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Final Report

A Profile of the Dry Cleaning Industry in King County, Washington

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This report was prepared by the Local Hazardous Waste Management Program in King County, Washington. The program seeks to reduce hazardous waste from households and small quantity generator businesses in King County by providing information and technical assistance to protect human health and the environment.

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Acronyms and Abbreviations

BFS	Business Field Services
CDC	Centers for Disease Control and Prevention
$\chi 2$	Chi-square
CO_2	Carbon dioxide
DLI	Dry Cleaning Laundry Institute
DOR	Washington State Department of Revenue
DSHS	Washington State Department of Social and Health Services
DOSH	Division of Occupational Safety and Health
Ecology	Washington State Department of Ecology
°F	Degrees Fahrenheit
L&I	Washington State Department of Labor and Industries
LHWMP	Local Hazardous Management Program in King County
MRL	Minimal Risk Level
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PEL	Permissible exposure limit
PERC	Perchloroethylene
PH-SKC	Public Health-Seattle & King County
PPE	Personal protective equipment
ppm	Parts per million
PSCAA	Puget Sound Clean Air Authority
SPSS	IBM SPSS Statistics
STEL	Short-term exposure limit
TWA	Time-weighted average
µg/L	Micrograms per liter
U.S. EPA	United States Environmental Protection Agency
VOC	Volatile organic compounds
WISH Act	Washington Industrial Safety and Health Act
WSIRB	Washington State Institutional Review Board

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Executive Summary

Workers in the dry cleaning industry are exposed to a variety of harmful solvents, and poor work practices can result in extensive environmental contamination. Of particular concern is perchloroethylene (PERC), which is the most commonly-used cleaning solvent. This chlorinated hydrocarbon is a pervasive environmental contaminant and a probable human carcinogen. PERC is also a neurotoxin and is toxic to the liver and kidneys.

This study was comprised of key informant interviews, site visits, and a county-wide business survey. The objectives were to gather information about: 1) the demographics of the dry cleaning industry; 2) general business characteristics, including the solvents used for cleaning; 3) current practices to protect human health and the environment; 4) perceptions about health and environmental protection, including business owners' needs; and 5) strategies to reduce occupational and environmental exposures and increase awareness.

The 64 percent response rate to the survey suggests that the results are likely representative of King County's dry cleaning industry. Dry cleaning was determined to be dominated by small, Korean-owned, family-run businesses. Although the use of PERC as the primary dry cleaning agent has decreased in recent years, this solvent is still used by the majority of businesses. Despite the attention paid to this industry by the Local Hazardous Management Program in King County (LHWMP) for more than a decade, many shops continue to face health and environmental protection challenges. Many of these difficulties are common to the small business community, and result from insufficient funds to address workplace health and safety concerns, inattention by regulatory agencies, and cultural barriers to effective communication of best management practice recommendations.

This industry would benefit from regulatory intervention, in concert with an educational campaign and enhanced technical and financial assistance. However, any intervention must account for the financial and demographic characteristics of this industry.

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Introduction

The dry cleaning process uses non-aqueous solvents to clean fabrics. Dry cleaning has existed as an industry since the mid-19th century. Historically, solvents such as kerosene, benzene, and gasoline were used as cleaning agents.[1] Currently, the most common solvent is perchloroethylene (PERC, PCE, or tetrachloroethylene), which has been classified as a probable human carcinogen by the United States Environmental Protection Agency (U.S. EPA).[2] Although alternative solvents are available, the industry has been slow to adopt these technologies. There is a belief in the industry that the alternative solvents are more expensive than PERC, that they do not clean as efficiently, and little information is available about their effects on human health and the environment.[3]

The Local Hazardous Waste Management Program

LHWMP was established in 1990 in response to the Washington State Dangerous Waste Management Act (RCW 70.50.220), which required local governments to address small quantity hazardous waste streams from businesses and households. The program has operated since 1991 to "address hazardous materials and to protect the public and the environment from their effects." LHWMP is comprised of the King County Water and Land Resources Division, King County Solid Waste Division, Seattle Public Utilities, Public Health-Seattle & King County, and the Suburban Cities Association.[4]

LHWMP is a non-regulatory program with no enforcement authority. Consequently, the program emphasizes free-of-charge, on-site technical assistance, educational outreach, and incentive programs to achieve its mission. Incentive programs include LHWMP's EnviroStars Program[5] and the Voucher Incentive Program.[6]

The EnviroStars Program provides recognition to small businesses that use environmentally responsible practices, such as reducing the use of hazardous materials and minimizing waste generation. Businesses apply for certification through LHWMP and, if approved, are awarded a two- to five-star rating. The certification is intended to provide consumers with a means to identify and support environmentally responsible local businesses.

The Voucher Incentive Program provides small and medium-sized businesses with one-time matching funds (up to $500) to make improvements to their handling, management, and disposal of hazardous materials.

LHWMP and dry cleaning

LHWMP has worked extensively with the dry cleaning industry in King County by providing education, outreach, and on-site assistance. In 1996, LHWMP became aware that several dry cleaners in King County were responsible for contaminating groundwater with PERC. Consequently, between 1997 and 1998, LHWMP staff visited approximately 20 percent of King County dry cleaners to evaluate waste handling practices. This was followed by a large technical assistance effort between November 1998 and July 2000, in which field personnel visited every dry cleaning business in King County (approximately 340 locations). Staff provided guidance on the proper handling, management, and disposal of hazardous materials. During these visits, it was estimated that 60 percent of the shops were owned and operated by individuals whose first

language was Korean and that all but a few businesses were using PERC as their dry cleaning solvent.[1]

In 2000-2001, LHWMP provided funding to the two local dry cleaning associations in order to recruit businesses for EnviroStars certification. Ninety dry cleaners subsequently joined the EnviroStars Program. Currently, 62 King County dry cleaners are enrolled.

A pilot sampling project conducted by LHWMP in 2006 found that sufficient PERC was present in the waste streams from some shops using alternative solvents that they designated as dangerous waste. The PERC most likely originated from the chemical stain removers ("spot cleaners") used in the pre-treatment of fabrics.

Currently, LHWMP's Business Field Services (BFS)[a] provides technical assistance to dry cleaners (and other small businesses) in response to information requests from property owners and business owners. BFS also responds to complaints from the public and referrals from other agencies. BFS also partners with local jurisdictions to assist businesses that are located in flood zones, above critical aquifers, or are served by on-site septic systems.

Recognizing that LHWMP has devoted significant resources to this industry for several years, we wanted to determine the current state of the industry with regard to protection of human health and the environment. The fraction of dry cleaning businesses that currently use PERC in King County, Washington was not known and although field observations indicate that dry cleaning is now dominated by individuals of Asian ancestry, the current demographics of the industry in King County was not well-characterized.

The first step was to conduct field visits to 12 dry cleaning businesses, which took place between November 2009 and July 2010. This preliminary investigation revealed that the dry cleaning industry is still in need of substantial technical assistance. The most common issues observed include poorly maintained machines, a lack of awareness about health concerns associated with exposure to dry cleaning solvents, and inappropriate treatment, storage, and disposal of hazardous wastes. In addition, most shops did not own respirators and even when they did own them, it appeared that this personal protective equipment (PPE) was used rarely. Workers were observed to handle the waste streams without using protective gloves, potentially exposing their skin to harmful solvents and allowing dermal absorption. These observations prompted the program to conduct the survey described in this report.

Dry cleaning solvents

Perchloroethylene (C_2Cl_4)

As stated previously, the most common dry cleaning solvent is PERC, which is a sweet-smelling, colorless, volatile, lipophilic solvent. In addition to dry cleaning, PERC is used as a chemical intermediate and in metal degreasing operations.[7] PERC is non-flammable, having no measurable flash point or flammable limits in air. As of 2008, the U.S. EPA estimated that dry cleaning accounts for 15 percent of all perchloroethylene used nationally.[2]

PERC can be absorbed into the body through inhalation, dermal exposure, and ingestion. Regardless of the route of exposure, PERC is rapidly distributed throughout the body, with peak tissue concentrations occurring within 10-30 minutes in the blood, brain, heart, lungs, kidneys, and liver (based on animal studies). In oral dosing of animals, systemic bioavailability was greater than 80 percent. However, up to 70 percent of inhaled PERC can be exhaled, while

[a] Prior to 2011, BFS was named the "Environmental Quality Team" or "EQT".

remaining unmetabolized. Many of the health effects attributed to this solvent are likely associated with PERC's numerous metabolites. The fraction of PERC that is metabolized in humans can be highly variable between individuals, and is dependent upon dose (the rate of metabolism decreases with increasing dose); there are also important sex- and species-differences in metabolism. PERC that is not exhaled is stored in fatty tissues.[8]

Acute inhalation exposure can cause headaches, dizziness, eye irritation, and upper respiratory tract irritation in humans.[7] Acute inhalation exposure at concentrations of 50-300 parts per million (ppm) can affect the central nervous system, causing changes in coordination, mood and behavior. Concentrations of 100-200 ppm can cause non-cardiogenic pulmonary edema, nausea, vomiting, and diarrhea.[9]

Chronic exposure to PERC can cause neurological, liver, and kidney damage in humans.[7] Effects of chronic exposure on the central nervous system can include disorientation, irritability, short-term memory deficits, reduced attention, visual system dysfunction, and sleep disturbance.[9] Animal studies have found an increased incidence of liver cancer in mice and kidney tumors in male rats. Oral exposure causes liver tumors in mice and kidney tumors, and leukemia in male rats.[7]

Several epidemiological studies indicate a link between occupation in the dry cleaning industry and increased risk for cancer of the kidney, bladder, lung, esophagus, and cervix.[10,11] However, these studies did not account for other risk factors, such as smoking status. A recent publication (2010) reported that the risk of esophageal cancer, bladder cancer, and hypertensive end-stage renal disease was highest among dry cleaners with the longest duration of exposure to PERC and the longest latency since their initial exposure.[11] These findings indicate an association between exposure and disease that is not attributable to socioeconomic or lifestyle factors.

The literature concerning occupational PERC exposures in the dry cleaning industry and non-cancer endpoints is similarly equivocal. For example, a 1995 study attempted to associate workplace exposure to PERC with subclinical hepatotoxicity. The authors reported mild to moderate changes to parenchymal kidney cells of exposed dry cleaners compared to unexposed laundry workers. However, most of the odds ratios presented in the study were not statistically significant. A statistically significant elevated risk was found for workers using older or wet-transfer machines. However, this finding did not persist once the odds ratios were adjusted for age (odds ratio = 4.2; 95 percent confidence interval = 0.9-20.4).[12]

A 2003 assessment of oxidative DNA damage in 38 women with (dry cleaners) or without (launderers) occupational exposure to PERC failed to demonstrate any statistically significant differences in biomarkers of oxidative DNA damage repair between the two groups.[13] However, a significant association was observed between PERC exposure and leukocyte 8-hydroxy-deoxyguanosine (an index of steady-state oxidative DNA damage), with higher levels in the launderers than in the dry cleaners. This finding indicates a reduction in oxidative DNA damage in PERC-exposed dry cleaners compared to launderers. The authors hypothesize that low level exposures to PERC may up-regulate genes, which causes a reduction in oxidative DNA damage. The authors noted, however, that correlation should not be confused with causation and that an unexamined factor may be responsible. The study also had a small sample size and the women worked in shops with relatively low exposure levels (i.e., an 8-hour time-weighted average of 5 ppm PERC).

Several studies have investigated the link between exposure of the general population to contaminated drinking water and health outcomes.[14-16] Other studies have evaluated ambient

exposure to PERC from residentially co-located dry cleaners and health outcomes in the general population.[17,18,19]

The U.S. EPA recently upgraded its classification of PERC from a "possible" to "probable" human carcinogen. An independent review of the U.S. EPA's assessment by the National Research Council concurred with the new classification.[20] The International Agency for Research on Cancer has considered PERC to be a "probable" human carcinogen since 1995.[10]

Although PERC has been the subject of regulatory scrutiny by numerous health and environmental agencies, its use persists in the industry, in part because of its excellent ability to clean fabric without causing shrinkage or wrinkling. It is often said in the industry that "nothing cleans like PERC." In addition, the costs of switching to an alternative solvent are substantial because purchase of a new dry cleaning machine is often required, along with structural modifications to the building to abide by fire codes (as noted below, some alternative solvents are more flammable than PERC).

Hydrocarbon solvents

These petroleum-based solvents are composed of aliphatic hydrocarbons and have relatively high flammability and volatility (flash points of 140-150°F). Examples include Exxon-Mobil's DF-2000, 3M's PureDry, and Chevron Phillips' EcoSolv. Many dry cleaners state that hydrocarbons do not clean as effectively and so require a longer cleaning cycle than PERC. There is limited information on the toxicity of these compounds, with the exception of Stoddard solvent (no longer in use), which showed some evidence of carcinogenicity in male rats.[21] These hydrocarbons are volatile organic compounds (VOCs) and can adversely impact ambient air quality.

Glycol ethers

A variety of glycol ether formulations are available, including dipropylene glycol tert-butyl ethers (DPTB), dipropylene glycol n-butyl ether (DPNB), and propylene glycol t-butyl ether (PGtBE). These are organic and biodegradable solvents with low volatility and a high flash point. Brand names include Rynex and Solvair. There is limited information about the toxicity of DPNB and DPTB. The California Office of Environmental Health Hazard Assessment has concerns about PGtBE as a potential carcinogen.[22]

Liquid silicone

Decamethylcyclopentasiloxane (D5) or volatile methyl siloxane is the primary ingredient in GreenEarth dry cleaning solvent. D5 is a colorless, odorless liquid and is not considered a VOC. Use of GreenEarth requires an affiliate license and payment of an annual affiliation fee to the Green Earth Cleaning company. However, a recent study has raised concerns about the global environmental distribution and persistence of this chemical class, which is currently being considered for regulation in Canada.[23] D5 has been shown to cause tumors in rats at higher concentrations.[24] The U.S. EPA has not yet conducted an assessment of D5 and "therefore, is not in a position to characterize potential risks to human health or the environment associated with D5 use in drycleaning."[25]

Liquid carbon dioxide (CO_2)

CO_2 is a non-flammable gas that can be maintained as a liquid under high pressure. The CO_2 used in dry cleaning is a by-product from industrial operations and so does not contribute to the overall global greenhouse gas inventory. At high concentrations, CO_2 can act as an asphyxiant, but otherwise there are no known health risks associated with CO_2 exposure. However, the high pressure system required to compress the gas into a liquid state poses a risk for explosion. Local

experience has shown that the high pressures required to operate these machines can compromise reliability.

"SolvonK4"

"Solvon K4" is a halogen-free solvent used in a relatively new dry cleaning process, called "SystemK4."[26] Although little information is currently available about SolvonK4, it is advertised as having similar cleaning capabilities to PERC while being relatively safe. The manufacturer (Kreussler, Germany) suggests it is possible to modify existing PERC machines to use this solvent.

Overview of the dry cleaning process

Regardless of the solvent used, all dry cleaning processes generally follow similar steps.

First, stained fabrics may be "spot-treated" by hand. A variety of chemicals are used to treat individual stains, depending on the nature of the stain. Spot cleaners may contain hydrofluoric acid and hazardous solvents such as trichloroethylene and PERC. Although non-chlorinated spot cleaning systems are now available, older spot cleaners are still used in the industry. Consequently, the levels of chlorinated hydrocarbons in the wastes can be so high that they designates as hazardous under Washington state's Dangerous Waste Regulations.[27]

Items are then loaded into dry cleaning machines, with typical capacities ranging from 30 to 60 pounds. Running on programmable cycles, the machines fill with liquid solvent and detergents, and then run through an agitation cycle.

Once cleaned, the fabrics are usually dried in the same machine. This "dry-to-dry" process has significantly reduced environmental releases and occupational exposures. Older "transfer" dry cleaning machines did not dry solvent-soaked fabrics, so they were removed by hand and transferred to a dryer. Transfer machines are no longer permitted within the jurisdiction of the Puget Sound Clean Air Authority (PSCAA), which includes King County, Washington.[28]

Solvent is distilled and filtered for reuse within the machine. Consequently, very little pure solvent is generated as waste. This closed loop process generates a sludge (also called "muck" or "still bottoms"), separator water (from the physical separation of dry cleaning solvent and water in a water separator), and used filters. These wastes may be contaminated with PERC, spot cleaning chemicals, and residual solvent in the clothing from previous cleanings. Unless chemical characterization determines that these wastes contain contaminant levels below those specified in Washington state's Dangerous Waste Regulations[27], they are considered hazardous and must be periodically collected and disposed of by licensed haulers.

For PERC machines, the technologies are referred to as "generations". For the purposes of this study, the generations were defined as follows:

- 1st Generation: Transfer Machine.
- 2nd Generation: Dry to Dry Vented, Water-cooled or Refrigerated.
- 2nd Generation Retrofitted: Self Contained Unit, Non-Vented and Refrigerated.
- 3rd Generation: Dry to Dry, Self Contained, Non-Vented and Refrigerated.
- 4th Generation: Enclosed Machine with Refrigeration and Carbon Absorber.

- 5th Generation: Enclosed Machine with Carbon Absorber and Vapor Sensor and Vapor Lock on Basket.

A detailed description of dry cleaning solvents, processes, and waste streams is presented in the California Agency Air Resources Board's technical assessment of the California dry cleaning industry.[29]

Wet cleaning

Unlike dry cleaning processes, wet cleaning uses water to launder fabrics. Many dry cleaning shops use some degree of wet cleaning for certain fabrics. Although wet cleaning is generally regarded as the environmentally preferable alternative, this process uses a considerable amount of water, which is discharged to the sewer system.

Some jurisdictions are promoting wet cleaning as a preferred alternative to traditional dry cleaning. For example, the City & County of San Francisco is offering grants of up to $10,000 to businesses willing to transition to non-PERC solvents.[30] However, wet cleaning has not been widely adopted by the dry cleaning community. One concern is that water tends to shrink and wrinkle fabric, increasing the amount of pressing, stretching, and other manual finishing work required after washing. To date, few shops in San Francisco have adopted wet cleaning technology.[31]

Opportunities for exposure to solvents

Although exposures to dry cleaning solvents other than PERC likely occur during the routine operation, maintenance, and upset conditions described below, very little information is currently available to characterize exposures to the alternative solvents. Therefore, this review will focus on occupational and environmental exposures to PERC.

Occupational exposures to PERC

PERC readily moves into the gas phase, especially when heated. Vapor concentrations can exceed the odor threshold of 1-5 ppm and potentially exceed occupational exposure limits if the machine is poorly maintained. LHWMP field staff noted that operators rarely use best management practices to minimize vapor release (such as waiting for the machine to cool down before opening the door).

Spot cleaning of clothing is often conducted without the use of gloves or other PPE, providing opportunity for eye injury, inhalation of vapors, and dermal exposure to a variety of chemicals.

