emissions.²⁸

Unfortunately, hydrocarbon solvents are not a viable alternative to PERC as they also use toxic chemicals. Hydrocarbon cleaning solvents are not considered carcinogenic, however they contribute to air pollution, which in itself is considered to be carcinogenic by the World Health Organization.²⁹

SILICONE CLEANING

Volatile methyl siloxane cleaning, also called silicone-based dry cleaning, has also been suggested as an alternative to PERC. However, volatile methyl siloxane solvents use an environmentally persistent chemical called siloxane.³⁰ These solvents are flammable and potentially toxic to aquatic ecosystems.

ASSESSING PERC SUBSTITUTES

Research on how to replace PERC has been conducted by various U.S. government and academic institutions. Two particular studies in California and Massachusetts clearly showed that wet cleaning is a commercially feasible alternative to PERC.³¹



Research shows that wet cleaning is the most technically viable, affordable and environmentally preferred alternative to PERC.

MASSACHUSETTS

In 2012, the Toxics Use Reduction Institute (TURI) of the University of Massachusetts conducted an assessment of seven common alternatives to PERC. These alternatives were assessed according to performance, cost, environmental and human safety, regulatory concerns and safety issues. Their recommendation was that wet cleaning was the most technically viable, affordable and environmentally preferred method for professional garment cleaning, and it was also a commercially feasible substitute for PERC.

The total cost of wet cleaning equipment ranges from \$36,000 to \$61,000 USD. It includes computer-controlled washers and dryers, specialized finishing equipment to process delicate garments and dispensing systems. The cost can vary depending on the size and the brand of the machines and whether the business already owns appropriate finishing equipment.

CO₂ based-cleaning requires “high-pressure basket-style” machines. Overall, the equipment is more expensive due to the pressure required. The cost of the CO₂ machines is significantly higher compared to wet cleaning equipment, typically ranging from \$100,000 to \$150,000 USD.

For comparison, the capital costs for dry cleaning equipment needed for PERC usage range from \$40,000 to \$65,000 USD. Apart from post-cleaning equipment, wet cleaning machines, CO₂ machines and PERC machines are not interchangeable; meaning a switch from PERC to those two methods requires equipment replacement.³² In contrast, some PERC machines can be switched to hydrocarbon cleaning.³³

CALIFORNIA

In 2000, the South Coast Air Quality Management District (SCAQMD), a public agency that regulates the stationary sources of air pollution in the Los Angeles metropolitan area, funded a demonstration project that compared before-and-after evaluations of seven dry cleaning businesses that converted from PERC to professional wet cleaning.

The results showed that dry cleaners were able to maintain their level of service, and that the customers' level of satisfaction was equal or higher with their new wet cleaning methods. In addition, wet cleaning involved significantly lower operating costs. The cleaning agents used in wet cleaning can be costly but not as high as the costs associated with operating PERC dry cleaning. Using PERC entails higher costs related to disposal of hazardous wastes, regulatory fees, mandatory staff training, solvents, maintenance, depreciation and higher electricity costs.³⁴

With health, environmental and financial benefits clearly demonstrated, jurisdictions in Canada should encourage dry cleaning businesses to switch from PERC to wet cleaning technology. The City of Toronto, as the largest city in Canada and only city with a PERC reporting system in place, is poised to take a leading role on this.

OVERVIEW PERC AND ALTERNATIVES

	MACHINE COST (IN USD)	HAZARDOUS WASTE	MANDATORY STAFF TRAINING	ELECTRICITY COSTS PER 100 LBS CLOTHING	TOXICITY TO HEALTH AND ENVIRONMENT
PERC	\$40-\$65k	High	Yes	\$4.28	Very High
Wet cleaning	\$36-\$61k	None	None	\$1.50	None
CO ₂	\$100-150k	None	None	\$4.90	Low
Hydrocarbon	\$38-\$75k	High	Yes	\$5.71	High
Silicone	\$30-\$55k	High	Yes	\$8.73	High

HOW CANADA IS FAILING TO ADDRESS THE RISKS OF PERC

FEDERAL REGULATIONS

PERC has been widely used in Canada for more than sixty years. It is listed as a toxic substance under the *Canadian Environmental Protection Act* (CEPA). Under CEPA, the *Solvent Degreasing Regulations* (2003) regulate the use of PERC, with the purpose of reducing the consumption and release of PERC into the environment.³⁵ Release limits only exist for facilities using more than 1,000 kilograms of PERC per year – a very high threshold.



