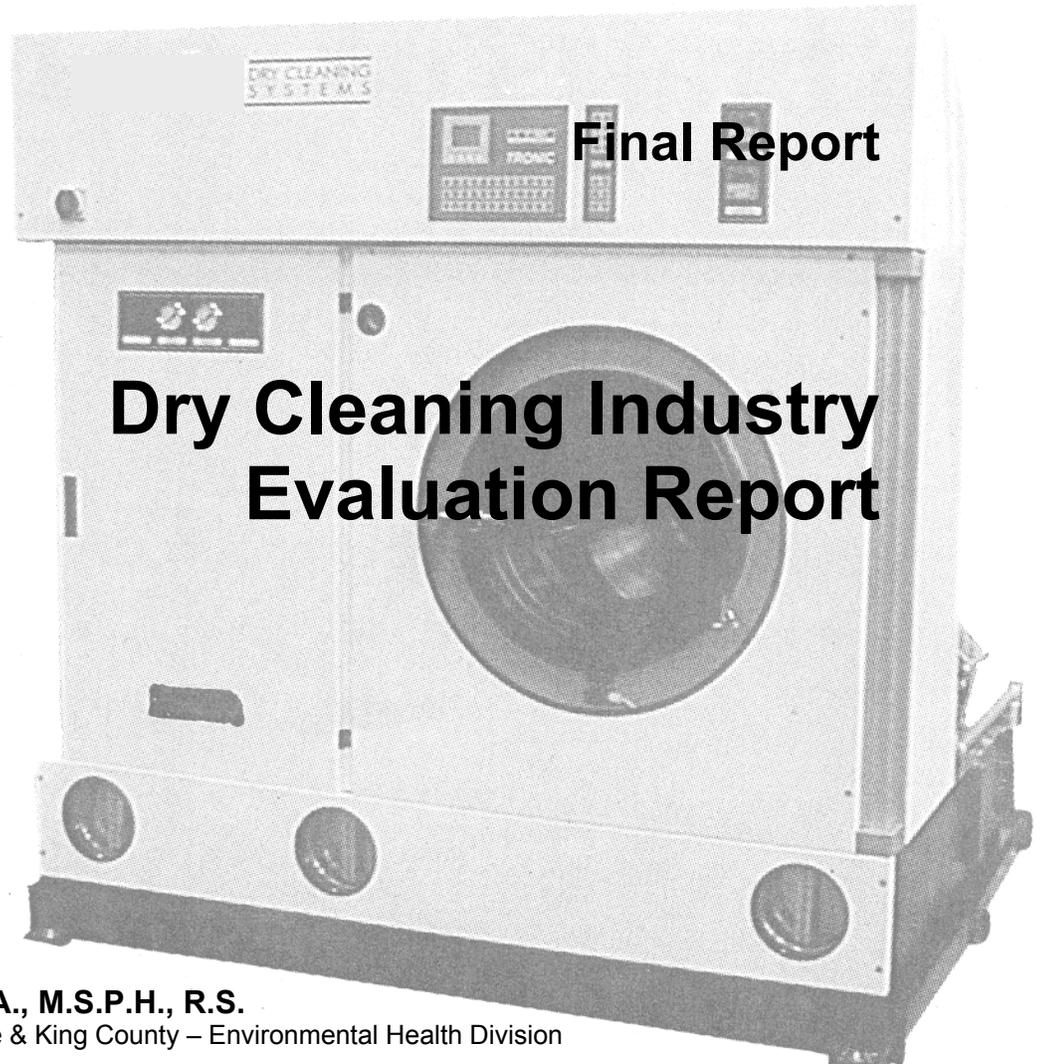

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Final Report

Dry Cleaning Industry Evaluation Report

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ABSTRACT

The Audit team, located in the Environmental Health Division of Public Health - Seattle & King County, is one of four field teams of the Local Hazardous Waste Management Program in King County (LHWMP). The Audit team works with businesses to attain compliance with hazardous waste regulations, primarily through technical assistance visits to designated small quantity generators within King County. Trevor Fernandes from the On-Site team at the Water and Land Resources Division of the King County Department of Natural Resources had previously worked extensively with King County Dry Cleaners and contributed to the training and field data collection as well as technical assistance to the industry.

This report describes a collaborative effort of the Local Hazardous Waste Management Program in King County, the Dry Cleaning Associations and dry cleaning industry in King County. The dry cleaning industry refers to businesses involved primarily in the retail cleaning of clothing and textiles. The industry, with a few exceptions, utilizes the solvent perchloroethylene (also known as tetrachloroethylene or "PERC") as the principal cleaning agent during the process. Consequently, the hazardous waste streams identified were filters, still bottoms, and separator water all containing varying levels of perchloroethylene (PERC).