There are opportunities for exposure during routine maintenance procedures, such as removing sludge from the still, replacing filters, handling separator water, or replenishing solvents. Accidental spills may also result in solvent exposure. Appropriate gloves and respirators are rarely used.[32]

A study by the National Institute for Occupational Safety and Health (NIOSH) evaluated the efficacy of various engineering controls to reduce PERC exposure in dry cleaning shops. In general, NIOSH found that relatively inexpensive ($5,000 or less) retrofits significantly reduced machine operators' PERC exposures. However, NIOSH discovered a significant leak in one of the machines and observed that repairing this leak had a greater impact on PERC exposure than did the retrofit. NIOSH concluded that work practices and maintenance procedures were as important as engineering controls to minimize PERC exposure.[33]

Occupational exposure limits for PERC

The Occupational Safety and Health Administration (OSHA) administers a Permissible Exposure Limit (PEL) for PERC of 100 ppm as an eight-hour time weighted average (TWA), with a short-term exposure limit (STEL) of 200 ppm (not to be exceeded for more than five minutes in any three-hour period), with a maximum peak of 300 ppm.[34] In 1989, OSHA attempted to lower the PEL to 25 ppm, but the rule was remanded by the U.S. Circuit Court of Appeals and the original limits remain in effect.[35]

Locally, under the Washington Industrial Safety and Health Act (WISH Act), the Washington State Department of Labor and Industries' (L&I's) Division of Occupational Safety and Health (DOSH) enforces a PEL of 25 ppm and a STEL of 38 ppm.[36] DOSH also enforces an Immediately Dangerous to Life or Health limit of 500 ppm (based on an internal DOSH directive).

NIOSH considers PERC to be an occupational carcinogen. Consequently, NIOSH does not specify a Recommended Exposure Limit; NIOSH simply states that workplace exposures should be minimized.[37]

The American Conference of Governmental Industrial Hygienists has set a threshold limit value of 25 ppm, with a STEL of 100 ppm as a 15-minute TWA.[34]

For the general public, the Centers for Disease Control and Prevention's (CDC's) Agency for Toxic Substances and Disease Registry set Minimal Risk Levels (MRLs) for PERC. The acute inhalation MRL is 0.2 ppm and the chronic MRL is 0.04 ppm.[38]

Eight-hour TWA sampling is a useful indicator of absorbed dose. A 2008 study found a strong correlation between air sampling results and levels of PERC in blood.[39]

Occupational exposure levels for PERC

In 2008, researchers at the University of Washington reviewed the existing literature on PERC exposures between 1936 and 2001 and calculated an overall arithmetic mean exposure of 59 ppm for dry cleaning workers (range: 0–4636 ppm, n=1395). However, this analysis included 441 machine operators using transfer machines; this cohort had the highest exposure levels (mean = 150 ppm; range: 0-1000 ppm). By contrast, dry-to-dry machine operators had an arithmetic mean exposure of 19 ppm (range: 0.3-257 ppm). These concentrations were much lower when data from only 1990-2001 were considered (mean = 9.5 ppm; range: 0.3-83 ppm).[40]

A 2001 study in Finland evaluated personal exposure samples in six commercial and three industrial dry cleaning shops that used dry-to-dry PERC machines. The mean TWA of exposure for employees who operated the dry cleaning machines (as opposed to customer service personnel or workers involved with pressing and finishing) was 4.1 ppm in commercial shops and 4.6 ppm in industrial establishments. Workers experienced the exposures when cleaning out the lint- and button-traps; the highest peak concentration was 334 ppm.[41] While this trend towards decreasing air concentrations is encouraging, they continue to exceed levels that can be potentially harmful.

Environmental exposures to PERC

Clean, well-maintained shops using modern, closed-loop equipment should theoretically not release PERC to the environment. However, leaking machines, failure to clean-up spills, inappropriate waste handling, and other lax operating procedures and housekeeping practices can result in contamination of soils, air, and groundwater.

Due to its volatility, about 85 percent of PERC used in industry is lost to the atmosphere.[7] PERC has the potential to escape and volatilize unless it is used in a well-maintained closed-loop system. Locally, LHWMP has responded to numerous complaints about PERC odors in residencies and businesses adjoining dry cleaners.

Ambient air sampling has detected PERC concentration levels of 30 parts per trillion in rural areas, and up to 4.5 parts per billion in urban and industrial areas. The highest concentrations were found near point sources such as dry cleaning shops.[41] A study in New York City found levels as high as 36,500 micrograms per cubic meter in apartments above dry cleaners.[43] Similar studies in Europe and the U.S. have found elevated levels in stores co-located with dry cleaning facilities.[42,43]

Because PERC is lipophilic, vapors can subsequently contaminate fat-containing food. Studies in Europe and the U.S. have found elevated PERC levels in fatty foods such as cheese, butter, and chocolate in apartments and shops located near or above dry cleaning facilities.[44]

PERC can contaminate groundwater, especially when shops store or dispose of solvents inappropriately or fail to contain leaks and spills. A U.S. EPA survey in 1984 sampled 945 groundwater supplies throughout the United States and found that 75 systems were contaminated with PERC, with a median concentration of 0.75 micrograms per liter (µg/L) and a maximum of 69 µg/L (the U.S. EPA has set a maximum allowable concentration of 5 µg/L). PERC was also found in 38 percent of over 9,000 surface water sampling sites nationwide.[7]

A review of the State Cleanup Sites database maintained by the Washington State Department of Ecology (Ecology) revealed that in King County, at least 50 dry cleaning locations are under active investigation for soil or groundwater contamination with chlorinated hydrocarbons, including PERC.[45]

Current study

Recognizing the potential for harmful exposures to dry cleaning workers and environmental release of solvents, we conducted key informant interviews, performed field investigations, and distributed a county-wide survey to gather information about:

1) The demographics of the dry cleaning industry;

2) General business characteristics, including the solvents used for cleaning;

3) Current practices to protect human health and the environment, with special emphasis on EnviroStars businesses;

4) Perceptions about health and environmental protection, including business owners' needs; and

5) Strategies to reduce occupational and environmental exposures and increase awareness.

Methods

Selection of businesses for inclusion

Five data sources were used to generate a "master list" of dry cleaners in King County:

- Dry cleaning establishments visited by LHWMP during previous field activities;
- The LHWMP BFS list of dry cleaning businesses. (Note that this list included only King County dry cleaners currently receiving technical assistance, including EnviroStars businesses.);
- The Washington State Department of Revenue (DOR) list of dry cleaners;
- The PSCAA list of active (i.e., PERC-using) dry cleaning establishments; and
- A commercial InfoUSA™ business listing, restricted to the dry cleaning industry by selecting for King County business locations with North American Industry Classification System code 81232 (Drycleaning & laundry services (except coin-operated)).

As of 2010, all these data sources were current, with the single exception of the first LHWMP database (last updated in 2002).

Business listings from all five sources were combined and duplicate records removed. If a shop was listed in only one database, then attempts were made to validate the existence of the business using Internet searches (i.e., Google™, Google Maps™, and Bing™) and telephone calls to shops when a number was available.

Businesses were retained on the master list unless it could be demonstrated conclusively that they were no longer operating. In the process of consolidating and verifying these sources, two additional dry cleaning shops were discovered that had not been present on any list. The final master list contained 475 businesses.

Survey development and strategy

Development of survey questions

The overall design of the survey instrument was based largely on a needs assessment survey of the auto body industry in Washington state, conducted by the Safety & Health Assessment & Research for Prevention program at L&I.[46] Questions were also derived from a report from the California Air Resources Board[29] and the field experience of the LHWMP staff. Additional questions about filter use and disposal were derived from a survey about waste management practices conducted in Canada.[47]

The survey questions were then reviewed by LHWMP staff with experience working with local dry cleaners. A pilot version of the survey was administered by LHWMP staff to 12 dry cleaning business owners during field visits. The survey was administered in English to individuals with moderate-to-fluent English language skills. A Korean interpreter was used to administer the survey to Korean-speaking business owners with limited English language skills. Modifications were made to the survey based on feedback from the interviewees.

Further input was solicited from stakeholders in the dry cleaning industry, including the Presidents of the Northwest Dry Cleaners Association and the Washington State Korean Dry Cleaners Association, staff at L&I, U.S. EPA Region 10, PSCAA, and Ecology.

In an attempt to make the survey inviting, it was printed in booklet format (5.5 x 8.5 inch) with a glossy cardstock cover that included a color photograph of a smiling dry cleaner seated at the front counter of a shop (Appendix A).

The survey and associated procedures were then submitted to the Washington State Institutional Review Board (WSIRB) for human subjects' protection. The study was also reviewed and approved by the Research Administrative Review Committee at Public Health-Seattle & King County (PH-SKC).

After the approvals were granted, the final draft was sent to a translation vendor under contract to PH-SKC. Per WSIRB requirements, the Korean translation was conducted by individuals certified by the Washington State Department of Social and Health Services (DSHS). The translated survey and supporting materials were reviewed for accuracy and readability by native Korean-speaking colleagues located at L&I and Ecology. Minor changes were subsequently made to the translated materials by the translation vendor.

The survey included 46 questions (although Question 46 gave respondents the opportunity to provide general open-ended comments). Before the first question, recipients were asked to indicate if their business performed dry cleaning on the premises or whether it was a drop shop (i.e., a store front that collects clothing to be cleaned at another facility; typically, no cleaning or processing is conducted). If they answered that it was a drop shop, they were instructed to check the appropriate box and return the survey without answering the remaining questions.

Although respondents could remain anonymous, they were asked to provide their contact information if they wished to avail themselves of LHWMP's incentive programs or receive technical assistance.

Both the Korean and English versions of the survey are presented in Appendix A.

Phase I: endorsement letter, survey mailing, and follow-up postcard

Before distributing the survey, we mailed a letter to all 475 businesses on the master list. This letter described the project and encouraged business owners to complete the survey. The letter was signed by the Presidents of the Northwest Dry Cleaners Association and the Washington State Korean Dry Cleaners Association, both of whom endorsed the project. The letter was presented in English on one side and Korean on the other (Appendix B).

Several of these initial letters were returned as undeliverable, and these businesses were removed from the master list of dry cleaners.

LHWMP contracted with Gilmore Research Group (Seattle, WA) to mail the survey to businesses, receive the responses, and record the data according to WSIRB requirements. All subsequent mailings were administered through Gilmore Research Group. We provided Gilmore Research Group with the identities of the businesses remaining on the master list. Gilmore Research Group then applied a unique six-digit ID number to the businesses on the master list and to the businesses' survey packet. The return envelopes did not include identifying information about the respondent, other than this six-digit ID number.

Approximately one week after LHWMP staff mailed the endorsement letters, Gilmore Research Group mailed the survey packet to the businesses remaining on the master list. The packet was

delivered in a 9 x 12 inch envelope (Appendix G), and included both English and Korean versions of the following materials:

- A cover letter (Appendix C);
- A two-page study description with contact information (Appendix D);
- Survey booklets (Appendix A); and
- A return envelope (including pre-paid postage).

Approximately two weeks later, Gilmore Research Group mailed a reminder postcard, printed in English and Korean (Appendix E), to businesses that had not yet returned the survey.

After another week, Gilmore Research Group mailed a second survey packet to businesses that had not yet responded. This mailing included a modified cover letter (Appendix F).

At the completion of Phase I, Gilmore Research Group provided LHWMP project staff with a summary database. The data included which businesses had completed the survey, were identified as drop shops, had not responded, or were undeliverable addresses. Note that LHWMP did not receive any data that matched a respondent with his or her responses to the survey questions.

Phase II: telephone calls and face-to-face Interviews

Follow-up telephone calls to businesses that had not responded to the mailed survey were conducted by LHWMP staff using a WSIRB-approved script (Appendix H) and a DSHS-certified interpretation service, when necessary. If the business owner or manager was not available, a message was left with contact information. Due to staffing limitations and time constraints, only one attempt was made to contact each business. Several businesses requested another copy of the survey, which they were subsequently mailed via Gilmore Research Group.

Following the telephone calls, we determined that businesses fell into one of six categories:

1) A drop shop, which does not conduct dry cleaning on the premises;
2) Unwilling to complete the survey;
3) Committed to complete the survey and return it by mail;
4) Requested administration of the survey in-person;
5) Another type of "cleaning" business (such as a house cleaners or coin operated laundromat); or
6) No longer in business.

Businesses in categories #5 and #6 were removed from the list of potential respondents and excluded from the sampling frame. One business requested to have the survey administered in-person during a site visit.

At the completion of Phase II, Gilmore Research Group provided LHWMP project staff with survey data in three file formats: IBM SPSS Statistics™ (SPSS™), Microsoft Excel™, and a text document that summarized the frequencies of responses to each question.

In cases where respondents had provided answers to open-ended questions in Korean, Gilmore Research Group electronically scanned the hand-written comments and emailed them to LHWMP staff. The comments were then emailed to a DSHS-certified translation service. Translated responses were then emailed back to Gilmore Research Group via LHWMP staff, to be compiled with the rest of the data. Note that these emailed documents were identified only by the six-digit ID code; no personal identifying information was transmitted electronically.

Data management and analysis

Data were managed according to the WSIRB's requirements and kept confidential. As mentioned previously, Gilmore Research Group assigned a six-digit ID code to individual respondents in the survey database. At no time during the study was LHWMP project staff in possession of information, keys, or linkages that could identify the respondents associated with survey responses. Gilmore Research Group provided respondent information only for those businesses that voluntarily provided this information because they wished to receive technical assistance or enroll in LHWMP's incentive programs.

The responses to open-ended questions were coded and assigned to appropriate categories for further analysis.

Survey data were analyzed using Microsoft Access 2003™, Microsoft Excel 2007™, STATA 11™, and SPSS™. Data were evaluated using cross-tabulations for chi-square (χ^2) analysis, linear regression analysis, Student's t-Tests, and Fisher's Exact Tests. Descriptive statistics were also calculated (i.e., means, medians, estimates of variability, percentages, and frequency distributions).

Results

Response rate

As stated previously, the initial endorsement letter was mailed to 475 businesses on the master list of dry cleaning businesses. Of these, 51 packets were returned by the U.S. Postal Service as bad addresses or otherwise marked as undeliverable; these businesses were regarded as "not qualified" and removed from the sampling frame. Gilmore Research Group mailed survey packets to the remaining 424 businesses. Subsequent returns and follow-up telephone calls resulted in the elimination of 44 additional businesses. Consequently, 380 businesses were considered "qualified" for inclusion in the sampling frame. The sample disposition summary is presented in Table 1. Responses were received from 64 percent of the qualified businesses, where the response rate was calculated as follows:

$$Response\ Rate\ (\%) = \left[\frac{Completed\ surveys + Drop\ shops}{Completed\ surveys + Drop\ shops + Unreachable + Refused + No\ Response}\right]$$

$$= \left[\frac{154 + 91}{154 + 91 + 17 + 3 + 115}\right] \times 100\% = 64\%$$

Note that the response rate calculation includes responses from both drop shops and dry cleaning facilities. Because the number of actual dry cleaning facilities in King County is unknown, it was not possible to calculate a response rate for these businesses alone.

Sixty-five percent of the returned surveys were completed in Korean. Because many of the drop shops were identified on the telephone or did not include demographic information in their returned surveys, the percentage of Korean-owned drop shops is unknown.

Table 1. Survey sample disposition

Disposition	No. shops
Completed survey responses received	154
Shops identified as drop shops	91
Unreachable: unable to determine if qualified (wrong number, no answer, answering machine, etc.)	17
Refused survey	3
No Response: made contact, determined qualified, but no response (respondent said would send, left message for owner / manager, resent survey)	115
Determined not qualified (bad address, business outside King County, not a dry cleaners)	95
Total	**475**

Utility of business databases

There was considerable overlap in business listings among the databases, with most of the businesses listed in two or more of the five databases. Only 16 percent of the valid listings were unique to a single database, with 12 percent being found in the InfoUSA™ database exclusively.

A total of 381 valid businesses were listed among all five databases combined. Table 2 shows the number of valid and unique listings that each database contributed. The most useful source of business listings was the InfoUSA™ database, which provided 94 percent of the valid business listings. The remaining four databases contributed only an additional 24 businesses.

Table 2. Valid business listings in each database

Source	Number	Percent
InfoUSA™	357	94
LHWMP	264	69
DOR	244	64
PSCAA	185	49
BFS	98	26

In general, databases that contributed the greatest number of valid businesses also contained the largest portion of erroneous listings. The number of total and invalid listings for each database is presented in Table 3.

Table 3. Invalid business listings in each database

Source	Total listings	Number of invalid listings	Percent invalid
InfoUSA™	409	52	13
LHWMP	312	48	15
DOR	267	23	9
PSCAA	196	11	6
BFS	101	3	3

Survey responses – answers to individual survey questions

The questions are presented in the survey booklet, located in Appendix A.

We received a total of 154 completed surveys. Because some respondents did not provide an answer to every question, the total number of respondents varies from question to question.

Please note that percentages may not total 100 due to rounding.

Question 1. Of 152 respondents, 93 percent described themselves as the shop owner while seven percent self-identified as shop managers.

Question 2. The majority of respondents identified themselves as Korean (84 percent). Ten percent were white. Respondents recorded as "Asian" did not provide more specific information about their race. The number of respondents identifying with each racial category is presented in Table 4.

Table 4. Racial categories of survey respondents

Race	Number	Percent
Korean	127	84
White	15	10
Asian	5	3
Vietnamese	2	1
Cambodian	2	1
Korean + White	1	1
Total	**152**	**100**

Question 3. Over one-third of businesses were located in Seattle. Another ten percent were located in Kirkland. The remaining 56 percent of shops were located in 23 other cities throughout King County. The list of responding shops in each city is presented in Table 5.

Table 5. Cities in which businesses were located		
City	**Number**	**Percent**
Seattle	51	34
Kirkland	15	10
Kent	11	7
Bellevue	10	7
Federal Way	9	6
Issaquah	7	5
Renton	7	5
Auburn	5	3
Redmond	5	3
Mercer Island	4	3
Bothell	3	2
Des Moines	3	2
Sammamish	3	2
Woodinville	3	2
Burien	2	1
Covington	2	1
Enumclaw	2	1
Kenmore	2	1
Maple Valley	2	1
Normandy Park	2	1
Mill Creek	1	1
SeaTac	1	1
Tukwila	1	1
Vashon	1	1
Total	**152**	**100**

Question 4. Fifty-one percent of respondents (65 businesses) stated that they were an EnviroStars business (145 total respondents). The number of stars respondents said they had earned is presented in Table 6.

Table 6. Number of stars of EnviroStars businesses		
Stars Earned	**Number**	**Percent**
One	6	9
Two	4	6
Three	6	9
Four	28	43
Five	21	32
Total	**65**	**100**

Question 5. Eighty-four percent of respondents stated that their business was family-owned and operated (149 total respondents).

Question 6. The majority (90 percent) of respondents indicated that their business is not part of a multi-store business, consolidator, franchise, cooperative group, chain, or similar collection of businesses (150 total respondents).

Question 7. Seventy-four percent of respondents reported that their business had employees while 26 percent had none. The majority of respondents (57 percent) had between one and three employees. The number of full and part time employees for all respondents is presented in Table 7.

Table 7. Number of full-time and part-time employees		
Number of employees per business	**Frequency**	**Percent**
1	34	22
2	36	24
3	16	11
4	8	5
5-10	12	8
11 or more	5	3
Not specified	2	1
No employees	39	26
Total	**152**	**100**

Of the 39 businesses that did not have employees, 26 percent stated they paid into L&I's workers compensation system to cover themselves or a co-worker, 46 percent stated they did not, and 28 percent (11 respondents) did not answer the question.

Question 8. Sixty-eight percent of businesses indicated that they belong to a local or national dry cleaner association (142 total respondents). The association with the greatest membership was the Washington State Korean Dry Cleaners Association (87 percent of the 92 respondents with a membership to any organization belonged to this association). Respondents' answers are presented in Table 8. All of the respondents who belonged to the Northwest Dry Cleaning Association also said they belonged to Dry Cleaning Laundry Institute, whereas members of the Korean Dry Cleaning Association did not report belonging to more than one association.