Existing federal regulations are inadequate. Businesses continue to release large amounts of the toxic chemical into the environment, putting workers and nearby residents at risk.

Additionally, Environment Canada developed the *Tetrachloroethylene Regulations* (2003), which require that owners and operators properly handle, recover and dispose of PERC in a safe way. PERC should be kept in closed containers and used in well-equipped machines. Owners and operators are also required to report and keep records of their PERC use. Similarly, importers of PERC into Canada, recyclers and sellers of PERC used in dry cleaning are also required to maintain books and records related to PERC. All report forms are required to be submitted annually to Environment Canada regional Offices.³⁶

In summary, the federal actions have been focused on better managing the use of PERC. However, existing federal regulations are inadequate. Businesses continue to release large amounts of the toxic chemical into the environment, putting workers and nearby residents at risk.

ONTARIO REGULATIONS

In Ontario, *Dry Cleaning Regulation 323/94* requires that dry cleaning establishments have one of their employees undergo contaminant and waste management training. The mandatory training is provided centrally at Seneca College in Toronto.³⁷ The training program has the potential to help in educating dry cleaning operators about safe alternatives to PERC.

TORONTO REGULATIONS

The ChemTRAC program in Toronto, under the City's Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423), requires dry cleaners to report on the use and release of PERC if they use more than 100 kg per year.³⁸ Facilities that do not meet this threshold are not required to report.

Toronto Public Health released a report on PERC in 2007 which recognized PERC as a likely human carcinogen. Toronto Public Health raised the need for stronger regulations from Environment Canada towards existing federal PERC regulations, deeming them insufficient.³⁹ The report recommended that additional measures should be implemented to reduce PERC usage - in particular in co-located units.⁴⁰ Sadly, there has been no progress on stricter PERC regulations on the federal level in the eight years since the Toronto Public Health recommendations.

According to Toronto Public Health research, PERC is used in most dry cleaning facilities in Toronto and these facilities are mainly small, family-owned businesses. Small-scale businesses also dominate the Canadian market outside Toronto. In 2012, small washing and dry cleaning companies generated the majority of the sector's revenue.⁴¹



HOW THE U.S. IS TAKING ACTION

Given PERC's high toxicity, several jurisdictions have imposed strict limits on PERC air concentrations in facilities that use the chemical. In the U.S., the workplace concentration limit has been set at 0.1 mg/m³ by the Occupational Safety and Health Administration (OSHA).⁴²

Likewise, given PERC's role as a groundwater pollutant, maximum pollution levels have been set for drinking water in many countries. The U.S. value, determined by the federal Environmental Protection Agency (EPA), is 0.005 milligram/litre.⁴³

FEDERAL REGULATORY SITUATION IN THE UNITED STATES

PERC's adverse health and environmental effects first became known in the 1970s, and in 1990 it was listed as a hazardous air pollutant under the *U.S. Clean Air Act*.⁴⁴

By July 2006, the United States Environmental Protection Agency (EPA) issued a national requirement to dry cleaners located in residential buildings to phase out the use of PERC by 2020. However, according to Sierra Club, dry cleaners found in residential buildings represent less than 10% of the total number of cleaning facilities in the U.S.⁴⁵ As a result, environmental groups Sierra Club and Earth Justice are at the forefront of pushing for phasing out the use of PERC in all dry cleaning facilities.⁴⁶

In addition to phasing out the use of PERC in dry cleaning facilities co-located with residences, all dry cleaning facilities currently using PERC across the U.S. must now meet stricter equipment standards.⁴⁷ These standards require that machines must have a secondary emission control system.⁴⁸ Moreover, all dry cleaners are required to have tools such as vapour barriers and carbon absorbers to address potential leaks.

CALIFORNIA

The California South Coast Air Quality Management District (SCAQMD) and the California Air Resources Board (CARB) were the first regional and state agencies to begin phasing-out PERC dry cleaning in 2003 and May 2008 respectively.⁴⁹ CARB is a branch of the state's Environmental Protection Agency and responsible for clean air standards while SCAQMD regulates the stationary sources of air pollution in the Los Angeles metropolitan area, the second-most populated area in the U.S.



Regulators in Southern California began phasing-out PERC dry cleaning in 2003.

The phase-out by SCAQMD is still on-going but any dry cleaner opening after January 2003 is forbidden from using PERC.⁵⁰ Drycleaners in this region that opened prior to this date are subject to tightened regulations regarding the usage, handling, and storage of PERC including primary and secondary controls and are subject to quadrennial reporting requirements. All PERC machines in the SCAQMD jurisdiction must be removed from service by 2020.