The Audit team and Trevor Fernandes of the On-Site team visited approximately 340 businesses that were identified as dry cleaners. These visits occurred between November 1998 and July 2000. Businesses received technical guidance on the proper handling, management, and disposal of hazardous materials and hazardous wastes. Approximately 165 follow-up visits were made. Businesses showed improvements in handling, containment and disposal of separator water. Filters and still bottoms were generally managed and disposed properly by a single treatment, storage, and disposal facility (TSDF) that has been providing pick-up service to the industry for several years.

INTRODUCTION

The Washington State Dangerous Waste Management Act (RCW 70.50.220) required local governments to develop plans by June 1990 to address hazardous waste generated by small quantity generators and households. Small quantity generators (SQG's) are businesses that generate less than 220 pounds of hazardous waste a month. Public Health - Seattle & King County, the City of Seattle Public Utilities Department, the King County Department of Natural Resources, and suburban cities in King County created a single cooperative program to meet this requirement. These agencies developed and now comprise the Local Hazardous Waste Management Program in King County (LHWMP).

The mission of the LHWMP is to protect the public health and the environment from adverse effects of improper handling and disposal of hazardous waste. A principal strategy of the program is to emphasize education and technical assistance rather than enforcement as a means of achieving compliance.

The Audit team, one of four LHWMP field teams, is part of the Environmental Health Division of Public Health - Seattle & King County. The Audit team works with small quantity generators of hazardous waste, focusing on priority industries. Priority industries are selected through a systematic process that evaluates a number of factors including the amounts and types of wastes generated, the hazards associated with these wastes, and the number of problems that have that have been identified in the industry. Businesses are provided current hazardous materials management and disposal options and recommendations for improvements. Follow up visits are made to businesses with issues of concern. The On-Site team, part of the Water and Land Resources Division of the Department of Natural Resources, focuses on businesses that request technical assistance or SQG's new to the county who have recently notified the Washington State Department of Ecology (Ecology).

The dry cleaning industry was selected as a priority industry for the following reasons. The On-site team had been providing technical assistance to the industry and working closely with the Washington Dry Cleaners Association for two years. Prior to mid-1999, the On-Site team had provided assistance to twenty percent of the estimated 340 dry cleaners in King County. The Voucher Incentive team had provided financial assistance for making recommended changes in individual businesses. The Audit team through its priority industry work could pick up where On-Site left off and visit all the dry cleaners. The waste streams generated by the industry are consistent from business to business, and the solvent PERC has been detected in ground water in several locations throughout King County that were formerly or are currently operating dry cleaner operations (described later).

Environmental Health Specialists conducted fifty-six surveys at King County dry cleaning establishments in March 1988. These surveys were performed at the request of Ecology to better understand waste management practices of the industry. At least seven of the businesses were still using transfer machines that typically used larger volumes of PERC as a result of release of the solvent during transfer of clothing from washer to

dryer. At that time, eleven of the businesses were disposing of dry cleaning machine filters as solid waste. Filters were either dried or placed in the garbage wet. The industry was in transition and would soon come under permit by the Puget Sound Air Quality Control Authority (PSAQCA)¹. PSAQCA issues an annual permit for the operation of the dry cleaning machine. Field inspectors checked for the PSAQCA permit to assure that the dry cleaning machine was in compliance with air regulations

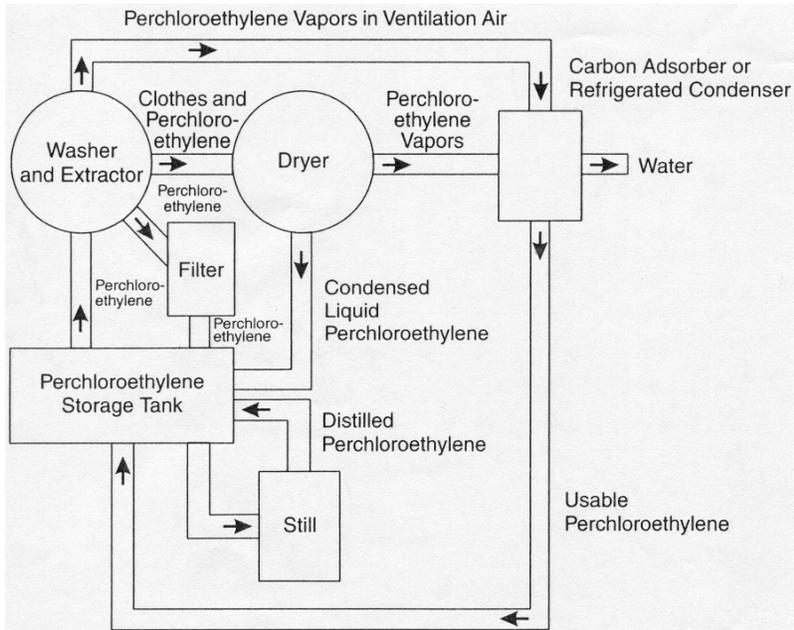
In 1996 the Department of Ecology developed guidelines in English and Korean that reinforced the need to properly dispose filters, still bottoms, and separator water. (Cover pages, appendix B and C.)