Table 8. Dry cleaner association membership

Association Name	Number	Percent
Washington State Korean Dry Cleaners Association	80	56
Dry Cleaning Laundry Institute (DLI)	4	3
Northwest Dry Cleaning Association and DLI	5	4
Other	2	1
DLI and other	1	1
Not specified	5	4
No membership	45	32
Total	**142**	**100**

Question 9. The majority (84 percent) of respondents indicated that they read at least one dry cleaning trade publication. Over a third of all respondents reported reading The Korean Cleaners Monthly trade publication. This trade magazine had twice the reported readership of any other publication. The complete list of publications that respondents said they read is presented in Table 9.

Table 9. Dry cleaning trade publications read by respondents

Publication Name	Number*	Percent
The Korean Cleaners Monthly	49	34
Dry Cleaning Times	19	13
Clothesline	17	12
American Dry Cleaners	17	12
Western Cleaner and Launderer	16	11
Dry Cleaning Information	15	10
Dry Cleaners	7	5
Clean America	5	3
DLI / Fabricare	4	3
Cleaners Family	2	1
Coin-Op	2	1
Other	11	8
Not specified	13	9
No subscriptions	23	16

*The total (200) exceeds the number of respondents (145) because some respondents read more than one trade publication.

Question 10. The median length of time respondents had owned their business at its location was 10 years, with over a third reporting that they had owned their current business for five years or less. The maximum number of years was 60 and the minimum was less than one year. The years all respondents said they had owned their business is presented in Table 10.

Table 10. Years respondent has owned business at current location

Number of Years	Number	Percent
1-5	54	36
6-10	30	20
11-15	20	13
16-20	27	18
21 or more	20	13
Total	**151**	**100**

Question 11. The median length of time that respondents said there had been a dry cleaning business at their current location (under any owner) was 11 years. The maximum number of years was 73 and the minimum was one year. One respondent said they did not know how long a dry cleaning business had existed at the current location. The responses are presented in Table 11.

Table 11. Years business has been at current location

Number of Years	Number	Percent
1-5	38	26
6-10	32	22
11-15	29	20
16-20	18	12
21 or more	29	20
Unknown	1	1
Total	**147**	**100**

Question 12. Table 12 shows the square footage of respondents' dry cleaning shops. The majority of shops (81 percent) were between 1000 – 2000 square feet in area. The largest shop was reported to be 20,000 square feet, 4 times larger than the next largest at 5,000 square feet. One respondent reported that their shop was only 100 square feet although this seems highly unlikely and is presumably a reporting error.

Table 12. Area of dry cleaning shop		
Area (square feet)	**Number**	**Percent**
<1,000	5	3
1,000 - 1,999	118	81
2,000 - 2,999	17	12
3,000 +	6	4
Total	**146**	**100**

Question 13. Seventy-seven percent of respondents said their facility is part of a larger building (149 total respondents). The majority (84 percent) reported that people do not live in the building where the dry cleaning facility is located (109 total respondents). Sixty-nine percent of all respondents indicated that there are businesses that sell or serve food where their dry cleaning facility is located (112 total respondents).

Question 14. Ninety-six percent of the 151 respondents reported that they have one dry cleaning machine in their facility. Four reported having two machines. Two respondents reported having three machines.

Question 15. When asked what generation of machine was used, 82 percent reported using a 3rd generation machine or later. Thirty-five percent said they use a 5th generation dry cleaning machine. Machines categorized as "other" included CO_2 machines and machines listed simply as "Rynex" or "hydrocarbon."

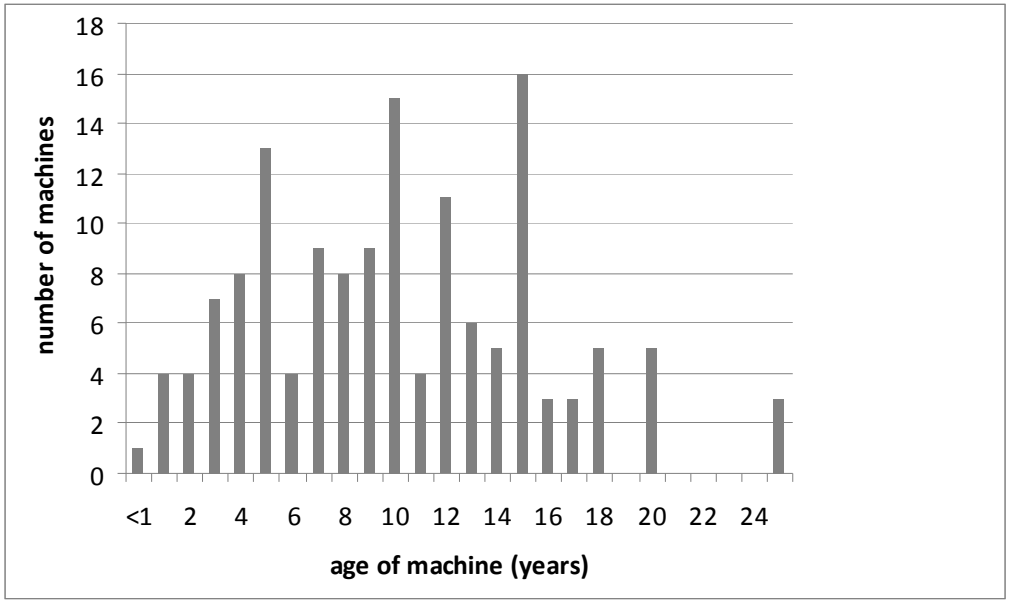
Two respondents indicated that they owned a first generation "transfer" machine. However, in one of these cases, the respondent also said the machine was only five years old. The machine must either be much older or be of a later generation since transfer machines have not been manufactured for well over a decade.

The distribution of type of dry cleaning machines is presented in Table 13.

Table 13. Generation of dry cleaning machines in use						
	Machine #1		Machine #2		Machine #3	
Machine	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
1st Generation	2	1	0	0	0	0
2nd Generation	9	6	0	0	0	0
2nd Generation retrofitted	5	3	0	0	0	0
3rd Generation	33	23	1	17	0	0
4th Generation	40	28	1	17	0	0
5th Generation	48	33	2	33	1	50
Other	8	6	2	33	1	50
Total	**145**	**100**	**6**	**100**	**2**	**100**

Question 16. The median reported age of dry cleaning machines was 10 years. One machine was reported to be less than a year old while three machines were reported to be 25 years old (149 total machines). Almost a quarter (23 percent) of all machines were reported to be 15 years old or more. Figure 1 presents the distribution of dry cleaning machines by age.

Figure 1. Distribution of age of dry cleaning machines (in years)



Question 17. Dry cleaners were asked to state the manufacturer of their dry cleaning machine. Table 14 shows respondents' answers for their primary machine (i.e., Machine #1).

Table 14. Manufacturer of primary dry cleaning machine

Brand	Number	Percent
Bowe / Permac	41	29
Union	30	21
Realstar	21	15
Firbimatic	10	7
VIC	7	5
Forenta	6	4
Satec	4	3
Western Automation	3	2
Donini	2	1
Other	19	13
Total	**143**	**100**

The five secondary dry cleaning machines were of the following brands: Azro Tech Bergparma, Fibrimatic, Sailstar Usa, and Union. Shops with a 3rd machine reported using Alliance and Union machines.

Question 18. Machine model number data not presented due to lack of utility.

Question 19. The median reported machine capacity was 35 pounds for the primary dry cleaning machine (i.e., Machine #1). Over half the respondents reported having a machine of this size. The smallest reported capacity machine was 22 pounds and the largest was 80 pounds. The reported capacity of all dry cleaning machines is presented in Table 15.

Table 15. Rated capacity of dry cleaning machine

	Machine #1		Machine #2		Machine #3	
Rated Capacity	Number	Percent	Number	Percent	Number	Percent
21 – 30	15	10	1	17	1	50
31 – 40	98	67	2	33	0	0
41 – 50	15	10	1	17	0	0
51 – 60	15	10	1	17	1	50
61 – 70	1	1	0	0	0	0
71 – 80	3	2	1	17	0	0
Total	**147**	**100**	**6**	**100**	**2**	**100**

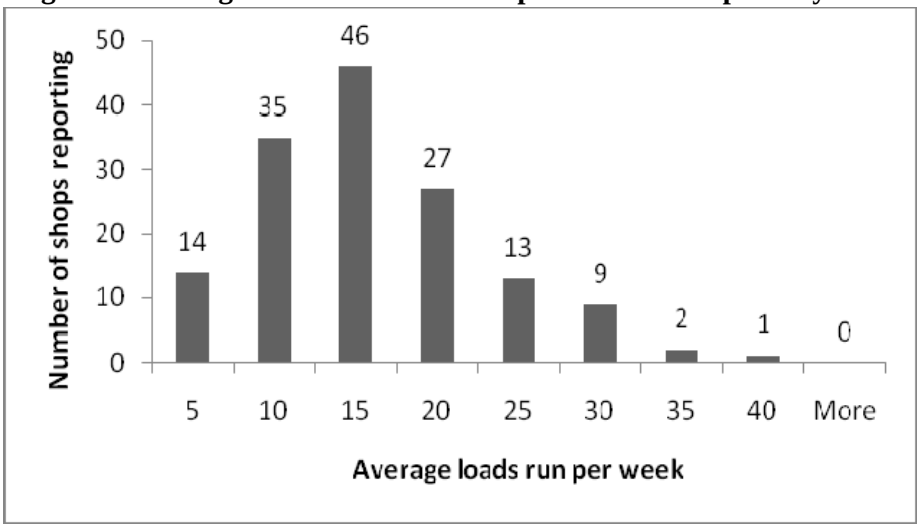
Question 20. When asked how many pounds they wash per load, the median reported load was 30 pounds for the primary machine (i.e., Machine #1). The smallest reported load was seven pounds and the maximum was 150 pounds (see Table 16).

Table 16. Pounds washed per load

	Machine #1		Machine #2		Machine #3	
Pounds	Number	Percent	Number	Percent	Number	Percent
1 - 10	4	3	0	0	0	0
11 - 20	36	25	0	0	0	0
21 - 30	76	53	3	50	1	50
31 - 40	16	11	2	33	1	50
41 - 50	6	4	0	0	0	0
51+	6	4	1	17	0	0
Total	**144**	**100**	**6**	**100**	**2**	**100**

Question 21. Respondents were asked how many loads of laundry they run per week, on average. The median response for the primary machine was 15 loads per week. The minimum number of loads reported was one per week and the maximum was 40 per week. Figure 2 presents the distribution of respondents' answers.

Figure 2. Average number of loads run per week on the primary machine



Of respondents who had a second dry cleaning machine, one ran only three loads per week in the additional machine. Three respondents ran between 12 and 20 loads per week, and two ran 30 loads per week, on average, in the second machine. Both respondents who had a third dry cleaning machine said they ran 30 loads per week, on average, in the third machine.

Question 22. Most respondents (88 percent) said they ran their primary dry cleaning machine five or more days per week. Respondents with a second or third machine also tended to run these machines at least five days per week, on average. See Table 17.

Table 17. Days per week machine is operated

	Machine #1		Machine #2		Machine #3	
Days	Number	Percent	Number	Percent	Number	Percent
Two	1	1	1	17	0	0
Three	12	8	0	0	0	0
Four	6	4	0	0	0	0
Five	71	48	2	33	1	50
Six	57	39	3	50	1	50
Seven	1	1	0	0	0	0
Total	**148**	**100**	**6**	**100**	**2**	**100**

Question 23. Over 70 percent of respondents began running their primary dry cleaning machine between 7:00 AM and 9:00 AM. Most respondents said they finished running loads in the late morning to early afternoon. Ten percent of respondents said they do not finish running loads until late in the evening (midnight or 1:00 AM). The start and end times are presented in Tables 18- 19.

Table 18. Start time of machine

	Machine #1		Machine #2		Machine #3	
Time	Number	Percent	Number	Percent	Number	Percent
5:00 - 5:59	5	3	1	17	0	0
6:00 - 6:59	10	7	1	17	1	50
7:00 - 7:59	59	40	1	17	1	50
8:00 - 8:59	46	31	2	33	0	0
9:00 - 9:59	19	13	0	0	0	0
10:00 - 10:59	4	3	1	17	0	0
11:00 or later	5	3	0	0	0	0
Total	**148**	**100**	**6**	**100**	**2**	**100**

Table 19. End time of machine

	Machine #1		Machine #2		Machine #3	
Time	Number	Percent	Number	Percent	Number	Percent
8:00 - 8:59	1	1	0	0	0	0
9:00 - 9:59	7	5	0	0	0	0
10:00 - 10:59	18	13	0	0	0	0
11:00 - 11:59	32	22	2	33	0	0
12:00 - 12:59	15	10	0	0	0	0
13:00 - 13:59	17	12	0	0	0	0
14:00 - 14:59	22	15	1	17	0	0
15:00 - 15:59	11	8	2	33	2	100
16:00 - 19:00	5	3	0	0	0	0
middle of the night	15	10	1	17	0	0
Total	**143**	**100**	**6**	**100**	**2**	**100**

Question 24. The majority (69 percent) of respondents stated that they used PERC in their primary machine. All of the respondents with a second or third machine reported using something other than PERC in those machines. See Table 20.

Table 20. Type of solvent used

Solvent	Machine #1		Machine #2		Machine #3	
	Number	Percent	Number	Percent	Number	Percent
PERC	105	69	0	0	0	0
Hydrocarbon	32	21	2	33	0	0
Glycol ethers	6	4	1	17	0	0
Liquid Silicone	6	4	1	17	1	50
Liquid CO2	2	1	2	33	1	50
Other	1	1	0	0	0	0
Total	**152**	**100**	**6**	**100**	**2**	**100**

Question 25. The median amount of solvent used per year was 30 gallons. The vast majority of respondents (84 percent) used 50 gallons (one drum) or less of solvent annually.

One respondent reported using zero gallons per year. This number is likely a reporting or data entry error (in earlier questions, the same respondent said they used PERC in their machine and ran loads seven days per week). Another respondent reported using 25,000 gallons per year of solvent in their second (CO_2) machine. See Table 21.

Table 21. Annual solvent use (gallons / year)

Gallons	Machine #1		Machine #2		Machine #3	
	Number	Percent	Number	Percent	Number	Percent
0 – 25	55	38	4	100	1	100
26 – 50	67	46	0	0	0	0
51 – 75	13	9	0	0	0	0
76 – 100	4	3	0	0	0	0
101 – 125	2	1	0	0	0	0
126 – 175	1	1	0	0	0	0
176 – 200	2	1	0	0	0	0
>200	1	1	0	0	0	0
Total	**145**	**100**	**4**	**100**	**1**	**100**

Question 26. Seventy-six percent of respondents who owned a PERC machine said they were not considering buying a non-PERC machine in the next year (3 percent already owned a second, non-PERC machine). Twenty-four percent of respondents said they were considering replacing their current PERC machine with an alternative solvent (103 total respondents).

Of respondents who indicated that they were considering buying a non-PERC machine, 36 percent stated that they would likely switch to wet cleaning. One respondent answered that they were considering both hydrocarbon and wet cleaning as alternatives. No respondents said they were considering switching to liquid CO_2. The solvent type PERC users said they would likely use if they were to switch is presented in Table 22.

Table 22. Alternative solvent preferences amongst PERC-users

Solvent	Number*	Percent
Water (wet cleaning)	9	36
Hydrocarbon	8	32
Glycol ethers	5	20
Liquid Silicone	4	16

*The total (26) exceeds the number of respondents (25) because one respondent gave more than one answer.

Table 23 lists the respondents' answers to what was preventing them from buying a non-PERC machine. A total of 70 businesses provided answers to this question with many respondents providing more than one answer.

Table 23. Reasons preventing PERC-using dry cleaners from buying a non-PERC machine

Reason	Number*	Percent
Financial barriers	53	76
Current machine in good condition	15	21
Alternatives not as good	9	13
Leaving business soon	2	3
Own a hydrocarbon machine	2	3
Lack of information	1	1

*The total (82) exceeds the number respondents (70) because some respondents listed more than one reason.

The most common barrier was financial, with 76 percent of respondents citing lack of money as an issue. Four of these respondents mentioned the downturn in the economy specifically impacting their ability to afford a new machine. The second most common reason respondents cited was the condition of their current machine. These respondents said that their current

machine was in good condition or not yet paid off and that they would not consider replacing the machine while it was still serviceable.

Respondents who said the alternatives to PERC were not as good cited PERC's ability to clean well and to keep clothes in good condition. Two of these also mentioned they considered that PERC was safe to use. The two respondents that cited already owning a hydrocarbon machine also owned PERC machines. When asked to explain what was preventing them from buying a new machine, one respondent said they did not know "anything about other solvents."

Question 27. Respondents using a non-PERC machine were asked to state their reasons for switching to an alternative solvent. Thirty-seven businesses provided answers to this question. Responses are presented in Table 24.

Table 24. Reasons for using alternative to PERC

Reason	Number*	Percent
Environment	22	59
Health	10	27
Landlord requirement	8	22
Better cleaning	4	11
PERC cost / regulation	4	11
PERC odor	3	8
Machine age	2	5
Customer perception	1	3
To be "chemical free"	1	3

*The total (55) exceeds the number of respondents (37) because some respondents listed more than one reason.

Fifty-nine percent of respondents indicated that they used an alternative solvent to PERC because of environmental concerns, such as preventing pollution or to be "more eco-friendly." Almost a third of respondents listed health concerns as a reason for switching. This included concern about employee health as well as customer health. The costs and regulations associated with PERC were focused on waste disposal and the prospect of tightening regulations.

Question 28. The majority (71 percent) of respondents stated that they had used wet cleaning (i.e., water) for fabrics that are labeled dry clean only (150 respondents).

Question 29. Eighteen percent of respondents indicated that they sometimes send garments to another facility for cleaning. The majority (82 percent) said they never send garments off-site for cleaning (153 respondents). Of respondents who indicated that they sent garments to another facility for cleaning, 82 percent reported sending approximately 3 percent or less off-site. Table 25 shows the percentage of items respondents estimated they cleaned off-site.

Curiously, five respondents who answered "yes" to ever sending garments to another facility for cleaning also said that approximately 0 percent of their garments are cleaned off site. It is not clear what these respondents meant. One possible interpretation is that they occasionally will send a garment to another facility for processing but it is not a regular occurrence.

Table 25. Percentage cleaned off-site

Percentage of Garments	Number	Percent
0	5	18
1 – 3	18	64
10	2	7
20	2	7
80	1	4
Total	**28**	**100**

Of respondents who indicated that they sometimes send garments to another facility for cleaning, the vast majority (86 percent) said the off-site location used something other than PERC. The type of solvent used at off-site locations is presented in Table 26. The most common solvent was hydrocarbons, with 48 percent of the respondents reporting that this was the solvent used off-site.

Table 26. Solvent used at off-site location

Solvent	Number	Percent
Hydrocarbon	10	48
Water (wet cleaning)	3	14
PERC	3	14
Liquid Silicone	2	10
Glycol ethers	1	5
Liquid CO_2	0	0
Other	2	10
Total	**21**	**100**

Question 30. The majority (79 percent) of respondents stated that the business owner performed maintenance on the dry cleaning machines. About a third of respondents said they hired an outside vendor or service person. The reported maintenance person(s) is presented in Table 27.

Table 27. Machine maintenance person		
Title	**Number***	**Percent**
Business owner	121	79
Outside vendor	50	32
Employee	4	3
Other	1	1
*The total (176) exceeds the number of respondents (154) because some respondents listed more than one person.		

Question 31. The majority (69 percent) of respondents indicated that their business did not own and use a sniffer or PERC detector (147 total respondents).

Question 32. Eighty-three percent of respondents reported that the person who cleaned out the still bottoms in their shop used respiratory protection (152 total respondents). Of the 126 that reportedly used respiratory protection, 47 percent said they used a disposable dust mask and 47 percent reported using a respirator with charcoal filters. See Table 28.