In 2007, CARB took a step further. Dry cleaners in the rest of California must remove all PERC machines from service by 2023.⁵¹ The installation of new PERC machines was forbidden as of January 1st 2008 and by 2010, all PERC machines located in co-residential facilities and any PERC dry cleaning system over 15 years old were to be removed from service.⁵²



In California, the massive switch from PERC to hydrocarbon cleaning and the relatively small number of switchovers to wet cleaning show that restrictive PERC policies are not enough.

The viability of wet cleaning had already been demonstrated by the previously mentioned SCAQMD study in 2000.⁵³ The favourable results prompted SCAQMD to develop educational programs to inform dry cleaners about the benefits of wet cleaning. In 2003, the SCAQMD, Southern California Edison, the primary electricity supply company for much of Southern California, and regional trade associations created a permanent professional wet cleaning demonstration centre that hosts periodic workshops on the viability of wet cleaning.^{54, 55}

In 2003, California's *Non-Toxic Dry Cleaning Incentive Program* imposed a fee on PERC users and offered \$10,000 grants to dry cleaners that switched from PERC cleaning systems to wet cleaning or CO₂ technology alternatives. A lesser award of \$5,000 was offered to dry cleaners that switched to hydrocarbon and silicone-based methods.⁵⁶ By 2010, the number of wet cleaners increased by 150, while hydrocarbon dry cleaners increased by over 1,500. The main reason was that wet cleaning requires the replacement of equipment and additional staff training while hydrocarbon cleaning often only requires a relatively simple chemical substitution that allows continued use of the original PERC equipment. Hydrocarbon cleaning is still the most popular alternative in California.⁵⁷

The massive switch from PERC to hydrocarbon cleaning and the relatively small number of switchovers to wet cleaning show that restrictive policies are not enough. In order to encourage dry cleaning operators to switch from PERC to wet cleaning, incentives and training programs need to be part of the approach.

NEW JERSEY

In 2009, the New Jersey Department of Environmental Protection used over \$4 million to finance a *Dry Cleaner Equipment Removal Reimbursement Program*. The program aimed to encourage the voluntary removal of PERC dry cleaning machines, in particular those in co-located and co-sensitive facilities (especially with daycare centres).⁵⁸ The same program also provided a separate financial incentive of \$15,000 to operators for purchasing a new wet cleaning system.⁵⁹ In total, dry cleaning operators could receive a total of \$25,000 for replacing a PERC system with a wet cleaning system.

MASSACHUSETTS

OVERVIEW OF REGULATORY ACTION BY SELECTED U.S. AUTHORITIES

	BAN ON NEW PERC MACHINES	BAN ON CO-LOCATED PERC MACHINES	BAN ON ALL PERC MACHINES
U.S. Federal (EPA)	-	2020	-
Southern California (SCAQMD)	2003	2010 (by CARB)	2020
Rest of California (CARB)	2008	2010	2023
City of Philadelphia	-	2013 (includes co-sensitive locations)	-

In Massachusetts, the Department of Environmental Protection regulates the use of PERC. It is listed as a toxic substance and a higher hazard substance under the Toxics Use Reduction Act. Businesses with more than 10 employees and with annual usage exceeding 1000 lbs of PERC must report on their PERC usage and prepare an annual reduction plan. Annual PERC reporting requirements for dry cleaners also include air emissions, wastewater and

hazardous waste management.⁶⁰

CITY OF PHILADELPHIA

The City of Philadelphia extended the EPA phase-out of PERC in dry cleaning operations located in residential buildings to co-sensitive facilities. These are defined as units that are below, above or next to a hospital, daycare, school, health clinic, community centre or recreation area. Philadelphia achieved this in 2010 through their *Air Management Regulation XIV*. The regulation forbids the use or emission of PERC by both co-located and co-sensitive facilities after the year 2013.⁶¹

All co-located facilities are eligible for a \$1,000 grant to purchase a new non-PERC dry cleaning machine.⁶²



CITY OF NEW YORK

As of February 2014, all dry cleaners are required to post the type of chemicals they use, following the passage of public “Right to Know” legislation. This enables customers to make an informed choice about the type of cleaning service they will use, and to learn more about potential risks associated with their use.⁶³

CITY OF BOSTON

Boston offers a case study for switching small, immigrant-owned dry cleaning businesses from PERC to wet cleaning.