The Site Hazard Assessment Program at Public Health Seattle & King County has also investigated some dry cleaning establishments. In December 1998 a dry cleaning establishment in Mercer Island began a formal voluntary cleanup action as a result of cleaning solvents in soil and localized perched groundwater. Past practices at the cleaners indicated that solvents might have been dumped out the back door. The cleanup involved “in situ” oxygen injections to treat the contaminated soil and groundwater. At a second establishment PERC contamination of soil and groundwater was discovered during the sale of a dry cleaning business in Redmond. In July/August 1999 the site assessment revealed soil and groundwater contamination. The dry cleaning solvents traveled from a leak in the machine through a crack in the concrete floor. The dry cleaner had since installed secondary containment around the dry cleaning machine, but the PERC contamination is moving through groundwater towards municipal drinking water wells. The real life contamination of dry cleaning solvent to soil and groundwater emphasized the value of secondary containment for dry cleaning machines and hazardous waste. Audit’s close contact with Public Health’s Site Hazardous Assessment team is a valuable linkage for sharing information about real environmental issues with priority industries.

Figure 1 illustrates the typical closed loop dry cleaning machines in use today. Figures two and three detail the front and rear view the dry cleaning machine.

¹ This regional agency since has been renamed the Puget Sound Clean Air Agency (PSCAA).

Figure 1 illustrates a typical closed loop dry cleaning machine.



Flow diagram of a typical plant for dry cleaning with perchloroethylene.



Figure 2 Front view of a Dry cleaning Machine.

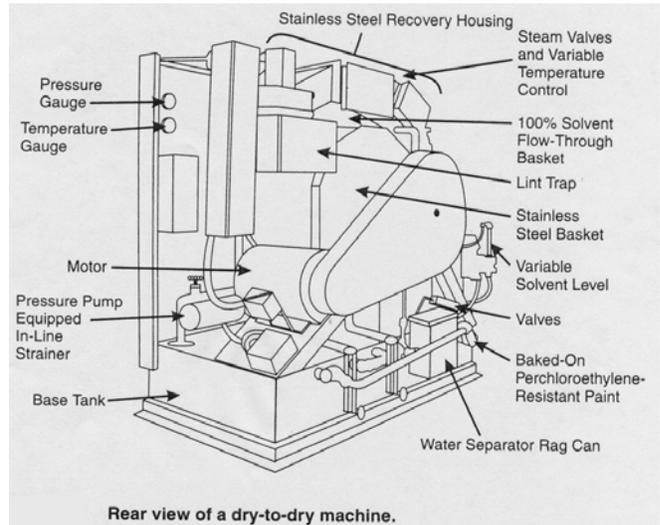


Figure 3 Rear view

METHODS

When Public Health's audits of the dry cleaner industry began in 1999, approximately 400 facilities were identified as dry cleaning establishments.

Businesses were identified using the Standard Industrial Classification (SIC), and lists were built using the electronic Yellow Pages and marketing agency lists. The SIC industry groups used were 7212 and 7216. These SIC codes are associated with industries described as commercial laundries and dry cleaners. Not all of the establishments identified performed dry cleaning operations. Some of the businesses had transformed or were in the process of transforming to a drop-off facility. Drop-off facilities typically are depots to collect clothing and textiles for cleaning elsewhere for later customer pick up of the cleaned items. These businesses were removed from the list, leaving approximately 340 dry cleaning establishments to be audited. Dry cleaners that requested technical assistance in hazardous waste management and had already been visited by the On-Site team were removed from the list. The list was sorted by zip codes and each auditor signed out specific zip codes that he or she would complete. Letters were sent to businesses announcing that Audit staff would visit the facility in the near future (Appendix D).

During initial visits auditors discussed hazardous materials management and waste disposal issues, distributed a packet of written materials and noted if current practices matched the Best Management Practices (BMP's) for the industry. Businesses received written observations and recommendations for correcting deficiencies (Appendix E). Additionally, audits included a health and safety check for respiratory protection use during cleaning of the stills and removal and replacement of the filters from the dry cleaning machines.