Table 28. Type of respiratory protection used when cleaning still bottoms		
Protection	**Number**	**Percent**
Disposable dust mask	59	39
Respirator with charcoal filters	59	39
Both	3	2
Not specified	5	3
No breathing protection used	26	17
Total	**152**	**100**

Question 33. The majority (95 percent) of respondents stated that the person who cleaned out the still bottoms in their shop wore gloves. Over half the respondents said they used chemical-resistant gloves in the cleaning process. The types of gloves respondents reported using are presented in Table 29.

Table 29. Type of gloves used when cleaning still bottoms		
Type of Gloves	**Number**	**Percent**
Reusable chemical-resistant gloves	80	53
Disposable latex gloves	39	26
Disposable nitrile gloves	9	6
Reusable "Kitchen" style rubber gloves	9	6
More than one type	5	3
Not specified	2	1
No gloves used	7	5
Total	**151**	**100**

Question 34. The majority (98 percent) of respondents reported that the still bottoms in their shop were hauled by a licensed hazardous waste carrier (150 total respondents). One respondent (who used a hydrocarbon solvent) said they disposed of this waste in the garbage.

Question 35. Table 30 presents the various methods respondents reported using to dispose of separator water. About 15 percent reported using more than one method for dealing with separator water. For example, several respondents mentioned using a system that relies on both filtration and evaporation.

Table 30. Disposal of separator water		
Disposal Method	**Number***	**Percent**
Evaporate the water and dispose of the solvent	78	51
Hauled by a licensed hazardous waste carrier	48	32
Use a carbon absorption system	26	17
Pour it down the drain	8	5
Use it in the boiler system	6	4
Water tower / cooling system (e.g. Smartmist)	5	3
Spread it on the ground	1	1
Other	1	1
*The total (173) exceeds the number of respondents (152) because some respondents listed more than one disposal method.		

Question 36. Sixty-seven percent of respondents reported that they used charcoal or "tonsil" filters on their dry cleaning machine (150 total respondents). Of the 100 businesses that used these filters, 96 (96 percent) said they disposed of the used filters through a licensed waste carrier. See Table 31.

Table 31. Disposal of filter material

Disposal Method	Number	Percent
Hauled by a licensed hazardous waste carrier	96	64
Throw in garbage	2	1
Solidify and throw in garbage	1	1
Not specified	1	1
Does not use filters	50	33
Total	**150**	**100**

Question 37. The majority of respondents (58 percent) said they received health and safety information from more than one source. Table 32 shows the number of sources used by respondents.

Table 32. Number of sources for health and safety information

Number of sources	Number	Percent
One	63	42
Two	33	22
Three	25	17
Four	18	12
Five	5	3
Six	6	4
Total	**150**	**100**

Sixty-six percent of respondents reported that they received their health and safety information about dry cleaning solvents from industry journals and newspapers. Two of the respondents in the "other" category said they received their information from trade representatives, such as the chemical distribution company (from a person, rather than a publication). Table 33 shows the different sources of information used by respondents.

Table 33. Method of receiving health and safety information about dry cleaning		
Method	**Number***	**Percent**
Industry journals & newspapers	99	66
Material Safety Data Sheets	68	45
Equipment and parts suppliers	62	41
Trade associations	49	33
State or local government agencies	27	18
Health & Safety information on Internet	24	16
Private safety consultants	0	0
Other	5	3
I don't have access to any health information	3	2
*The total (337) exceeds the number of respondents (150) because some respondents listed more than one method.		

Question 38. When asked if they believe there are health problems that can be caused by PERC, 44 percent of respondents indicated that they did not know or did not have an opinion. Only about one-quarter said they believed there are health problems associated with using PERC (149 total respondents).

About a third of respondents who indicated they believed PERC could cause health problems did not specify what these problems might include. Table 34 shows the respondents' answers.

When asked to describe the health problems they believed to be associated with PERC, four of these respondents did not answer the question but wrote that they, personally, had not had any problems. These answers were coded as "not specified."

Table 34. Perceived health problems resulting from PERC use		
Problem	**Number***	**Percent**
Strong odor causes headaches / dizziness	6	16
Breathing problems / lung damage	5	13
Cancer	3	8
Skin irritation/rashes	2	5
Liver damage	2	5
Kidney damage	1	3
Don't know	4	11
Not specified	17	45
*The total (40) exceeds the number of respondents (38) because some respondents listed more than one health problem.		

Question 39. Respondents were asked if they experienced health symptoms after spending time in their shop. The majority (87 percent) reported experiencing no symptoms. The most common reported symptoms were headaches and eye irritation. Five respondents reported experiencing multiple symptoms. The complete list of symptoms experienced by respondents is presented in Table 35.

Table 35. Symptoms experienced in shop		
Symptom	**Number***	**Percent**
Eye Irritation	7	5
Headaches	6	4
Dizziness	5	3
Nausea	3	2
Skin Irritation	3	2
Breathing problems	1	1
Not specified	6	4
None	127	86
*The total (148) exceeds the number of respondents (158) because some respondents listed more than one symptom.		

Question 40. Table 36 presents the ways in which respondents stated they would spend $500 in LHWMP matching funds.

Table 36. How respondents would spend $500 in matching funds

Response	Number*	Percent
Improving maintenance of existing machine	73	48
Purchasing a "sniffer" or PERC detector	53	35
Improving the ventilation in my shop	43	28
Improving spill management / containment around equipment	36	24
Purchasing personal protective equipment	32	21
Other	5	3
Would not use the matching funds	17	11

*The total (259) exceeds the number of respondents (151) because some respondents gave more than one answer.

Question 41. Fifty-seven percent of respondents indicated that they would like technical assistance from LHWMP (149 total respondents).

The respondents most likely to want technical assistance were those using PERC who also believed that PERC can cause health problems. Sixty-eight percent of these respondents wanted technical assistance, compared to one-half of the PERC users who believe there are no health problems associated with PERC.

Question 42. Sixty-six percent of respondents reported that they would like more information about becoming an EnviroStars business (149 total respondents).

Question 43. The majority (81 percent) of respondents stated that they prefer to read technical information and educational materials in Korean. English was the preferred language for less than a third of all respondents. Table 37 shows respondents' preferred language.

Table 37. Language preferred when reading technical and educational information		
Language	**Number***	**Percent**
Korean	122	81
English	44	29
Vietnamese	3	2
Other	1	1
*The total (170) exceeds the number of respondents (150) because some respondents gave more than one answer.		

Question 44. Respondents were asked to provide open-ended answers to the question: "What do you think are the greatest challenges to running a profitable dry cleaning business that is also healthy and environmentally friendly?" Sixty-seven respondents provided answers to this question. Their answers are presented in Table 38.

Thirty-six percent of respondents cited the costs associated with buying or maintaining equipment and supplies as their biggest challenge. Five of these respondents specifically mentioned that "greener" equipment and supplies tended to be more expensive than traditional dry cleaning. Another nine said that they needed a new dry cleaning machine.

Table 38. Challenges to running a safe, profitable, and environmentally friendly business		
Challenge	**Number***	**Percent**
Equipment / supply costs	24	36
Need for better / safer alternatives	6	9
Lack of education / training	6	9
General management challenges	6	9
Taxes, fees, and regulations	5	7
General financial difficulties	5	7
Waste disposal fees	3	4
Lack of public concern about environmental issues	4	6
Nothing	4	6
Other / don't know	10	15
*The total (73) exceeds the number of respondents (67) because some respondents listed more than one challenge.		

Question 45. Respondents were asked to write open-ended answers to the question: What could government agencies and programs do to help improve the safety, health, and environmental performance of dry cleaning businesses? Seventy-one respondents provided answers, presented in Table 39. Many of the respondents who wrote about a need for more education specified that they would like information presented in a seminar format.

Table 39. What could government agencies and programs do to help?

Suggestions	Number*	Percent
Financial assistance (all)	**30**	**42**
New machine / equipment	17	24
General	7	10
Waste disposal	3	4
Health insurance	3	4
Training and education (all)	**32**	**45**
Health and safety training and education	23	32
Training and endorsement of specific technologies or brands	6	8
Help increase public awareness	3	4
More regulation (all)	**7**	**10**
More inspections / enforcement	4	6
Tighter zoning restrictions	3	4
Don't want government help / interference	**4**	**6**
Other / don't know	**12**	**17**

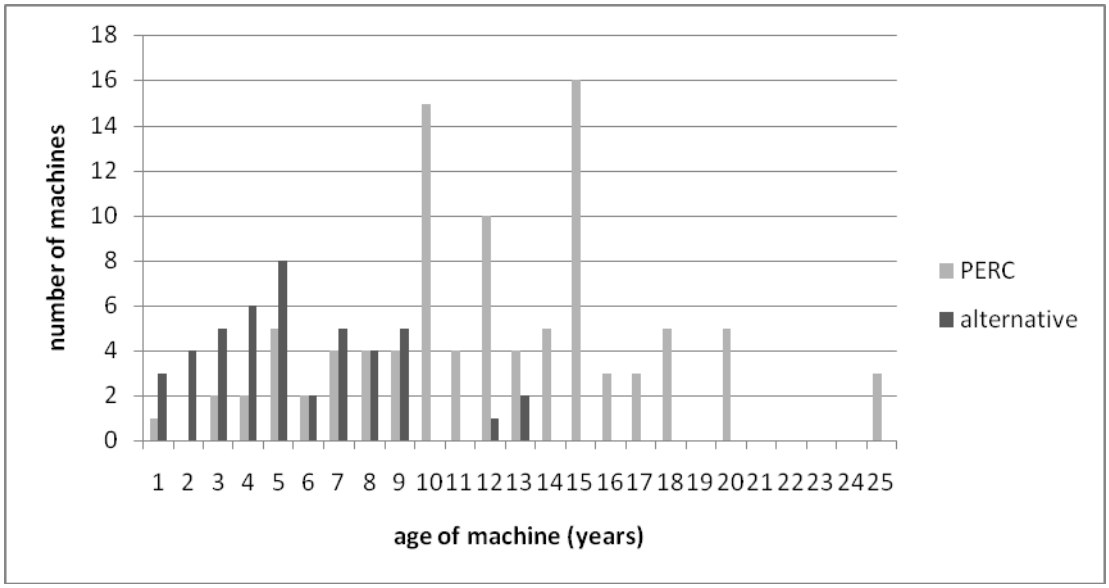
*The total (85) exceeds the number of respondents (71) because some respondents gave more than one suggestion.

Dry cleaning machine age

Age of machine and type of solvent being used

There was an association between the age of dry cleaning machine and the type of solvent in use (t=-7.88; p<0.001). All machines older than 13 years (a total of 40 machines) used PERC. Figure 3 shows the age distribution of PERC versus alternative solvent machines.

Figure 3. Age distribution of PERC machines versus alternatives



Solvent use and amount of solvent

There was no association between the age of dry cleaning machine and the amount of solvent being consumed annually (regression analysis, adjusted for number of loads run per week: F (2, 90) = 1.77; p = 0.1764). The analysis was limited to PERC only since comparisons across different solvent types can be problematic, especially when comparing CO_2 to liquid solvents.

The only parameter that was predictive of the amount of solvent used was the number of loads a shop runs per week (F (1, 95) = 12.32; p = 0.001).

Self-reported symptoms of exposure

Age of machine and any self-reported health problems

There was no association between self-reported symptoms and age of the dry cleaning machine (t=-0.83; p=0.408). The analysis was limited to PERC-using shops because PERC machines are also likely to be older machines and because we would expect there to be a greater likelihood of symptoms among shops using PERC.

Self-reported health problems and solvent type

There was no observed risk for self-reported symptoms between PERC users and other types of solvent (χ^2=0.01; p=0.921). This may be due to a lack of statistical power because the sample size was small; only 18 respondents reported any symptoms, compared to 128 respondents with no symptoms.

The risk ratio (presented in Table 40) suggests there may have been a slight increased risk for PERC-exposed workers, given a larger sample size.

Table 40. Self-reported symptoms by solvent type

Solvent	Symptoms	No symptoms	Total
PERC	13	91	104
Alternative	5	37	42
Total	18	128	146
Risk ratio = 1.05 (95 percent confidence interval: 0.399 – 2.762)			

There was also no association between self-reported health problems and the amount of PERC being used annually (two-sample t-test with unequal variances: t=0.969; p=0.353). Analysis was limited to shops using PERC.

Because the total number respondents that reported any symptoms was so small, we pooled all symptoms into a single group. Consequently, we were not able to determine whether specific symptoms were more likely in PERC-using shops.

Analysis of EnviroStar businesses

Several statistical analyses were conducted to determine whether businesses that self-reported as EnviroStars differed from non-EnviroStars. The findings are summarized below:

- Using simple linear regression analysis, there was no relationship between being an EnviroStar business and the age of dry cleaning machine(s) in use. Nor was there an association between the level of EnviroStars (the number of stars) and reported age of machines.
- Overall, EnviroStar businesses were no more likely to use PERC as a solvent than non-EnviroStar businesses (χ^2=1.140; p=0.286). However, 70 percent of five-star businesses used an alternative solvent, compared to less than 20 percent for all other star ratings.
- EnviroStars status was not associated with where respondents said they received their health and safety information (two-sided t-test with unequal variance: t=1.01; p=0.313).
- EnviroStars businesses were no more likely to say they believed there were health problems associated with PERC than were other businesses (two-sided t-test with unequal variance: t=-1.48; p=0.141).
- The following analyses were conducted on only PERC-using businesses:
    - EnviroStars business used the same amount of PERC annually as other businesses (two-sided t-test with unequal variance: t = -0.5611; p=0.576). This held even when the model was adjusted to account for the number of loads being run per week.
    - There was no association between being an EnviroStars business and use of PPE (using two-sided t-test with unequal variance). EnviroStars status was not

significantly associated with use of gloves (t=1.37; p=0.173); type of gloves (t=0.38; p=0.701); use of respiratory protection (t=0.71; p=0.478); or type of respiratory protection (t=1.4; p=0.166);

- There was no association between being an EnviroStars business and use of a PERC leak detector (t=0.20; p=0.844).
- Because all PERC shops reported using the same disposal method, being an EnviroStars business was not associated with disposal of still bottoms. Nor was being an EnviroStars business associated with disposal of separator water (two-sided t-test with unequal variance: t=0.17; p=0.867).
- Being an EnviroStars business was not associated with the presence of self-reported health problems (two-sided t-test with unequal variance: t=-1.04; p=0.299).

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Discussion

Survey Findings

This study was comprised of key informant interviews, site visits, and a county-wide business survey. The objectives were to gather information about: 1) the demographics of the dry cleaning industry; 2) general business characteristics, including the solvents used for cleaning; 3) current practices to protect human health and the environment; 4) perceptions about health and environmental protection, including business owners' needs; and 5) strategies to reduce occupational and environmental exposures and increase awareness.

The 64 percent response rate to the survey suggests that the results are likely representative of King County's dry cleaning industry.

Demographics

The results of this survey indicate that this is an industry dominated by small, family-run, independent businesses. Approximately one-quarter of the businesses surveyed have no employees and approximately one-half have between one and two employees. Over 80 percent of shops in King County are Korean-owned, which is substantially greater than the estimate of 60 percent derived from field activities conducted by LHWMP in 1998-2000.[48] This reported increase in Korean-owned businesses is consistent with oral testimony provided by key informants in the dry cleaning industry.

Business characteristics

On the average, the owners have operated the businesses for 10 years. Over two-thirds of businesses use PERC as a solvent in a single dry cleaning machine, which is significantly fewer than was observed during LHWMP's 1998-2000 field activities.[48] The LHWMP report states, "The industry, with a few exceptions, utilizes the solvent perchloroethylene…as the principal cleaning agent during the process."

On the average, dry cleaning machines are 10 years old and operate five or six days a week, usually in the morning, processing an average of two to three loads per day. Businesses supplement the dry cleaning with some amount of wet cleaning, even of "dry clean only" fabrics.

The shops are generally small (81 percent are less than 2,000 sq. ft. in area). Over two-thirds are co-located with businesses that sell or serve food.

Health and environmental protection practices

Business owners receive health and environmental information from multiple sources, with the majority stating that they rely upon industry journals and newspapers. Less than a fifth of respondents retrieve information from state or local government agencies; none used private consultants.

Machine maintenance is conducted primarily by the business owners, or by an employee in one-third of businesses. Although the U.S. EPA's National Perchloroethylene Air Emission Standards for Dry Cleaning Facilities requires PERC-using businesses to use a PERC vapor leak detector (or "sniffer"), the majority do not own or use such a device.

Although most respondents suggested that both respiratory protection and gloves are worn when the still bottoms are removed from the machine, the type of PPE used is often not appropriate.

For example, almost 40 percent of individuals who use respiratory protection stated that they use dust masks, even though they are not designed to provide protection from exposure to solvent vapors. Similarly, approximately one-quarter of individuals who use gloves stated that they use latex gloves, which may not be adequate to protect against dermal exposures.

In general, the number of respondents self-reporting as an EnviroStars business and their star-certification level matched the membership records maintained by the EnviroStars Program. Currently, 62 King County dry cleaners are enrolled in the program, whereas 65 respondents self-reported as EnviroStars. In addition, 32 percent claimed to be a five-star business, compared with 32 percent of businesses in the membership records. Similarly, 43 percent of respondents reported having a four-star rating, compared with 46 percent in the records. The one exception to this agreement is respondents who reported having a one-star rating; EnviroStars businesses are awarded two- to five-stars.

Based on the questions asked in this survey, businesses that received LHWMP's EnviroStars certification do not appear to be significantly different from the other dry cleaners in King County. There are several possible reasons for this lack of difference. The most likely explanation is that the questions posed on the survey do not necessarily align with EnviroStar criteria. For example, neither appropriate PPE nor the use of leak-detectors is required for EnviroStar certification. Although a comprehensive certification program may aspire to include aspects of occupational health, this is not currently an emphasis of EnviroStars. It is noteworthy that all businesses performed equally well in terms of waste management; the still bottoms from 98 percent of shops were hauled by licensed hazardous waste carriers.

Although five-star EnviroStars may use PERC as long as the waste is handled appropriately, 70 percent of five-star businesses use an alternative solvent (typically a hydrocarbon). This finding likely reflects the fact that several five-star businesses are "elite" cleaners; they exhibit a greater commitment to health and environmental protection than even many of their five-star contemporaries.

The local regulatory climate is biased against providing adequate oversight or assistance for this industry. For example, owner-operated businesses do not typically fall under the jurisdiction of worker health and safety regulatory agencies. Unless owner-operators pay into L&I's industrial insurance system, they are not subject to compliance actions by local DOSH inspectors and are not eligible for the consultation services typically provided by DOSH technical assistance staff.

In King County, dry cleaners are required to file a notice with PSCAA when they add or replace a dry cleaning machine. However, once this initial form is completed, there is no formal process of recertification other than paying an annual operating fee. Subsequent inspections typically take place only if a complaint is filed. As one respondent noted, "when I started working for a drycleaners in 1974 (California) a license was required to be an operator which had to be renewed each year. Since that requirement was eliminated, and in states where it is not required, the quality expertise of dry cleaning businesses has deteriorated."

Health and environmental perceptions and needs

Almost 80 percent of respondents cited financial considerations as the primary reason they would not switch from PERC to an alternative solvent. In addition, shop owners were not ready to replace equipment that operates well, especially when they do not perceive that a clearly preferred alternative is available. Those who were actively considering an alternative for their shop were evenly divided among the solvent options.