In the neighborhood of Jamaica Plain, toxic chemicals are widely used in local businesses and the rate of all forms of cancer is higher than the rest

of the state. A local NGO, the Jamaica Plain New Economy Transition (JPNET) worked with the University of Massachusetts to move local dry cleaners to wet cleaning.⁶⁴

The group approached all existing dry-cleaners and came to them with a green cleaning presentation to explain the dangers of PERC and the possible ways to convert to wet cleaning. A \$15,000 grant, awarded by the University of Massachusetts’ Toxics Use Reduction Institute (TURI), was offered to dry cleaners that were interested in switching from PERC to wet cleaning.⁶⁵

Many dry cleaning storefront businesses in Jamaica Plain are owned and operated by immigrants for whom the cost of converting to wet cleaning might be prohibitive in the absence of financial supports or other incentives. As part of the project, an immigrant-owned dry cleaning family business was converted from PERC to wet cleaning with the help of a crowdfunding initiative. The business became the first professional wet cleaning facility in Boston.

COMPARISON OF U.S. GRANT PROGRAMS

	PERC MACHINE REMOVAL	SWITCH PERC TO WET CLEANING	SWITCH PERC TO HYDROCARBON CLEANING
California	-	\$10,000	\$5,000
New Jersey	\$10,000	\$15,000	-
Philadelphia (City)	-	\$1,000	\$1,000
Boston (TURI)	-	\$15,000	-

PHASING OUT PERC: HOW TO DO IT RIGHT

In the U.S., the lack of a federal ban on PERC has prompted state and municipal levels of government to push for a phasing out of PERC beyond co-located dry cleaning facilities.

The State of California has taken the vanguard role with its commitment to phase-out of PERC from all dry cleaning operations by 2023. However, initial results show that only a fraction of operators are switching to the most sustainable alternative, wet cleaning, while the vast majority of operators seem to be opting for hydrocarbon cleaning. The associated VOCs involved in this type of cleaning, while not as toxic as PERC, come with their own serious health risks, as the recent Environmental Defence report “The Dirty Truth - How Toxic Cleaning Products Are Putting Canadians at Risk” showed.



Most dry cleaning operators are simply not familiar with wet cleaning technology, its health and financial benefits and high quality of cleaning.

The main hurdle for operators seems to be that the switch to wet cleaning requires new equipment and additional staff training, while the switch to hydrocarbons in some cases can amount to simply swapping out chemicals where appropriate equipment exists. Most dry cleaning operators are simply not familiar with wet cleaning technology, its health and financial benefits and high quality of cleaning.

Therefore it's clear that restrictive policies aimed at curtailing the use of PERC in Canadian dry cleaning operations would not be enough. In order to initiate a widespread transition to wet cleaning and discourage moves to hydrocarbons or silicone-based methods, the right incentives and educational measures are needed.

Regular workshops or establishing a demonstration and training facility should be considered by municipalities. In addition to online and print material in English, it will also be important to provide information in other languages common among dry cleaning business operators in Canada's major cities. In response to community needs, Toronto Environmental

Alliance (TEA) has already made materials available in Korean to dry cleaning operators in Toronto. Facilitating the sharing of success stories of wet cleaners might inspire current dry cleaners to make the shift.

The various transition incentive amounts examined in this study ranged from \$1,000 to \$25,000 USD total per business. These grants cover a portion of the overall cost for new wet cleaning equipment, which the Massachusetts-based Toxics Use Reduction Institute (TURI) pegged at \$36,000 to \$61,000 USD. Smaller, family-run dry cleaning businesses would probably need substantial financial incentives to make such an investment when a simple chemical substitution is easier and cheaper.



RECOMMENDATIONS

Despite its toxic properties, PERC remains in widespread use in the dry cleaning industry in Toronto and across Canada. Hydrocarbon cleaning, another important dry cleaning method, cannot be considered a safe alternative to PERC due to its associated environmental risks, including air pollution which impacts human health. If a transition to wet cleaning as a sustainable and healthy alternative to PERC is to occur, action is needed by various levels of government.



Government action is needed for a transition to wet cleaning as a sustainable and healthy alternative to PERC.

A federal ban on the use of PERC would be the most effective way to eliminate exposure. We recommend that the new federal government initiates such a ban in a manner that prevents unsafe substitution of PERC with hydrocarbon cleaning.

At the provincial level, “Right to Know” measures can inform customers and increase transparency to support the switch to sustainable methods via increased demand. In Ontario, the legal framework already exists with the *Ontario Toxics Reduction Act* (2009), but the specific section (50.(1)(o.2)) has not yet been enacted. It could easily be activated to fulfill the government’s mandate to provide better information about carcinogens in consumer products.⁶⁶ This section could support the implementation of a storefront signage program that discloses the chemicals used in dry cleaning to customers, mirroring the action taken by the City of New York.