When respondents were asked to explain why they had switched from PERC, shops using alternative solvents said they were motivated primarily by environmental issues. Only about one-third of respondents cited health concerns as a reason for switching. Most dry cleaners did not consider PERC to be particularly hazardous; only one-quarter of respondents felt there were any adverse health effects associated with PERC exposure and only three dry cleaners considered PERC to be a possible carcinogen. Most respondents who felt there was any problem with PERC believed that it is simply an irritant, causing headaches or dizziness. In addition, those who believed there are health problems (of any kind) were also those already using alternative solvents. Those still using PERC were the same respondents who did not believe PERC can cause harm.

When asked what they think are the greatest challenges to running a profitable dry cleaning business that is also healthy and environmentally friendly, 36 percent cited the costs associated with buying or maintaining equipment and supplies. Over one-half of respondents were interested in receiving technical assistance from LHWMP. When asked what could government agencies and programs do to help improve the safety, health, and environmental performance of dry cleaning businesses, 42 percent requested financial assistance, particularly with purchasing new machines and equipment. Interestingly, even more respondents (45 percent) requested training and education, particularly concerning health and safety.

Reflecting the demographics of this industry, 81 percent of respondents preferred to read technical and educational information in Korean.

Strategies to reduce exposures and increase awareness

The health and safety deficiencies noted in the dry cleaning industry are typical of those observed in previous studies of the auto body industry[49] and other small businesses.[50] However, the finding that over 80 percent of dry cleaners are owned by Korean-speaking individuals compounds the difficulties in improving the health and environmental performance of this industry because of potential language and cultural barriers.

Education and outreach opportunities

Despite these challenges, the dry cleaning community in King County appears receptive to education and outreach efforts. For example, almost one-half of respondents suggested there was a need for more government-sponsored training and education, exceeding the number who felt government should provide funds or other financial assistance. One respondent wrote, "I need a program (educational program) to prevent the things like environment contamination or disregard of health that comes from ignorance."

A significant challenge is providing adequate technical assistance, considering the resource limitations faced by state and local government programs. Providing information to the dry cleaning community in a culturally appropriate manner is also challenging, but of paramount importance.

Recommendations must be sufficiently specific to have the greatest impact. For example, many respondents are concerned about the lack of certainty regarding the safety of the alternative solvents and are requesting explicit recommendations from government agencies. One respondent wrote, "I need things like the exact designation of equipment by the government in order to improve business safety, health and environment." Another wrote that LHWMP and other local agencies could help by providing recommendations "of solvents that are compatible with health and environment (names of the company and the solvents), and machines that are safe."

Dry cleaners would benefit from accessible information about the toxicity of PERC. As stated previously, many dry cleaners do not believe PERC is hazardous or they view it as an irritant and are not aware that it is a probable carcinogen. Emphasis on the health risks associated with PERC exposure ties into education about the proper use of PPE. Although respondents indicated that gloves and respirators are used, field observations suggest that while these types of PPE may be available, they are not used consistently, if at all. This finding is consistent with other observations, such as a 1999 study that found that although PPE was available, it typically was not used or used improperly. Many business owners in the 1999 study felt that the PPE was "not necessary to protect their health and safety."[32] Many dry cleaners understand that they should be using gloves and respiratory protection, but they do not understand how respirators function or why dust masks are inadequate.

Despite the fact that most business owners reported that they maintain their machines themselves, field observations suggest that many do not know how to properly repair gaskets or perform other basic maintenance to keep their machines adequately sealed. For example, during one field visit, we observed an owner who had attempted to affix a failing gasket using rubber cement. The PERC vapors subsequently dissolved the rubber cement, rendering the repair ineffective.

Dry cleaners would also benefit from education about the reasonable lifecycle of a dry cleaning machine and guidance about how to include equipment replacement costs into their capital budgets.

We have learned that the success of our outreach efforts hinges upon our ability to work through the local dry cleaning associations, provide materials in Korean and English, make repeated contact, and engage in face-to-face conversations with individual dry cleaners. Many respondents indicated they would like educational opportunities provided in a seminar format, underscoring the need for a hands-on, interpersonal approach.

Given sufficient resources, the EnviroStars Program, coupled with financial incentives, represents a viable model to provide much of this technical assistance. However, for LHWMP and the EnviroStars Program to improve the quality of its assistance, the program should consider making the following modifications to its criteria and processes:

1) Ensure that businesses that enroll in the EnviroStars Program are fully aware of the requirements and their responsibilities. Although procedures have improved in recent years, EnviroStars personnel report several problems with the recruitment conducted in 2000-2001 in collaboration with the dry cleaning business associations;

2) Assign sufficient staff with technical expertise in dry cleaning technology to guide businesses through EnviroStars certification and provide regular, in-depth follow-up inspections. If resource limitation preclude this approach, then random audits of a subset of businesses could be conducted;

3) When necessary, provide technical information in Korean and use Korean interpreters when conducting site visits;

4) Award five-star certification only to non-PERC businesses. In the words of one respondent, "It is very frustrating to see PERC dry cleaners promoting their '5 star EnviroStar' status, it confuses customers into thinking PERC is environmentally friendly… I am frustrated that I paid a premium to build a "true" PERC free business and there is no support to promote our efforts.";

5) Expand EnviroStar criteria to include aspects of occupational health (for example, best management practices to reduce worker exposures); and

6) To the extent possible, ensure that certified businesses are compliant with all applicable regulations. This would require significant coordination with state and local regulatory agencies.

Another important component of any voluntary performance recognition program is holding businesses accountable, by administering penalties for failure to comply with certification criteria. The EnviroStars Program withholds recertification from non-responsive businesses and failure to address the program's concerns can result in decertification. EnviroStars personnel have noted that the threat of decertification is frequently sufficient to bring about compliance.

Given the substantial capital investment required to purchase and install new dry cleaning systems, another approach is to provide funding for businesses to make the transition from PERC. For example, the New Jersey Department of Environmental Protection provides grants of up to $25,000 to businesses for dry cleaning equipment upgrades.[51] Preliminary discussions with local dry cleaning business owners revealed considerable enthusiasm for such a program, with several suggesting that a grant of this magnitude would allow them to upgrade their equipment almost immediately. In 2000, LHWMP awarded a $15,000 grant to a local dry cleaner to facilitate the replacement of a PERC machine with an alternative technology. LHWMP is currently considering awarding grants (up to $20,000 each) to several businesses to facilitate the replacement of PERC dry cleaning machines. Other financial mechanisms could include low interest loans or revolving funds designed specifically for small businesses, administered either by local banks or government agencies.

Regulatory opportunities

One of the surprising results of this study was the number of respondents (10 percent) who said that government could help by providing additional oversight and restrictions. These respondents felt that it is too easy to become a dry cleaner or that there were not enough inspections, zoning regulations, or other restrictions to eliminate marginal businesses.

Rather than simply issuing a permit and responding to complaints, to the extent possible, PSCAA should implement regular inspections and a licensing renewal process. This would further ensure that PERC-using dry cleaners meet regulatory requirements for protection of air quality.

The majority of local dry cleaners are not regulated by L&I's state OSHA program and are ineligible for consultation advice from L&I's industrial hygiene staff. Therefore, L&I should consider extending the protections afforded by the WISH Act to owner-operated businesses that do not pay into the state's industrial insurance program.

One of the most effective mechanisms by which PERC exposures can be reduced is banning its use as a dry cleaning solvent. The state of California is phasing out the use of PERC in dry cleaning entirely, and Illinois recently announced that they are also considering similar restrictions.[52] In addition, the U.S. EPA's National Perchloroethylene Air Emission Standards for Dry Cleaning Facilities specifies a phase-out of PERC-using dry cleaners in facilities co-located with residential units. Several jurisdictions have adopted more stringent requirements than those specified by the U.S. EPA. For example, the state of Maine extended the definition of "co-location" to include day care centers, health care facilities, prisons, elementary schools, middle or high schools, children's pre-schools, senior centers, youth centers or other facilities inhabited by children or the elderly.[53]

Regulation could also have a substantial impact on public awareness and demand. Many customers do not understand that dry cleaning involves applying solvents to their clothes and other fabrics. Customers are likely not aware of the health concerns associated with dry cleaning solvents or know which alternatives are the safest or most environmentally friendly. The issue is further compounded by many businesses claiming to be "green" based on (for example) recycling practices, rather than solvent properties. To increase public awareness, efforts could be directed towards requiring all dry cleaners to display the type of solvent they use on the door or window of their business. This signage could alert customers to the type of solvent in use as well as any associated health concerns.

"Safer alternative" solvents

Although the environmental and human health consequences of PERC exposures have been well-characterized, relatively few data are available for the alternative solvents that are coming into common usage in King County and elsewhere. This situation presents a dilemma for programs like LHWMP, which promote the adoption of safer alternatives. Given the community's resistance to wet cleaning and the technical difficulties with liquid CO_2 machines, many dry cleaners favor the aliphatic hydrocarbons, like DF-2000 and EcoSolv. Clearly, independent and credible studies are required to describe the toxicological properties, exposures, and environmental fate of PERC alternatives. Such information would be invaluable to manufacturers, government agencies, and dry cleaners.

Strengths and limitations of the study

This was the first comprehensive survey of the dry cleaning industry in King County. Although this study provided valuable information about local dry cleaning businesses, we cannot be certain of the representativeness of the data.

The principal limitation of this survey is that the responses were self-reported by business owners. This approach can result in response bias (i.e., respondents answer questions in the way they think the questioner wants them to answer rather than according to their true beliefs), yielding responses that may not reflect actual conditions and practices. Non-response bias may compromise the representatives of the data (i.e., the opinions and needs of those who responded to the survey may differ from those who declined to participate). Businesses owners may have either modified their responses or failed to participate for fear of retribution by regulatory agencies, concerns about privacy, etc. However, we attempted to minimize these sources of bias by informing business owners that their responses were confidential and that LHWMP has no regulatory authority. We noted that the survey responses were generally consistent with LHWMP's extensive field observations in King County's dry cleaning industry.

EnviroStar businesses were over-represented because the number responding exceeded the number of active EnviroStars in LHWMP's membership records. It is likely that some of the self-reported EnviroStars were either never certified or had expired memberships. Although the number of stars reported in the survey generally matched the EnviroStar database, it was not possible to verify the validity of these responses.

Drop shops are almost certainly overrepresented because owners of these businesses were asked to answer only one question and return the survey, whereas owners of dry cleaning facilities were required to complete and return the entire survey. When following-up with non-respondents by telephone, drop shops could be identified readily by asking only whether they do dry cleaning on the premises. Again, owners of dry cleaning facilities were required to complete and return the survey, which was considerably more burdensome.

Another possible source of response bias is that answers were provided in good faith but were inaccurate. For example, over one-half of the respondents said they used reusable chemical-resistant gloves for cleaning out still bottoms. Even if we assume that these responses are honest and representative, we cannot be certain that they are accurate. For example, some shop owners may believe that their food-grade latex gloves are chemical-resistant. Another example of potential inaccuracy is in the number of gallons of solvent used annually. Some respondents may have provided the number of drums of solvent, not realizing that there are 55 gallons in a single drum. Because the nature of this survey involved many technical questions, there were multiple opportunities for respondents to provide honest but erroneous answers.

Respondents may have felt limited by the choices provided as answers. For example, when asked about their usual method for receiving health and safety information, none offered that they get information from other shop owners or friends in the business. Only one respondent suggested that they received information from other people (a business representative). The checklist of answers consisted only of written sources of information, which may have influenced respondents' open-ended responses to the question.

Strengths of the study include:

1) The use of several data sources to identify dry cleaners (most shops in King County were likely identified);

2) The use of key informant interviews and field visits to validate survey questions;

3) The support and participation of local dry cleaners, community leaders, and businesses association officers;

4) The availability of LHWMP staff with many years of field experience in the dry cleaning industry and in-depth knowledge of the EnviroStars Program;

5) High-quality translation of all materials into Korean by a certified contractor, with review provided by local Korean-speaking colleagues; and

6) The high (64 percent) response rate to the survey. Although we cannot exclude the possibility of bias, we conclude that this relatively high response rate likely results in a representative profile of King County's dry cleaning industry.

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Conclusions

For over a decade, LHWMP has devoted considerable resources to the dry cleaning industry, particularly with regard to the proper handling and disposal of waste streams. However, this study has demonstrated that PERC exposures remain a concern for workers, the public, and the environment. To a large extent, this situation reflects the fact that LHWMP's activities have focused almost exclusively on waste management – and it is noteworthy that the majority of businesses are reportedly managing their wastes appropriately. However, this industry has received very little technical assistance or regulatory attention with regard to occupational health. Controlling worker exposures is outside of LHWMP's purview, and the local regulatory agency responsible for occupational health & safety (L&I) has paid little attention to this industry because dry cleaning businesses generally fall outside of its jurisdiction.

The challenges faced by dry cleaners are typical of those seen in many small businesses, especially in a time of economic recession. However, the dominance of this industry by individuals whose first language is Korean exacerbates the difficulties with providing effective outreach and education.

We conclude that the most effective means to improve the health and environmental performance of the dry cleaning industry is to remove PERC from shops. This may be achieved by a combination of regulation, financial assistance, outreach, and technical assistance. Specifically, we recommend the following course of action for LHWMP:

1. Introduce legislation to phase-out the use of PERC in King County and possibly state-wide;

2. Provide grants and facilitate low-interest loans to allow businesses to replace their PERC machines;

3. No longer award five-star EnviroStar status to PERC-using dry cleaners;

4. Work closely with local agencies to identify potential conflicts in regulations and deliver consistent messaging regarding regulatory requirements;

5. Using culturally appropriate methods, educate businesses owners about the hazards of PERC, increase their awareness of the appropriate regulations and best management practices, and encourage them to invest in new technologies; and

6. Assist businesses with characterizing the waste streams from alternative solvent machines, to ensure that the wastes are disposed of appropriately.

A final recommendation, beyond what can be achieved at the local level, is for an independent review of the toxicology and environmental fate of the alternative dry cleaning solvents. Local government entities and businesses urgently need reliable information about "safer alternative" solvents and other products.

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APPENDICES

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APPENDIX A

SURVEY INSTRUMENT

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King County Dry Cleaners

How can we help your business?

A voluntary survey from the Local Hazardous Waste Management Program in King County

Return to:
Gilmore Research Group
2101 4th Avenue, 8th Floor
Seattle, WA 98121

Local Hazardous Waste Management Program in King County

How to complete the survey

Step 1: Ask the person most familiar with the day-to-day operations in your business (preferably the owner or manager) to complete the survey.

Step 2: Return the survey in the enclosed postage-paid envelope to Gilmore Research by **September 10th, 2010**.

If you have questions about this survey, please contact:

Steve Whittaker, Dry Cleaning Project Lead.
Local Hazardous Waste Management Program
401 Fifth Ave., Suite 1100
Seattle, WA 98104
Phone: 206.263.8499 or 1-800-325-6165 (toll-free) / when prompted, enter 38499
Email: steve.whittaker@kingcounty.gov

Thank you for participating in this survey!

1

Do you do dry cleaning on the premises?

Does your business actually do dry cleaning, as opposed to being a "drop shop" (i.e., do you have a dry cleaning machine on the premises)? ❑ Yes ❑ No

If you answered "No" and **do not** do dry cleaning on the premises, **please stop here**, complete the optional Survey Respondent Information form on the last page, and return the survey to Gilmore Research.

If you actually do dry cleaning on the premises, please complete the rest of the survey.

QUESTIONS ABOUT YOU AND YOUR BUSINESS

1. Which job title best describes your current position? (Please check one box)

- ❑ Shop owner
- ❑ Shop manager
- ❑ Other (describe) _____

2. Please select one or more of the following racial categories to describe yourself:

- ❑ American Indian or Alaska Native
- ❑ Asian
  - ❑ Chinese
  - ❑ Korean
  - ❑ Vietnamese
  - ❑ Other Asian, please describe: _____
- ❑ Black or African American
- ❑ Native Hawaiian or Pacific Islander
- ❑ White

3. In which city is your business located? _____

4. Are you a King County "EnviroStars" business?

❑ Yes ❑ No

If you answered "Yes", how many "Stars" has your business earned? _____

3

5. **Is your business family-owned and operated**?

❑ Yes ❑ No

6. **Is your business part of a multi-store business, consolidator, franchise, cooperative group, chain, or similar collection of businesses?** ❑ Yes ❑ No

7. **Do you have any employees?** ❑ Yes ❑ No

If you answered "Yes", how many full-time and part-time employees do you have at your busiest time?
____ employees

If you answered "No", do you pay into the Department of Labor & Industries' workers compensation system to cover yourself or a co-owner? ❑ Yes ❑ No

8. **Do you belong to any local or national dry cleaner associations?** ❑ Yes ❑ No

If you answered "Yes", which association(s) do you belong to? _____

_____

9. **Do you read any dry cleaning trade publications?**

❑ Yes ❑ No

If you answered "Yes", which publication(s) do you read? _____

_____

4

10. How long have you owned the business at this location? _____years

11. How long has there been a dry cleaning business at this location? _____years

12. What is the area of your shop? _____ square feet

13. Is the facility a part of a larger building? ❑ Yes ❑ No

If you answered "Yes":
Do people live in the building where the facility is located? ❑ Yes ❑ No

Are there businesses that sell or serve food where the facility is located? ❑ Yes ❑ No

QUESTIONS ABOUT YOUR DRY CLEANING MACHINE

14. How many dry cleaning machines do you have in this facility? _____ machines

5

Please provide the following information for each of the machines you have in your facility. If you only have one machine, please just complete the column "Machine #1":

Question		Machine #1	Machine #2	Machine #3
15. What generation of machine do you use? Please place a check mark in the box next to the correct description.	**1st Generation:** Transfer Machine	❑	❑	❑
	2nd Generation: Dry to Dry Vented, Water-cooled or Refrigerated	❑	❑	❑
	2nd Generation Retrofitted: Self Contained Unit, Non-Vented and Refrigerated	❑	❑	❑
	3rd Generation: Dry to Dry, Self Contained, Non-Vented and Refrigerated	❑	❑	❑
	4th Generation: Enclosed Machine with Refrigeration and Carbon Absorber	❑	❑	❑
	5th Generation: Enclosed Machine with Carbon Absorber and Vapor Sensor and Vapor Lock on Basket	❑	❑	❑
	Other (please describe):			

6

Question	Machine #1	Machine #2	Machine #3
16. **How old is the machine?**	_____ years	_____ years	_____ years
17. **Who is the manufacturer?**			
18. **What is the model number?**			
19. **What is the rated capacity of the machine?**	_____ pounds	_____ pounds	_____ pounds
20. **On the average, how many pounds do you wash per load?**	_____ pounds	_____ pounds	_____ pounds
21. **On the average, how many loads do you run per week?**	_____ loads per week	_____ loads per week	_____ loads per week
22. **How many days per week do you operate the machine?**	_____days per week	_____days per week	_____days per week

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7

Question	Machine #1	Machine #2	Machine #3
23. **When do you normally run the machine? Please write in the hours and circle AM or PM.**	Starting: ______ AM/PM Until: ______AM/PM	Starting: ______ AM/PM Until: ______AM/PM	Starting: ______ AM/PM Until: ______AM/PM
24. **What type of solvent is used in the machine?**	❑ PERC ❑ Glycol ethers (Rynex, Solvair) ❑ Hydrocarbon (DF-2000, EcoSolv) ❑ Liquid Silicone (GreenEarth) ❑ Liquid CO_2 ❑ Other: ____________	❑ PERC ❑ Glycol ethers (Rynex, Solvair) ❑ Hydrocarbon (DF-2000, EcoSolv) ❑ Liquid Silicone (GreenEarth) ❑ Liquid CO_2 ❑ Other: ____________	❑ PERC ❑ Glycol ethers (Rynex, Solvair) ❑ Hydrocarbon (DF-2000, EcoSolv) ❑ Liquid Silicone (GreenEarth) ❑ Liquid CO_2 ❑ Other: ____________
25. **Approximately how many gallons of solvent do you use per year?**	______ gallons per year	______ gallons per year	______ gallons per year

8

26. If you <u>are using</u> PERC at the present time, are you considering buying a non-PERC machine in the next year? ❑ Yes ❑ No

If you answered "Yes", what type of solvent would you use?