We are confident that municipal governments like the City of Toronto can play an effective role in transitioning Canada’s dry cleaning industry away from PERC and similarly toxic chemicals to a healthy and sustainable way of operating. Other municipalities should use the City of Toronto’s ChemTRAC program as a model for tracking the use and release of chemicals. Incentive and education programs should be implemented at the municipal level as well, responding to local businesses needs.

To this end, Environmental Defence makes the following recommendations:

Government Decision Makers/Regulators



FEDERAL: **Phase out PERC**

- Initiate a phase-out of PERC managed by Environment Canada, with a view to a complete cessation in the use of PERC while giving businesses a reasonable time period over which to switch to better methods.
- The PERC phase out should include measures to encourage safer substitution and prevent a switch to hydrocarbon cleaning or other polluting alternatives.
- Improve sharing of PERC use and enforcement data with other levels of government.

PROVINCIAL: **Let Customers Know**



- Institute “Right to Know” measures requiring business disclosure to their customers of the type of dry cleaning chemicals being used through the Ontario Toxics Reduction Act, by enacting section 50.(1)(o.2). This will inform consumers and increase transparency to support the switch to sustainable methods via increased demand.

MUNICIPAL: **Understand the Problem and Support Local Businesses**



- Municipalities can use the City of Toronto’s ChemTRAC program as a model for tracking the use and release of PERC and other dry cleaning contaminants from businesses.
- Introduce financial incentives that help with the cost of replacing dry cleaning with wet cleaning equipment. Property tax breaks or similar tax incentives could be provided to businesses that switch to wet cleaning.
- Implement training and mentoring programs that provide staff with the necessary skills and guidance. Any equipment replacement program should be supplemented by education and training programs. Small businesses should be provided with information and training on how to use wet cleaning machines through workshops.
- Develop a mentorship program for small businesses switching to safer alternatives. In jurisdictions where dry cleaners have already begun to use alternatives to PERC, successful wet cleaning businesses should be encouraged to share best practices with interested operators still using PERC.
- An educational program targeting depots that do not clean on site could encourage a shift to using wet-cleaning facilities.

Businesses

CLEANERS: Be the Change

Replace aging PERC dry cleaning equipment with new wet cleaning technology.

DEPOTS (DROP-OFF ONLY): Make the Switch

If you run a dry cleaning business that only accepts, but doesn't process, garments on site, ask your cleaning provider to use wet cleaning or switch to a cleaner who offers wet cleaning.



Customers

Choose Safer Cleaning Methods

Ask your dry cleaner about their cleaning methods and if available, insist on wet cleaning. Check out the joint Toronto Environmental Alliance/Environmental Defence pocket guide with more tips at environmentaldefence.ca/drycleaning

Help Gather Data

If you live in the Toronto area, help collect information. Just ask your local dry cleaner to participate: torontoenvironment.org/dryclean_scorecard

Add Your Voice

Demand greater transparency about toxic chemicals in goods and services, such as window signs in dry cleaning businesses that disclose the chemicals used. **Take action at environmentaldefence.ca/label**



APPENDIX A - TOXICITY SUMMARY TABLE

IMPACTS	DRY CLEANING (PERC)	WET CLEANING	CARBON DIOXIDE	HYDRO-CARBON	SILICONE CLEANING
Environmental	Persistence	Low in water, soil and air Moderate in sediment	NA	Low in water, soil and air Moderate in sediment	Low in water Moderate in soil High in sediment and air
	Bioaccumulation	Low	NA	Moderate	Moderate
	Aquatic Toxicity	Moderate	Low	High	High
Human Health	Neurotoxicity	No	No	Yes	Inconclusive
	Reproductive Toxicity	Negligible	Unknown	Unknown	Some concern
	Carcinogenicity	Not classified by IARC	Not classified by IARC	Not classified by IARC	Inconclusive
	Recommended Exposure Limits	NA	5000 ppm	100 ppm	10 ppm
		25 ppm			

Source: Toxic Use Reduction Institute (2012).