- ❑ Glycol ethers (Rynex, Solvair)
- ❑ Liquid Silicone (GreenEarth)
- ❑ Hydrocarbon (DF-2000, EcoSolv)
- ❑ Liquid CO_2
- ❑ Water (wet cleaning)
- ❑ Other: _____

If you answered "No", what is stopping you from buying a non-PERC machine?

_____

_____

27. If you <u>are not</u> using PERC, what made you decide to use an alternative solvent?

_____

_____

28. Do you ever use wet cleaning (i.e., water) for fabrics that are labeled "dry clean only"? ❑ Yes ❑ No

If you answered "Yes", roughly what percentage of the "dry clean only" fabrics do you wet clean? _____ %

9

29. Do you ever send garments to another facility for cleaning? ❑ Yes ❑ No

If you answered "Yes", approximately what percentage is cleaned off-site? _____%

What solvent is used at the off-site location?

- ❑ PERC
- ❑ Liquid Silicone (GreenEarth)
- ❑ Glycol ethers (Rynex, Solvair)
- ❑ Liquid CO_2
- ❑ Hydrocarbon (DF-2000, EcoSolv)
- ❑ Other: _____
- ❑ Water (wet cleaning)

QUESTIONS ABOUT MACHINE MAINTENANCE AND WASTE HANDLING

30. Who performs the maintenance on the machines?

- ❑ Business owner
- ❑ Employee
- ❑ Outside vendor/service person
- ❑ Other, please describe _____

31. Do you own <u>and use</u> a "sniffer" or PERC detector?

❑ Yes ❑ No

32. Does the person who cleans out the still bottoms use breathing protection? ❑ Yes ❑ No

If you answered "Yes" what type of breathing protection do they use?

- ❑ A disposable dust mask
- ❑ A respirator with charcoal filters
- ❑ Other, please describe: _____

10

33. Does the person who cleans out the still bottoms wear gloves? ❑ Yes ❑ No

If you answered "Yes", what type of gloves do they wear?

- ❑ Disposable latex gloves
- ❑ Disposable nitrile gloves
- ❑ Reusable "Kitchen" style rubber gloves
- ❑ Reusable chemical-resistant rubber gloves
- ❑ Other, please describe:

_____

34. How do you dispose of the still bottoms?

- ❑ Hauled by a licensed hazardous waste carrier
- ❑ Throw in the garbage
- ❑ Other, please describe:

_____

_____

35. How do you dispose of your separator water?

- ❑ Pour it down the drain
- ❑ Spread it on the ground
- ❑ Use it in the boiler system
- ❑ Hauled by a licensed hazardous waste carrier
- ❑ Evaporate the water and dispose of the solvent
- ❑ Use a carbon absorption system
- ❑ Other, please describe:

_____

_____

11

36. Do you use charcoal or "tonsil" filters on your dry cleaning machine? ❑ Yes ❑ No

If you answered "Yes", how do you dispose of the filter material?

- ❑ Hauled by a licensed hazardous waste carrier
- ❑ Throw in the garbage
- ❑ Solidify and throw in the garbage
- ❑ Other, please describe:

_____

QUESTIONS ABOUT HEALTH AND SAFETY

37. Where do you get your health & safety information about dry cleaning solvents (check all that apply)

- ❑ Material Safety Data Sheets (MSDS)
- ❑ Equipment and parts suppliers
- ❑ Health & safety information on the Internet
- ❑ Industry journals & newspapers
- ❑ Private safety consultants
- ❑ State or local government agencies
- ❑ Trade associations
- ❑ Other (please describe): _____
- ❑ I don't have access to any health information.

38. Do you believe there are health problems that can be caused by PERC?

❑ Yes ❑ No ❑ Don't know/no opinion

If you answered "Yes", please describe the health problems:

_____

39. Do you experience any of the following health problems after spending time in your shop? (check all that apply)

- ❑ headaches
- ❑ dizziness
- ❑ nausea
- ❑ eye irritation
- ❑ skin irritation
- ❑ breathing problems
- ❑ other, please describe _____
- ❑ none

40. We can provide your business with one-time 50% matching funds up to $500 to help improve health & safety and waste management.

If we gave you $500, how would you spend the money? (check all that apply)

- ❑ Improving maintenance of existing machine (new gaskets, seals, hoses)
- ❑ Improving the ventilation in my shop
- ❑ Purchasing personal protective equipment such as gloves and respirators
- ❑ Purchasing a "sniffer" or perc detector
- ❑ Improving spill management / containment around equipment
- ❑ Other, please describe: _____
- ❑ I would not use the matching funds

If you are interested in receiving these matching funds, please be sure to complete the "Survey Respondent Information" on the last page so we know how to contact you.

13

41. **If we get additional funding, we will be doing more work in the dry cleaning industry. We would visit your business to check out your dry cleaning machine and provide free testing of spot cleaners, the levels of solvent in your shop's air, and waste products. We will help you address any problems with free training and education. We would not reveal your name or the identity of your business to anybody.**

Would you like us to provide you with this technical assistance? ❑ Yes ❑ No

If you answered "Yes", please be sure to complete the "Survey Respondent Information" on the last page so we know how to contact you.

42. **Our EnviroStars program gives small businesses incentives and recognition for reducing hazardous materials and waste. EnviroStars certification provides the public with an easy way to identify and support businesses using environmentally responsible practices.**

Would you like to receive more information about becoming an EnviroStars business? ❑ Yes ❑ No

If you answered "Yes", please be sure to complete these "Survey Respondent Information" on the last page so we know how to contact you.

43. In which language do you prefer to read technical information and educational materials?

- ❑ English
- ❑ Chinese - Cantonese
- ❑ Chinese - Mandarin
- ❑ Korean
- ❑ Vietnamese
- ❑ Other, please describe: _____

44. What do you think are the greatest challenges to running a profitable dry cleaning business that is also healthy and environmentally friendly?

_____

_____

_____

_____

45. What could government agencies and programs do to help improve the safety, health, and environmental performance of dry cleaning businesses?

_____

_____

_____

_____

15

46. Please provide any comments you would like to share with us in the space below:

16

Survey Respondent Information

If you prefer to remain anonymous, do not provide the information below. However, we encourage you to complete this form so that we might send you educational materials and work with you in the future on this confidential project.

Please print your name below:

_____
First Last

Business name: _____

Job title: _____

Business address:

_____
Street address City State Zip

E-mail address: _____

Business telephone no.: ( ) _____

Business fax no.: ( ) _____

Thank you for helping to keep King County's dry cleaning businesses profitable and healthy!

Please do not complete this section. For business use:
❑VIP Program ❑EnviroStars ❑Technical assistance

17

킹 카운티 드라이클리닝 사업자 대상

보다 나은 사업 환경을 위한 유익한 제안

킹 카운티 지역 유해 폐기물 관리 프로그램의 자발적 설문 조사

반송 주소:
Gilmore Research Group
2101 4th Avenue; 8th Floor
Seattle, WA 98121

Local Hazardous Waste Management Program in King County

설문 작성 방법

1 단계: 귀하의 사업장에서 일상 업무를 가장 잘 알고 있는 사람(되도록이면 업주 또는 운영자)에게 설문 작성을 부탁드립니다.

2 단계: 동봉한 반송용 봉투에 작성한 설문지를 넣어 2010 년 9 월 10 일까지 Gilmore Research 로 반송하십시오.

본 설문 조사와 관련하여 궁금한 점이 있으시면 아래로 문의하십시오.

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본 설문 조사에 참여해 주셔서 감사합니다!

1

업소에서 드라이클리닝 작업을 합니까?

세탁물을 "다른 업소에 맡기"지 않고 업소에서 실제로 드라이클리닝을 합니까(즉, 업소에 드라이클리닝 기계가 있습니까)? ❑ 예 ❑ 아니요

'아니요'로 답했고 업소에서 드라이클리닝을 하지 **않을** 경우 **설문을 중단하고** 마지막 페이지에 있는 설문 조사 응답자 정보(선택 사항)를 작성한 후 설문지를 Gilmore Research로 반송하십시오.

업소에서 실제로 드라이클리닝을 할 경우, 나머지 설문에 답하십시오.

응답자 본인 및 사업 관련 질문

1. 다음 직위 중 귀하의 현재 직위를 가장 잘 설명한 것은 어떤 것입니까? (하나만 체크로 표하십시오)

- ❑ 업소 주인
- ❑ 업소 매니저
- ❑ 기타(기재 요망)_____

2. 본인에 해당하는 인종을 선택하십시오.

- ❑ 아메리칸 인디언 혹은 알래스카 원주민
- ❑ 아시아계
  - ❑ 중국인
  - ❑ 한국인
  - ❑ 베트남인
  - ❑ 기타 아시아계(기재 요망): _____
- ❑ 흑인 또는 아프리카계 미국인
- ❑ 하와이 원주민 혹은 기타 태평양 섬주민
- ❑ 백인

3. 업소가 위치한 시는 어디입니까? _____

4. 킹 카운티의 "**EnviroStars**(환경 모범 업소)" 업소로 지정되어 있습니까?

❑ 예 ❑ 아니요

"예"로 답한 경우, 귀하의 업소는 몇 개의 "Star"를 획득했습니까? _____

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5. 귀하의 사업장은 가족 소유로 운영하고 있습니까?

❑ 예 ❑ 아니요

6. 귀하의 업소는 다종 정포 사업, 통합 업체**(consolidator)**, 프랜차이즈, 협력 그룹**(cooperative group)**, 체인 또는 유사 업소 중 하나입니까? 예 ❑ 아니요

7. 종업원이 있습니까? ❑ 예 ❑ 아니요

"예"로 답한 경우, 가장 바쁜 시기에 풀타임 및 파트타임 종업원을 몇 명 두고 있습니까?
____명

"아니오"라고 답한 경우, 본인 또는 공동 소유주를 위해서 노동부(Department of Labor & Industries)에 근로자 산재 보험료(workers compensation system)를 납부하고 있습니까? ❑ 예 ❑ 아니요

8. 지역 또는 전국 세탁업 협회에 소속되어 있습니까?
예 ❑ 아니요

"예"로 답한 경우, 어떤 협회에 소속되어 있습니까?

_____

_____

9. 구독하고 있는 세탁업 관련 간행물이 있습니까?

❑ 예 ❑ 아니요

"예"로 답한 경우, 어떤 간행물을 구독하고 있습니까?

_____

_____

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10. 이 장소에서 업소를 경영한 지는 얼마나 되었습니까?
_____년

11. 이 장소에서 얼마 동안 세탁업에 종사해 왔습니까?
_____년

12. 사업장 면적은 얼마나 됩니까? _____ 평방 피트

13. 귀하의 업소는 더 큰 건물에 포함되어 있습니까?
❑ 예 ❑ 아니요

"예"로 답한 경우:
업소가 위치한 건물에 사람들이 거주하고 있습니까?
❑ 예 ❑ 아니요

업소가 있는 건물에 음식을 판매 또는 제공하는 다른 업소가 있습니까? ❑ 예 ❑ 아니요

드라이클리닝 기계에 대한 질문

14. 업소에 몇 대의 드라이클리닝 기계를 보유하고 있습니까?
_____대

업소에 보유하고 있는 각 기계에 대해 다음 정보를 제공해 주십시오. 기계가 단 한 대뿐일 경우, "기계 #1" 칸에만 기입하십시오.

질문		기계 #1	기계 #2	기계 #3
15. 몇 세대 기계를 사용하고 있습니까? 알맞는 설명 옆에 있는 네모 칸에 표기하십시오.	**1 세대:** 트랜스퍼 머신(Transfer Machine)	❑	❑	❑
	2 세대: 드라이 투 드라이 통풍 방식, 수냉식 또는 냉각식	❑	❑	❑
	2 세대(보강): 독립형 장치, 통풍구 없는 냉각식	❑	❑	❑
	3 세대: 드라이 투 드라이, 독립형, 통풍구 없는 냉각식	❑	❑	❑
	4 세대: 냉각기 및 탄소 흡착기가 포함된 밀폐식 기계	❑	❑	❑
	5 세대: 탄소 흡착기, 바스켓에 증기 센서(Vapor Sensor)와 증기 잠금장치(Vapor Lock)가 포함된 밀폐식 기계	❑	❑	❑
	기타(기재 요망):			

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질문	기계 #1	기계 #2	기계 #3
16. 기계가 얼마나 오래되었습니까?	_____년	_____년	_____년
17. 제조업체는 어디입니까?			
18. 모델 번호는 무엇입니까?			
19. 기계의 정격 용량은 얼마나 됩니까?	_____파운드	_____파운드	_____파운드
20. 평균적으로 한 번의 세탁 량은 몇 파운드입니까?	_____파운드	_____파운드	_____파운드
21. 평균적으로 일주일에 몇 번세탁 과정을 처리합니까?	_____회/주	_____회/주	_____회/주
22. 일주일 중 몇 일 동안 기계를 작동합니까?	_____일/주	_____일/주	_____일/주

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질문	기계 #1	기계 #2	기계 #3
23. 통상적으로 언제 기계를 작동합니까? 시간을 기록하고 AM 또는 PM 에 동그라미하십시오.	작동 시작: _____ AM/PM 작동 종료: _____AM/PM	작동 시작: _____ AM/PM 작동 종료: _____AM/PM	작동 시작: _____ AM/PM 작동 종료: _____AM/PM
24. 기계에서 어떤 종류의 용제(solvent)를 사용합니까?	❑ PERC ❑ 글리콜에테르 (Rynex, Solvair) ❑ 탄화 수소(DF-2000, EcoSolv) ❑ 액상 실리콘 (GreenEarth) ❑ 액체CO_2 ❑ 기타: _____	❑ PERC ❑ 글리콜에테르 (Rynex, Solvair) ❑ 탄화 수소(DF-2000, EcoSolv) ❑ 액상 실리콘 (GreenEarth) ❑ 액체 CO_2 ❑ 기타: _____	❑ PERC ❑ 글리콜에테르 (Rynex, Solvair) ❑ 탄화 수소(DF-2000, EcoSolv) ❑ 액상 실리콘 (GreenEarth) ❑ 액체 CO_2 ❑ 기타: _____
25. 연간 사용되는 용제는 대략 몇 갤런 정도 됩니까?	_____ 갤런/년	_____ 갤런/년	_____ 갤런/년

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26. 현재 **PERC**를 사용하고 있는 경우, 내년에 비 PERC 기계 구입을 고려하고 있습니까? ❑ 예 ❑ 아니요

"예"로 답한 경우, 어떤 종류의 용제를 사용하시겠습니까?

- ❑ 글리콜에테르(Rynex, Solvair)
- ❑ 액상 실리콘(GreenEarth)
- ❑ 탄화 수소(DF-2000, EcoSolv)
- ❑ 액체 CO_2
- ❑ 물(웨트 클리닝)
- ❑ 기타: _____

"아니오"로 답한 경우, 비 PERC 기계를 구입하지 못하는 이유는 무엇입니까?

_____

_____

27. **PERC**를 사용하지 않고 있다면, **PERC**가 아닌 다른 용제를 사용하기로 결정하신 이유는 무엇입니까?

_____

_____

28. 라벨에 "드라이클리닝 전용"으로 표기되어 있는 옷을 웨트클리닝(즉, 물세탁)한 적이 있습니까? ❑ 에 ❑ 아니요

"예"로 답한 경우, "드라이클리닝 전용" 의류 중에서 대략 몇 퍼센트 정도나 웨트클리닝(물세탁)을 합니까?

_____ %

29. 옷을 다른 세탁 시설로 보낸 적이 있습니까? ❑ 예 ❑ 아니요

"예"로 답한 경우, 대략 몇 퍼센트의 옷을 다른 곳에서 세탁합니까? _____%

그 외부 시설에서는 어떤 용제를 사용합니까?

- ❑ PERC
- ❑ 액상 실리콘(GreenEarth)
- ❑ 글리콜에테르(Rynex, Solvair)
- ❑ 액체 CO_2
- ❑ 탄화 수소(DF-2000, EcoSolv)
- ❑ 기타: _____
- ❑ 물(웨트 클리닝)

기계의 유지보수 및 폐기물 처리에 관한 질문

30. 기계의 유지보수는 누가 수행합니까?

- ❑ 업주
- ❑ 종업원
- ❑ 외부 업체/서비스 직원
- ❑ 기타(기재 요망) _____

31. "냄새 탐지기**(sniffer)**" 또는 **PERC** 탐지기를 소유 및 사용하고 있습니까? ❑ 예 ❑ 아니요

32. 증류 찌꺼기를 청소하는 사람은 호흡기 보호구를 사용합니까? ❑ 예 ❑ 아니요

"예"로 답한 경우, 어떤 종류의 호흡기 보호구를 사용합니까?

- ❑ 일회용 방진 마스크
- ❑ 숯 필터가 있는 마스크
- ❑ 기타(기재 요망) _____

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33. 증류 찌꺼기를 청소하는 사람의 경우, 장갑을 사용합니까?
❑ 에 ❑ 아니요

"예"로 답한 경우, 어떤 종류의 장갑을 사용합니까?
- ❑ 일회용 라텍스 장갑
- ❑ 일회용 니트릴 장갑
- ❑ 재사용 가능한 '주방'용 고무 장갑
- ❑ 재사용 가능한 내화학성(chemical-resistant) 고무 장갑
- ❑ 기타(기재 요망):

_____

34. 증류 찌꺼기는 어떤 식으로 폐기합니까?

- ❑ 허가 받은 유해 폐기물 수송 회사에서 수거
- ❑ 쓰레기통에 버림
- ❑ 기타(기재 요망):

_____

_____

35. 분리수(separator water)는 어떻게 폐기합니까?

- ❑ 배수구에 버림
- ❑ 땅바닥에 뿌림
- ❑ 보일러 시스템에 사용
- ❑ 허가 받은 유해 폐기물 수송 회사에서 수거
- ❑ 물은 증발시키고 용제는 폐기
- ❑ 탄소 흡착 시스템 사용
- ❑ 기타(기재 요망):

_____

_____

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36. 드라이클리닝 기계에 숯 필터 또는"**tonsil**" 필터를 사용합니까? ❑ 예 ❑ 아니요

"**예**"로 **답한 경우,** 이 필터의 구성 물질을 어떤 식으로 폐기합니까?

❑ 허가 받은 유해 폐기물 수송 회사에서 수거
❑ 쓰레기통에 버림
❑ 응고시킨 다음 쓰레기통에 버림
❑ 기타(기재 요망):

_____

건강 및 안전에 관한 질문

37. 드라이클리닝 용제와 관련하여 건강 및 안전 정보를 어디에서 얻습니까(해당하는 것에 모두 표기하십시오)?

❑ 물질안전보건자료(MSDS)
❑ 장비 및 부품 공급업체
❑ 인터넷 상의 건강 및 안전 정보
❑ 업계 저널지 및 신문
❑ 민간 안전 컨설턴트
❑ 주 또는 지역 정부 기관
❑ 동업자 단체
❑ 기타(기재 요망): _____
❑ 건강 정보를 볼 방법이 없음

38. PERC 로 인해 건강상 문제가 생길 수 있다고 생각합니까?

❑ 예 ❑ 아니요 ❑ 모르겠음

"**예**"로 **답한 경우,** 건강상의 문제에 대해 기술해 주십시오.