APPENDIX B - COMPARATIVE COST ANALYSIS OF CLEANING METHODS

COST	DRY CLEANING (PERC)	WET CLEANING	CARBON DIOXIDE	HYDROCARBON	SILICONE CLEANING
Cost per lb cleaned ¹	USD\$0.63 - USD\$1.94 (avg. USD\$1.02)	USD\$0.57 - USD\$1.32 (avg. USD\$1.10)	USD\$1.40	USD\$0.73 - USD\$1.02 (avg. USD\$0.88)	USD\$1.08 - USD\$2.33 (avg. USD\$1.71)
Capital (e.g. equipment)	USD\$40,000 - USD\$65,000	USD\$36,000 - USD\$61,000	USD\$100,000 - USD\$150,000	USD\$38,000 - USD\$75,000	USD\$30,500 - USD\$55,000
Chemical (e.g. solvent/detergent per gallon)	USD\$17 per gallon	USD\$0.007/gallon (water) ² + USD\$25-USD\$31/gallon of detergent	USD\$0.18/lb CO ₂ + USD\$40/gallon of detergent	USD\$14 - USD\$17 per gallon	USD\$22 - USD\$28 per gallon
Mandatory staff training	CAD\$527.35 ³	\$0	\$0	\$527.35 CAD	\$0
Electricity usage (per 100 lbs clothing)	26.6 kWh X 16.1cents ⁴ = CAD\$4.28	9.3 kWh ⁵ X 16.1cents = CAD\$1.5	30.9 kWh X 16.1cents = CAD\$4.9	35.5 kWh X 16.1cents = CAD\$5.71	54.2 kWh X 16.1cents = CAD\$8.73
Natural gas usage (per 100 lbs clothing)	12 therms or 34m ³ of usage = CAD\$5.01 ⁶	9 therms or 25.47m ³ of usage = CAD\$3.76 ⁷	7.3-14.2 therms or 20.6-40.19m ³ of usage = CAD\$3.04-\$5.93	13.1 therms or 37.07m ³ of usage = CAD\$5.47	13.4 therms or 37.92m ³ of usage = CAD\$5.6
Maintenance ⁶⁷	3.5% of annual revenue	1.5% of annual revenue	1.5% of annual revenue	2.5% of annual revenue	2.5% of annual revenue
Hazardous waste management	Type: hazardous still bottoms and spent filters. Cost: \$300 - \$400 CAD per barrel (i.e. \$1.50 - \$2.00 per litre) ⁶⁸	Type: non-hazardous spent filter and solid waste.	Type: non-hazardous spent filter and solid waste.	Type: hazardous still bottoms and spent filters.	Type: non-hazardous still bottoms and spent filters.

Source: Toxic Use Reduction Institute (2012), unless otherwise indicated in endnotes.

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- ² In some cases, dry cleaning may consume more water than wet cleaning due to PERC air emission control and recycling systems using water for cooling.
- ³ In compliance with Ontario Regulation 323/94 – The Dry Cleaners Regulation under the Environmental Protection Act (1994) dry cleaners must have at minimum one employee who has completed the environmental management training course.
- ⁴ 16.1 cents per kWh – Ontario's electricity rate for on-peak hours.
- ⁵ Wet cleaning uses less electricity primarily because of the elimination of power-intensive cleaning and water cooling machines required for dry cleaning systems. Additionally, dry cleaning using PERC requires more power for recycling solvent vapours ([Sinsheimer & Latif, 2007](#)).
- ⁶ Therms, a unit of heat energy, equals in terms of energy approximately 100 cubic feet or 1 CCF of natural gas. Cost calculated by converting to cubic metres (1ft³ = 0.0283m³), then multiplying by 14.7524 ¢/m³ – the natural gas rate in Toronto as of July 1, 2015.
- ⁷ A study by Sinsheimer (2007) did not find a statistically significant reduction in natural gas used after switching from PERC dry cleaning systems to wet cleaning (the study was part of the Professional Wet Cleaning Demonstration Project that evaluated seven PERC dry cleaners switching to wet cleaning).

APPENDIX C - PERC USAGE AND HAZARDOUS WASTE IN TORONTO

Year	HAZARDOUS WASTE PUBLIC INFORMATION			CHEMTRAC DATA				# of Generators not reported in ChemTRAC
	Total Sum Received (kg)	Number of Generators	Sum of Total Use (kg)	Sum of Released To Air (kg)	Count of Total Use	Sum of Total Use (kg)		
2014	43787	113	NA	NA	NA	NA		
2013	48557	102	30240	12705	65*	12705	55	
2012	49138.5	149	32792	13945	69	13945		
2011	44265	105	28636	12372	71	12372		

*Note that some generators that reported to ChemTRAC were not reported in the hazardous waste public information database.

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