_____

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39. 귀하의 사업장에서 시간을 보낸 후 다음과 같은 건강상의 문제를 경험한 적이 있습니까? (해당하는 것에 모두 표기하십시오)

- ❑ 두통
- ❑ 현기증
- ❑ 메스꺼움
- ❑ 눈의 자극
- ❑ 피부 자극
- ❑ 호흡 문제
- ❑ 기타(기재 요망) _____
- ❑ 없음

40. 저희는 건강 및 안전과 폐기물 관리 개선을 지원하기 위해 최대 500 달러까지 한차례 **50%**의 보조금을 귀하의 사업장에 지급할 수 있습니다.

귀하에게 **500** 달러를 지급한다면, 이 돈을 어떻게 사용하시겠습니까? (해당하는 것에 모두 표기하십시오)

- ❑ 기존 기계의 유지 보수(개스킷, 씰, 호스 교체)
- ❑ 사업장 내 환기 장치 개선
- ❑ 장갑 및 마스크와 같은 개인용 보호구 구입
- ❑ "냄새 탐지기" 또는 PERC 탐지기 구입
- ❑ 유출물 관리 / 장비 주변의 유출 방지책 개선
- ❑ 기타(기재 요망): _____
- ❑ 보조금을 사용하지 않을 것임

이러한 보조금 수령에 관심이 있을 경우, 저희가 귀하에게 연락할 수 있도록 마지막 페이지에 있는 "설문 조사 응답자 정보"를 작성해 주시기 바랍니다.

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41. 저희가 추가로 자금을 지원 받게 되면, 세탁업계를 위해서도 더 많은 일을 하게 될 것입니다. 업소를 방문하여 드라이클리닝 기계를 점검하며, 얼룩 제거기**(spot cleaner)**, 사업장 내 공기 중의 솔벤트 레벨 및 폐기물 처리 제품에 대해 무상 점검을 실시할 수 있을 것입니다. 또한, 무료 훈련과 교육을 제공하여 귀하께서 문제에 대처하는 데 도움이 될 것입니다. 저희는 귀하의 성명 또는 업소 정보에 대해서는 누구에게도 공개하지 않습니다.

저희한테서 이러한 기술 지원을 받으시겠습니까?
❑ 예 ❑ 아니요

"예"로 답한 경우, 저희가 귀하에게 연락할 수 있도록 마지막 페이지에 있는 "설문 조사 응답자 정보"를 작성해 주시기 바랍니다.

42. 저희 **EnviroStars** 프로그램은 중소기업들의 독성 유해 물질 및 폐기물 감축 노력에 대해 평가하고 인센티브를 제공하고자 합니다**. EnviroStars** 인증은 대중들로 하여금 환경적으로 책임감 있는 업소를 구분하고 지원할 수 있게 돕는 간단한 방법이기도 합니다**.**

EnviroStars 업소에 관한 추가 정보를 받으시겠습니까?
❑ 예 ❑ 아니요

"예"로 답한 경우, 저희가 귀하에게 연락할 수 있도록 마지막 페이지에 있는 "설문 조사 응답자 정보"를 작성해 주시기 바랍니다.

43. 기술 정보 및 교육 자료는 어느 언어로 읽기를 원하십니까?

❑ 영어
❑ 중국어 – 광둥어
❑ 중국어 – 표준 중국어
❑ 한국어
❑ 베트남어
❑ 기타(기재 요망): _____

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44. 드라이클리닝 사업에서 수익을 낼 뿐만 아니라 건강하고 환경 친화적으로 운영하는 데 있어서 가장 큰 문제점은 무엇이라고 생각합니까?

45. 드라이클리닝 사업의 안전, 건강 및 환경이 개선될 수 있도록 정부 기관이나 프로그램에서 할 수 있는 일은 어떤 것이 있습니까?

46. 추가로 하실 말씀이 있으시면 아래의 빈칸에 적어 주십시오.

설문 조사 응답자 정보

익명을 원하실 경우는 아래를 기입하지 마십시오. 그러나, 본 기밀 프로젝트를 통해 앞으로 귀하와 함께 업무를 진행하고 귀하에게 교육 자료를 발송할 수 있도록 본 양식을 작성하실 것을 권장합니다.

아래에 성명을 인쇄체로 써 주십시오.

_____

이름 성

업소명: _____

직위: _____

업소 주소:

_____

번지 시 주 우편번호

이메일 주소: _____

업소 전화번호: ( ) _____

업소 팩스 번호: ( ) _____

킹 카운티 지역의 세탁 업체들이 수익성과 건강을 유지할 수 있도록 도와주셔서 감사합니다!

본 섹션은 작성하지 마십시오. 업무용:
❑VIP 프로그램 ❑EnviroStars ❑기술 지원

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APPENDIX B

ENDORSEMENT LETTER

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NORTHWEST DRYCLEANERS ASSOCIATION NWDCA

워싱턴주 한인 세탁협회
Washington State Korean Dry Cleaners Association

드라이클리닝(세탁소) 업주/매니저님께,

킹 카운티(King County)의 위험폐기물 관리 프로그램(The Local Hazardous Waste Management Program, 이하 LHWMP)은 현재 드라이클리닝 업계에 관해 조사를 하고 있습니다. LHWMP 에서 하고 있는 조사가 드라이크리닝 업계에 도움이 될 것이라 믿기에, 여러분의 적극적인 참여를 부탁 드리고자 본 서신을 띄웁니다. 본 조사 결과는 LHWMP 가 지역 내 드라이클리닝 업계 관계자분들과 함께 환경보존 및 공중보건 강화 노력을 하는 데 큰 도움이 될 것입니다.

아시다시피, 드라이클리닝 업계에는 많은 변화가 예고되고 있습니다. 일부 타 주에서는 PERC 사용이 점진적으로 폐지되고 있으며, 다른 규정들 또한 변경되고 있는 실정입니다. LHWMP 는 여러분의 고충을 듣고, 보다 수익성 높고 안전한 사업을 하실 수 있도록 도움을 드리고자 합니다.

여러분은 과거에도 LHWMP 와 함께 일하신 경험이 있을 것입니다. 이번 킹 카운티의 프로그램은 드라이클리닝 폐기물 처리에 도움을 드리기 위한 것입니다. 본 프로그램에서는 개별 사업자의 사업 발전을 돕기 위해 바우처 인센티브 프로그램을 제공합니다. 더불어 EnviroStars 프로그램도 운영됩니다. **LHWMP 는 법적 강제력이 없으며, 사업자 여러분께 무상으로 도움을 드립니다.**

LHWMP 는 본 조사에 관련된 정보와 함께,설문조사를 요청할 것입니다. 잠시 시간을 내셔서 설문에 답하신 후, 그 설문지를 LHWMP 로 보내주시기를 부탁드립니다.

LHWMP 설문 조사의 목적은:

- 드라이클리닝 업계의 건강 및 안전상의 요구사항을 **파악**하고,
- 건전하고 수익성 있는 친환경 사업을 운영하는 데 걸림돌이 되는 요인을 **규명**하며,
- 걸림돌 극복을 위한 방안을 모색하는 데 **도움**을 드리고,
- 유해한 화학 물질에 대한 노출을 **줄이기 위한** 것입니다.

설문조사를 마치시면, 여러분은 드라이크리닝 업계가 사람에게 해를 입히는 독성 화학물질 노출을 줄이기 위해 최선을 다하며, 환경을 생각하는 산업임을 알리는 노력에 동참하게 될 것입니다.

중요한 본 조사에 여러분들의 많은 참여를 부탁드립니다.

감사합니다.

워싱턴 주 한인드라이클리너 협회
Jung (John) C. Seo 협회장

NW 드라이클리너 협회
Eldon Barteiheimer 협회장

NORTHWEST DRYCLEANERS ASSOCIATION NWDCA

워싱턴주 한인 세탁협회
Washington State Korean Dry Cleaners Association

Dear Dry Cleaning Business Owner or Manager:

The Local Hazardous Waste Management Program in King County (LHWMP) is doing a study of the dry cleaning industry. This letter is to encourage you to take part in the study because we believe it will be helpful for our industry. Study results may help LHWMP in their work with local dry cleaning owners to protect the environment and public health.

As you know, many changes are coming to the industry. PERC will be phased out in some states; other regulations are changing. LHWMP wants to find out your concerns and help you run a profitable and safe business.

You may have worked with LHWMP in the past. This King County program helps our businesses manage dry cleaning waste. It offers a voucher incentive program to help make improvements to individual businesses. They also run the EnviroStars program. **LHWMP does not enforce rules and regulations – they provide free help for business owners.**

LHWMP will be sending you information about their study and ask you to do a survey. We hope you will take the time to fill out the survey and return it.

The aim of LHWMP's survey is to:

- **Learn** about the health & safety needs of your business,
- **Identify** the challenges to running a healthy, profitable, and environmentally friendly business,
- **Help** you find ways to overcome those challenges, and
- **Reduce** harmful chemical exposures.

If you complete the survey, you will join other business owners in showing that our industry strives to reduce chemical exposures that are harmful to people and that we care about the environment.

We hope you will decide to take part in this important study.

Sincerely,

Jung (John) C. Seo
President
Korean Dry Cleaners Association of Washington

Eldon Bartelheimer
President
NW Dry Cleaners Association

APPENDIX C

SURVEY COVER LETTER

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Local Hazardous Waste Management Program in King County, Washington
401 Fifth Avenue, Suite 1100
Seattle, WA 98104

Dear Dry Cleaner Owner or Manager:

Your help and ideas are needed.

As you probably know, changes are happening in the dry cleaning industry. In California and elsewhere, PERC is being phased out and the regulations that apply to your industry are changing. There is also new information about the harmful effects of PERC.

These changes are happening while dry cleaners may have difficulty running a profitable business.

The Local Hazardous Waste Management Program in King County (LHWMP) is concerned about the impacts of all these changes on your business. We want to help you be prepared for them. LHWMP is a King County government program that works with small businesses to help solve environmental and health & safety problems. **We provide free technical assistance to help protect the health of all people and the environment. We do not enforce rules and regulations.**

Please help us learn from you and help us understand your concerns by filling out the survey that came with this letter.

Please take 20 minutes to complete the enclosed questionnaire and return it in the enclosed postage-paid envelope

Why are you receiving this survey?
You are one of about 400 dry cleaning business owners in King County who have received this survey. We found your business by reviewing several sources of information that are available to the general public. We hired Gilmore Research Group to help us mail the surveys and collect completed surveys from business owners.

Filling out the survey is voluntary. Refusing to participate in this study will have no negative consequences for you. Please read the Study Description that came with this letter before you decide whether to fill out the survey.

If you take part in the survey, you will be helping LHWMP in its work to reduce harmful chemical exposures. This can help you, your workers, and your family.

Thank you for your interest in this study!

Steve Whittaker
Chantrelle Johanson
Telephone: (206) 263-8499 or 1-800-325-6165 (toll-free) / when prompted, enter 38499
Email: steve.whittaker@kingcounty.gov.

Local Hazardous Waste Management Program in King County, Washington
401 Fifth Avenue, Suite 1100
Seattle, WA 98104

친애하는 세탁소 업주/운영자 귀하,

귀하의 도움과 아이디어가 필요합니다.

아마 알고 계시겠지만, 드라이클리닝 업계에도 변화가 일어나고 있습니다. 캘리포니아 및 다른 지역에서는 PERC 사용을 단계적으로 중단시키고 있으며 드라이클리닝 업계에 적용되는 규제 또한 변화하고 있습니다. PERC의 유해에 대한 새로운 정보도 있습니다.

이러한 변화의 바람이 계속되는 동안, 세탁 사업자들의 입장에 서는 수익성 있는 사업 운영에 어려움이 있을 수 있습니 다.

킹 카운티의 지역 유해폐기물 관리 프로그램 (LHWMP, Local Hazardous Waste Management Program)은 이러한 모든 변화가 귀하의 사업에 미칠 영향에 대해 염려하고 있습니다. 따라서, 귀하께서 이러한 변화에 준비하는 데 도움이 되고자 합 니다. LHWMP는 킹 카운티 주정부 프로그램으로, 소규모 업체들을 도와 환경, 보건 및 안전 문제를 해결할 수 있도록 지원합니다 . **저희는 무료로 기술 지원을 제공하여 모든 이들의 건강과 환경을 보호하는 데 도움이 되도록 하고 있습니다. 이 프로그램은 규칙이나 규제 사항을 집행하지 않습니다.**

본 서신에 딸려 있는 설문지를 작성하여 귀하의 관 심사를 저희가 파악할 수 있도록 의견을 들려주십시오.

설문지를 완성하는 데는 **20** 분 정도가 소요되며, 작성한 후 동봉한 반송용 봉투에 넣어 보내주십시오.

본 설문 조사의 대상자가 된 이유

귀하는 본 설문을 받은 킹 카운티 거주 약 400명의 세탁 업주 중 한 명입니다. 저희는 일반 대중들도 이용할 수 있는 몇몇 정보원을 검토하여 귀하의 사업체를 알게 되었습니다. Gilmore Research Group을 고용하여 설문지를 발송하고 사업주들에게서 작성된 설문지를 수거하도록 하고 있습니다.

설문 작성은 자발적인 참여를 토대로 합니다. 본 조사에 참여를 거부하더라도 귀하에게 부정적인 결과를 초래하지 않습니다. 설문 작성 여부를 결정하기 전에 본 서신과 함께 제공된 조사에 대한 안내문을 함께 읽으십시오.

본 설문 조사에 참여하면, 유해한 화학 약품에 대한 노출을 줄이기 위한 LHWMP의 노력에 큰 보탬이 될 것입니다. 이는 본인 뿐 아니라, 종업원 및 가족들에게도 도움이 될 수 있습니다.

본 조사에 관심을 보여주셔서 감사합니다!

Steve Whittaker
Chantrelle Johanson
전화번호: (206) 263-8499 또는 1-800-325-6165 (무료전화) / 응답시 38499 입력
이메일: steve.whittaker@kingcounty.gov.

APPENDIX D

STUDY DESCRIPTION

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Local Hazardous Waste Management Program in King County, Washington
401 Fifth Avenue, Suite 1100
Seattle, WA 98104
www.LHWMP.org

Study Description

Researchers

Steve Whittaker, PhD
Chantrelle Johanson, BA
Telephone: (206) 263-8499 or 1-800-325-6165 (toll-free) / when prompted, enter 38499
Email: steve.whittaker@kingcounty.gov

Researchers' Statement

Why is the research taking place?

- As you probably know, changes are happening in the dry cleaning industry:
  - The Environmental Protection Agency (EPA) has recently found that perchloroethylene (PERC) is more harmful than originally thought - and EPA's new air quality regulations are much stricter.
  - EPA is also concerned about the use of PERC in businesses that are located in the same building as homes and apartments.
  - PERC is being phased out in California - and other states are following what is happening in California.
- Here at the Local Hazardous Waste Management Program in King County (LHWMP), we want to help you be prepared for these changes.
- You are one of the about 400 dry cleaning business owners in King County who have received this survey.
- Please help us learn from you and help us understand your concerns by completing the enclosed survey.

What would I be asked to do?

- We are asking you to take about 20 minutes to complete the survey and return it in the enclosed postage-paid envelope.
- If you don't return this survey, we will send you a reminder postcard in about two weeks. Two weeks after that, we will mail you a second copy of the survey. If we still haven't heard from you, we will try to call you to see if we can come to your business to help you complete it.
- Examples of the questions we are asking include:
  - What type of solvent is used in your dry cleaning machine?
  - If you are using PERC at the present time, are you considering buying a non-PERC machine in the next year?
  - If you are not using PERC, what made you decide to use an alternative solvent?
  - Do you own and use a "sniffer" or PERC detector?
  - How do you dispose of the still bottoms?
- You may wish to have your business records available while you fill out the survey.

What are the possible risks or harms if you take part?

- There is a remote chance that somebody could see your survey answers if they submitted a "Public Disclosure Request" in the 3-4 week period when the survey is taking place.
- Our experience has been that this is unlikely to happen. We will destroy any record of your name, business address and phone number in six weeks, then it will be impossible for anyone to know who answered the survey.

What are the possible benefits?

- We can help you take advantage of funds from LHWMP's Voucher Incentive Program and help you enroll in LHWMP's EnviroStars Program. You can get free technical assistance from LHWMP staff, if additional funds become available.
- This research may benefit dry cleaning businesses by identifying needs and barriers to complying with regulations. It may help us work with business owners to adopt best practices to protect human health and the environment. The information gathered during this survey will be used for education and outreach.
- Your participation is voluntary. You may refuse to participate or withdraw from the study at any time without losing any services or benefits that you are entitled to.

Who would see study information about me?

- The only people who would see information about you would be the survey company we hired (Gilmore Research Group, Seattle, WA) and the LHWMP research team.
- Gilmore Research will keep survey information confidential. All information is kept locked away in their offices. Access to their computers is protected by log-in and password security. LHWMP researchers won't keep any information that links you to your survey responses.
- Gilmore Research will keep your name, address, and phone number only while the mail survey is being conducted.
- All information that identifies you will be destroyed when Gilmore finishes sending out and collecting surveys (late August to mid-September 2010).
- If we become aware of a problem that is an immediate hazard to human health or the environment, we will share your business information with our program's Environmental Quality Team. Our team would then work with you to fix the problem.

Would I be paid or compensated for my time? Will the study cost me anything?

- The only cost to you will be your time while you complete the survey (approximately 20 minutes).

What else do I need to know?

- If you have any questions about the research, please contact the Dry Cleaning Project Lead, Steve Whittaker, by calling (206) 263-8499 or toll-free at 1-800-325-6165 (when prompted, enter 38499). You may also email steve.whittaker@kingcounty.gov.
- You may also call the Washington State Institutional Review Board (WSIRB) if you have questions about your rights or concerns/complaints about the research. The WSIRB oversees this study to make sure that the rights of people who take part are protected. The WSIRB can be reached at 1- (800) 583-8488. You don't have to give your name if you call.

Local Hazardous Waste Management Program in King County, Washington
401 Fifth Avenue, Suite 1100
Seattle, WA 98104

설문 조사 안내문

조사원

Steve Whittaker, PhD
Chantrelle Johanson, BA
전화번호: (206) 263-8499 또는 1-800-325-6165 (무료전화) / 응답시 38499 입력
이메일: steve.whittaker@kingcounty.gov.

조사원 보고서

이 조사를 실시하는 이유는 무엇입니까?

- 아마 알고 계시겠지만, 드라이 클리닝 업계에도 변화가 일어나고 있습니다:
  - 미국 환경 보호국(EPA)에서 최근 밝힌 바에 따르면, 퍼클로로에틸렌(PERC)은 원래의 예상보다 더 유해한 것으로 나타났습니다. 따라서, EPA의 공기 청정도에 대한 새로운 규제가 더욱 엄격해졌습니다.
  - EPA는 또한 일반 가정 및 아파트와 같은 건물에 위치한 사업장에서 PERC를 사용하는 부분에 대해서도 염려하고 있습니다.
  - PERC의 경우, 캘리포니아 주에서는 단계적으로 사용을 중지하도록 하고 있으며, 다른 주에서도 캘리포니아주의 뒤를 따르고 있습니다.
- 이곳 킹 카운티의 LHWMP에서는 귀하께서 이러한 변화에 대비하는 데 보탬이 되고자 합니다.
- 귀하는 본 설문을 받은 킹 카운티 거주 약 400명의 세탁 업주 중 한 명입니다.
- 동봉한 설문지를 작성하여 귀하의 관심사를 저희가 파악할 수 있도록 의견을 들려주십시오.

제가 무엇을 해야 합니까?

- 설문지를 완성하는 데는 20분 정도가 소요되며, 작성한 후 동봉한 반송용 봉투에 넣어 보내주십시오.

- 본 설문지를 반송하지 않으면, 약 2주 내에 안내 엽서를 보내드립니다. 그 이후 2주가 지난 뒤, 두 번 째 설문지를 발송합니다. 귀하로부터 계속해서 답변이 없으면, 귀하에게 전화를 시도하여 저희 쪽에서 귀하의 사업장에 방문하여 설문지를 완성할 수 있도록 지원할 수 있을지 여부를 확인합니다.
- 설문 문항의 예에는 다음과 같은 항목들이 포함됩니다.
    - 드라이클리닝 기계에 어떤 종류의 용제를 사용합니까?
    - 현재 PERC를 사용하고 있는 경우, 내년에 비 PERC 기계 구입을 고려하고 있습니까?
    - PERC를 사용하지 않고 있다면, PERC가 아닌 다른 용제의 사용을 결정하신 이유는 무엇입니까?
    - "냄새 탐지기(sniffer)" 또는 PERC 탐지기를 소유 및 사용하고 있습니까?
    - 증류 찌꺼기는 어떤 식으로 폐기합니까?
- 설문을 작성하는 동안 귀하의 사업 기록을 이용할 수 있도록 요청할 수 있습니다.

설문에 참여하는 경우, 어떤 위험이나 손해를 볼 수 있는 가능성이 있습니까?

- 설문 조사가 진행되는 3-4주 기간 내에 "일반 공개 요청(Public Disclosure Request)"을 제출하더라도, 귀하의 설문 답변을 누군가가 볼 수 있는 가능성은 매우 희박합니다.
- 경험상 이러한 일이 발생할 가능성은 거의 없습니다. 저희는 6주 내에 귀하의 이름, 사업장 주소 및 전화번호 등의 모든 기록을 파기하기 때문에, 설문에 답변한 사람이 누구인지 아무도 알 수 없습니다.

어떤 혜택이 있습니까?

- LHWMP의 Voucher Incentive Program으로부터 기금을 이용하거나 LHWMP의 EnviroStars Program에 등록하도록 도와드릴 수 있습니다. 추가 기금을 이용할 수 있게 되면 LHWMP 직원으로부터 무상 기술 지원을 받을 수 있습니다.
- 본 조사를 통해 규제를 준수하는 데 있어서 필요한 사항과 장애 요인을 확인 및 식별할 수 있기 때문에, 드라이클리닝 업체들에게는 유익할 수 있습니다. 이는 주민들의 건강과 환경을 보호할 수 있는 모범 사례들을 채택하도록 사업주들과 함께 노력하는 데 보탬이 될 수 있습니다. 이 설문 조사 중에 수집된 정보는 교육 및 지원 활동을 위해 사용될 것입니다.
- 설문 작성은 자발적인 참여로 이루어집니다. 설문 대상자는 본인에게 부여된 서비스 또는 혜택을 포기하지 않고도, 언제든지 조사 참여를 거부하거나 중단할 수 있습니다.

저에 대한 조사 정보는 누가 보게 됩니까?

- 귀하에 대한 정보를 볼 수 있는 유일한 사람은 우리가 고용한 설문 조사 회사(Gilmore Research Group, Seattle, WA)와 LHWMP 조사 팀뿐입니다.
- Gilmore Research는 설문 정보를 기밀로 유지합니다. 모든 정보는 사무실 내의 안전한 곳에 넣어 두게 됩니다. 컴퓨터에 대한 액세스는 로그인 및 비밀번호로 보호됩니다. LHWMP 조사원들은 귀하와 귀하의 설문 답변을 연관 지을 어떠한 정보도 보관하지 않습니다.
- Gilmore Research는 우편 설문 조사가 수행되는 동안에만 귀하의 이름, 주소 및 전화번호를 보관합니다.
- 귀하를 식별하는 모든 정보는 Gilmore에서 설문지 발송 및 수거를 마칠 때(2010년 8월 말에서 9월 중순) 파기됩니다.
- 저희가 건강 또는 환경에 즉각적인 위험 요소가 되는 문제점을 인식하게 되면, 저희 프로그램의 Environmental Quality Team과 귀하의 사업체 정보를 공유하게 됩니다. 그 후, 저희 팀은 귀하와 협력하여 이 문제점을 해결하게 됩니다.

작성 시간에 대한 대가 또는 보상을 받게 됩니까?
본 조사에 대한 비용을 제가 지불해야 합니까?

- 귀하께서 지불해야 할 유일한 비용은 설문 조사를 작성하는 시간(약 20분)뿐 입니다.

그 밖에 알아 두어야 할 사항은 무엇입니까?

- 본 조사에 대해 궁금한 점이 있는 경우, (206) 263-8499 또는 무료 전화 1-800-325-6165(응답시 38499 입력)로 전화하여 Dry Cleaning Project Lead, Steve Whittaker에게 문의하십시오. 또한 이메일(steve.whittaker@kingcounty.gov)을 통해 문의할 수도 있습니다.
- 본 설문에 대한 권리 또는 우려/불만 사항과 관련하여 궁금한 점이 있는 경우, 워싱턴 주 기관 심사 위원회(WSIRB, Washington State Institutional Review Board)로도 문의할 수 있습니다. WSIRB는 참가자들의 권리가 보호되도록 본 설문 조사를 감독합니다. WSIRB는 1- (800) 583-8488로 전화하면 연결할 수 있습니다. 전화 문의시 이름을 밝힐 필요는 없습니다.

APPENDIX E

REMINDER POSTCARD

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Local Hazardous Waste Management Program in King County

Dry Cleaning Survey – Reminder Postcard

Two weeks ago, we sent you a survey in the mail, asking for your ideas and help.

If you have returned the survey already, we would like to thank you for taking the time to help us.

If you have not yet returned the survey, please do so as soon as you can. If we don't hear from you, we will send you another copy in the mail. After that, we will call you at your business to ask if we can help you complete it in-person.

If you have any questions, please contact Steve Whittaker at 206-263-8499 or 1-800-325-6165 (toll-free) / when prompted, enter 38499. You can also email steve.whittaker@kingcounty.gov.

Thank you.

세탁업 관련 설문 조사 – 안내 엽서

2 주 전 저희는 우편으로 설문지를 발송하여 귀하에게 의견과 지원을 요청하였습니다.

이미 설문지를 반송하셨다면, 소중한 시간을 내서 저희를 도와주신 데 대해 감사드립니다.

설문지를 아직 반송하지 않았다면, 가능한 한 빨리 보내주시기 바랍니다. 귀하로부터 답변이 없는 경우, 저희는 또 다른 설문지를 우편으로 발송하게 됩니다. 그 후에는 저희가 직접 설문지 작성에 도움을 줄 수 있는지 여부를 확인하기 위해 귀하의 사업장으로 전화를 드릴 것입니다.

궁금한 점이 있는 경우, Steve Whittaker에게 문의하십시오: 206-263-8499 또는 1-800-325-6165 (무료 전화) / 응답시 38499 입력. 또한, 이메일 (steve.whittaker@kingcounty.gov) 을 통해서도 문의할 수 있습니다.

감사합니다.

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APPENDIX F

FOLLOW-UP COVER LETTER

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Local Hazardous Waste Management Program in King County, Washington
401 Fifth Avenue, Suite 1100
Seattle, WA 98104

Dear Dry Cleaner Owner or Manager:

Several weeks ago, we mailed you our survey. We are hoping that you will take the time to complete it and mail it back to us. Your help and ideas are needed to make sure that King County's dry cleaning businesses stay profitable and healthy.

As you probably know, changes are happening in the dry cleaning industry. In California and elsewhere, PERC is being phased out and the regulations that apply to your industry are changing. There is also new information about the harmful effects of PERC.

These changes are happening while dry cleaners may have difficulty running a profitable business.

The Local Hazardous Waste Management Program in King County (LHWMP) is concerned about the impacts of all these changes on your business. We want to help you be prepared for them. LHWMP is a King County government program that works with small businesses to help solve environmental and health & safety problems. **We provide free technical assistance to help protect the health of all people and the environment. We do not enforce rules and regulations.**

Please help us learn from you and help us understand your concerns by filling out the survey that came with this letter.

Please take 20 minutes to complete the enclosed questionnaire and return it in the enclosed postage-paid envelope

Why are you receiving this survey?
You are one of about 400 dry cleaning business owners in King County who have received this survey. We found your business by reviewing several sources of information that are available to the general public. We hired Gilmore Research Group to help us mail the surveys and collect completed surveys from business owners.

Filling out the survey is voluntary. Refusing to participate in this study will have no negative consequences for you. Please read the Study Description that came with this letter before you decide whether to fill out the survey.

If you take part in the survey, you will be helping LHWMP in its work to reduce harmful chemical exposures. This can help you, your workers, and your family.

Thank you for your interest in this study!

Steve Whittaker
Chantrelle Johanson
Telephone: (206) 263-8499 or 1-800-325-6165 (toll-free) / when prompted, enter 38499
Email: steve.whittaker@kingcounty.gov

Local Hazardous Waste Management Program in King County, Washington
401 Fifth Avenue, Suite 1100
Seattle, WA 98104
www.LHWMP.org

친애하는 세탁소 업주/운영자 귀하,

몇 주 전, 저희는 귀하에게 설문지를 우편으로 발송했습니다 . 잠시 시간을 내셔서 설문지를 작성한 후 저희에게 반송 해 주시기 바랍니다. 킹 카운티의 세탁업이 수익성과 활력을 유지할 수 있도록 귀하의 도움과 의견이 필요합니다.

아마 알고 계시겠지만, 드라이클리닝 업계에도 변화가 일어나고 있습니다. 캘리포니아 및 다른 지역에서는 PERC 사용을 단계적으로 중지시키고 있으며 세탁업계에 적용되는 규제 또한 변화하고 있습니다. PERC의 유해에 대한 새로운 정보도 있습니다.

이러한 변화의 바람이 계속되는 동안, 세탁 사업자들의 입장에 서는 수익성 있는 사업 운영에 어려움이 있을 수 있습니 다.

킹 카운티의 지역 유해폐기물 관리 프로그램 (LHWMP, Local Hazardous Waste Management Program)은 이러한 모든 변화들이 귀하의 사업에 미칠 영향에 대해 염려하고 있습니다. 따라서, 귀하께서 이러한 변화에 준비하는 데 도움이 되고자 합 니다. LHWMP는 킹 카운티 주정부 프로그램으로, 소규모 업체들을 도와 환경, 보건 및 안전 문제를 해결할 수 있도록 지원합니다 . 저희는 무료로 기술 지원을 제공하여 모든 이들의 건강과 환경을 보호하는 데 도움이 되도록 하고 있습니다. 이 프로그램은 규칙이나 규제 사항을 집행하지 않습니다.

본 서신에 딸려 있는 설문지를 작성하여 귀하의 관 심사를 저희가 파악할 수 있도록 의견을 들려주십시오.

> 설문지를 완성하는 데는 **20** 분 정도가 소요되며, 작성한 후 동봉한 반송용 봉투에 넣어 보내주십시오.

본 설문 조사의 대상자가 된 이유

귀하는 본 설문을 받은 킹 카운티 거주 약 400명의 세탁 업주 중 한 명입니다. 저희는 일반 대중들도 이용할 수 있는 몇몇 정보원을 검토하여 귀하의 사업체를 알게 되었습니다. 저희는 Gilmore Research Group을 고용하여 설문지를 발송하고 사업주들로부터 작성된 설문지를 수거하도록 하고 있습니다.

설문 작성은 자발적인 참여를 토대로 합니다. 본 조사에 참여를 거부하더라도 귀하에게 부정적인 결과를 초래하지 않습니다. 설문 작성 여부를 결정하기 전에 본 서신과 함께 제공된 조사에 대한 안내문을 함께 읽으십시오.

본 설문 조사에 참여하면, 유해한 화학 약품에 대한 노출을 줄이기 위한 LHWMP의 노력에 큰 보탬이 될 것입니다. 이는 본인 뿐 아니라, 종업원 및 가족들에게도 도움이 될 수 있습니다.

본 조사에 관심을 보여주셔서 감사합니다!

Steve Whittaker
Chantrelle Johanson
전화번호: (206) 263-8499 또는 1-800-325-6165(무료 전화) / 응답시 38499 입력
이메일: steve.whittaker@kingcounty.gov

APPENDIX G

MAILING ENVELOPE

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Local Hazardous Waste Management Program in King County, Washington
401 Fifth Avenue, Suite 1100
Seattle, WA 98104
www.LHWMP.org

설문에 답변함으로써 귀하의 사업체가 좋 운영되고 수익성을 유지하는 데 도움이 될 수 있습니다.

ANSWERING THIS SURVEY MAY HELP YOUR BUSINESS STAY HEALTHY AND PROFITABLE.

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APPENDIX H

TELEPHONE SCRIPTS

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DRY CLEANING TELEPHONE SCRIPT

Purpose: To be used at the beginning of Phase II. LHWMP staff contact business owners to ask if they would be willing to have LHWMP staff visit their business to complete the survey in-person.

Non-respondent telephone script

Contact with dry cleaning owner or manager to confirm that they received the survey in the mail, determine if they intend to complete it, if they need help with translation, and offer to conduct a site visit to help them complete it.

Message in the event of answering machine or voice mail pick-up, English speaking business:

Hello. This message is for [insert name of business owner/manager]. My name is [insert name of researcher] and I'm calling from the Local Hazardous Waste Management Program in King County. I'm calling to follow up on a survey that Gilmore Research sent to your business on our behalf about [insert appropriate time frame]. We'd like to know if you have any questions about the study. Please give me a call back at [insert phone number]. Thanks. I look forward to speaking with you.

Message in the event of answering machine or voice mail pick-up, Korean speaking business:

Hi. This message is for [insert name of business owner/manager]. My name is [insert name of researcher] and I'm calling the Local Hazardous Waste Management Program in King County. I'm calling to follow up on a survey that Gilmore Research sent to your business on our behalf about [insert appropriate time frame]. We'd like to know if you have any questions about the study. We can provide a Korean language interpreter if that would be helpful to you. Please give me a call back at [insert phone number]. Thanks. I look forward to speaking with you.

In the event another individual answers the phone:

- Say hello and ask to speak to [insert name of business owner].
- If unavailable, inquire as to a good time to call back to speak with the business owner [record time with name and number to call].
- Give them the phone number and ask that the business owner contact you.

Protocol when speaking to the business owner on the phone:

Hello. My name is [insert name of researcher] and I'm calling from King County Public Health Local Hazardous Waste Management Program. I'm calling to follow up on a survey that Gilmore Research sent to your business on our behalf about [insert appropriate time frame]. Do you remember receiving it in the mail?

If they did not receive the survey: Tell them about the survey (see detailed list below). Ask if they would be willing to participate in this research by filling out a survey.

If they are willing: thank them and confirm mailing address. Let them know that we will have Gilmore get the survey to them in the mail shortly.

If they are not willing: Say, "That's okay. We will not contact you again. Thank you for your time".

If they did receive the survey: Ask if they had a chance to look at it. If not, tell them about the survey (see detailed list below). In either case, ask if they have any questions and if they are intending to send the survey back. Answer their questions and then:

If they say, yes, they are going to send it back: Thank them and let them know we'll follow up with another phone call if they haven't sent it back in the next 2 weeks. Let them know they can call at any time if they have questions or concerns about the survey. Thank them for their time.

If they say no or are uncertain: Let them know that we could complete the survey in-person:

- Would it be OK if we were to visit your business and ask you the questions in person instead?
- In addition to the survey, we give you information about vouchers to help pay for maintenance or repair costs if you need it.
- We can also provide you with information about the EnviroStars program.
- Would you like us to bring a Korean interpreter?

If they agree to a site-visit, thank them and set up a time. Confirm their address.

Talking points when describing the survey:

- This survey is from the Local Hazardous Waste Management Program in King County (LHWMP).
- We are a local government program that specializes in providing services to small business
- We have no regulatory authority.
- We are conducting a survey of dry cleaners in King County.
- The focus of the survey is to understand the day to day operations of dry cleaners in King County.
- We want to understand the concerns you might have about running a safe and profitable dry cleaning business.
- Their participation will help us understand the challenges in running a profitable, safe, and environmentally friendly dry cleaning business.

- We have safeguards to protect the confidentiality of survey answers. There is a possibility that survey answers could be made available because of a public disclosure request while the survey is actually being conducted. But our experience in Public Health tells us that the chances of this happening are very small.
- Participation is voluntary. There will be no penalties for not participating.
- Study results will be used to develop prevention and education programs for dry cleaning business owners in King County.

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APPENDIX H

SITE VISIT PROTOCOL

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Site visit protocol

Upon arrival:

Introduce self and (if applicable) interpreter and provide business card(s). Ensure that you are talking with the owner of the business. If not, ask to speak to the owner and tell them you have an appointment.

Once you are speaking with the owner, remind them of the following:

- We are from King County Local Hazardous Waste Management Program (LHWMP).
- We are a local government program that specializes in providing services to small business
- We have no regulatory authority.
- The interview we'll be doing today is research with dry cleaners in King County.
- The focus of the survey is to understand the day to day operations of dry cleaners in King County.
- We want to understand the needs and concerns of dry cleaning businesses in our community.
- Their participation will help us understand the challenges in running a profitable, safe, and environmentally friendly dry cleaning business.

Provide a copy of the Study Description and go through it with them verbally. Ask if they have any questions. Verify that they have understood the Study Description and that they agree to participate.

Survey instructions

Ask them where they would like to fill out the survey. Try to ensure that it is in a location where interruptions will be minimal (away from the front counter) if possible. Tell them they may want to have access to business records to help with answering some of the questions.

Once you are situated, say the following:

"Okay, I'm going to ask you a series of questions about this business. For each of these questions, try to answer as accurately as you can. Your answers will be kept confidential. We won't share this information with anyone. If you aren't sure what a question is asking about, please tell me. Also, if you don't know the answer to a question, that's fine; just let me know. Any questions before we start?"

Protocol for administering the survey

- Read each of the questions exactly as it is written.
- Remain neutral and professional when reading questions.
- Remain neutral when participants answer (do not show approval or disapproval of their responses). Examples are below.
- Record answers accurately and completely.
- Do not make leading comments or suggestions about how a participant should respond. Examples are below.
- If participants do not know the answers to some questions, they may be able to find some of this information in their business records. Things that might be in the records include:
    - Type of solvent
    - Square footage of business
    - Age of business
    - Age of machine
    - Manufacturer and model of machine
    - Capacity of machine
- If you would like the participant to provide a more complete response on an open ended question, ask "can you tell me more about that?" or "why is that?" Do NOT make guesses and ask them to confirm. Examples are below.

Examples of leading, judgmental, and interpretive language:

Question clarification. For example, if you ask "what type of solvent do you use?"

Do NOT say: "do you use perc?"	DO show them the list of possible responses on the survey and ask "which of these do you use?"

Probing for more information on open ended questions. For example, if a participant says they do not use protective equipment when cleaning out the machine…

Do NOT say: "Wow. That seems kind of nuts! Is that because you don't think there's a risk or is there some other reason?"	DO say: "We've noticed that many people don't use gloves. Can you tell me about why you don't use them?"

Hearing responses that you might feel strongly about. For example, if participant says they've switched to wet cleaning to avoid using poisonous chemicals…

Do NOT say: "That is really good. I'm really glad to hear that you are worrying about your health and the environment. Good for you!"	DO record what they have said accurately.

Remember to thank them again for their time before leaving.