Sometimes a follow up visit was required to provide further assistance in implementing recommendations and to verify changes that did occur. Many businesses received incentives offered by our program to meet compliance goals. LHWMP offers a voucher that pays up to \$500 of disposal or pollution prevention equipment costs. Some businesses had the opportunity to become EnviroStars, a program that rewards environmentally progressive businesses with free, targeted advertising.

RESULTS AND DISCUSSION

The results of visits are presented in terms of the objectives set for the visits. Both performance and impact objectives were set. A performance objective is the completion of a given activity in a given manner. An impact objective is the beneficial effect an activity is expected to produce.

I. Performance Objectives

The first performance objective was to conduct audits at all the King County Dry Cleaners.

There were approximately 400 businesses on the initial list. Approximately 270 initial visits were made by the Audit team and additional sixty-eight visits by the On-Site team. The locations of the businesses visited are shown in Appendix F. Seven visits found no business at the listed address and four were out of county. There were twenty-six businesses that were drop-off locations and did not generate any hazardous wastes on-site.

Approximately 165 follow-up visits were conducted in businesses that were identified as having problems with hazardous waste handling, storage, and disposal.

The second performance objective was to develop observation and recommendation forms, a PERC health effect fact sheet, and work practice fact sheet in Korean.

It became apparent while developing the list of dry cleaning businesses within King County that approximately sixty percent of the dry cleaners were owned and operated by individuals whose first language was Korean. Consequently, a work practice recommendations for dry cleaners fact sheet (Appendix G) and health effects of PERC fact sheet (Appendix H) were developed in both English and Korean and distributed to operators. Additionally, the back side of the observation and recommendations field form containing descriptions of the recommendations that is left with the operator was translated into Korean.

The third performance objective was to collaborate with the Washington Dry Cleaners and the Korean Dry Cleaners Associations through participation at association meetings.

Relations between the Washington Dry Cleaners Association, the Korean Dry Cleaners Association, and the Local Hazardous Waste Program staff have been productive and collegial since 1997. Prior to starting field visits in August 1999, several members of the Audit team and On-Site team met with members of the Washington Dry Cleaners Association. At that meeting, LHMWP staff explained the purpose and intentions of the upcoming visits to King County dry cleaners. The Association has also been involved in reviewing the criteria for the EnviroStars recognition program and developing the

worksheet tailored for the dry cleaning industry. Appendix I contains the current EnviroStar Worksheet for dry cleaners.

The fourth performance objective was to coordinate sampling and testing of separator water from different treatment systems in use by King County dry cleaners.

Samples of separator water were taken at seven different dry cleaners in King County during the period January 1997 through July 2000 and were analyzed for PERC. The samples were effluent from the dry cleaning machine and the filtration/evaporation units used by the dry cleaners. Samples were taken according to operators' schedules for treating separator water.

The following table describes preliminary test results on selected commercially available separator water treatment systems. The eight unit numbers represent different manufactures of separator water treatment systems located in selected King County dry cleaners.

Table 1. Results from testing several different commercially available separator water treatment units from 1997-2000.

Unit Number	Date Sampled	Influent concentration of PERC (ppm)	Effluent concentration of PERC (ppm)
1	1/21/00	210	5.5
2	5/31/00	230	27
3	3/20/00	180	0.027
3	5/19/00	87	0.003
3	10/6/00	120	0.0027
3	7/20/00	65	0.0093
4	3/7/00	210	49
5	3/9/00	210	ND
5	4/19/00	62	0.0093
6	2/4/97	2.2	<0.5
6	2/6/97	24	0.003
6	2/6/99	79	0.003
6	2/26/97	170	0.051

6	2/26/97	220	0.057
6	3/4/97	63	<0.10
6	3/4/97	2.1	<0.10
6	3/4/97	220	0.007
6	3/4/97	200	0.54
6	3/10/97	58	0.003
6	3/10/97	55	<0.002
6	3/10/97	150	11*
7	2/5/97	5.5	0.24
7	2/10/97	140	0.13
7	2/19/97	30	0.073
7	2/24/97	85	<0.05
7	3/4/97	96	0.064
7	3/10/97	86	0.056
7	3/17/97	85	0.10
7	3/17/97	110	0.045
8	8/7/97	85	0.037

* Leakage in gasket detected and repaired immediately.

As the sample size is limited, we have chosen not to publish the manufacturer's name in Table 1. However, test results for individual treatment units are made available to both dry cleaner operators and equipment vendors for their particular product.

II. Impact Objectives

The first impact objective was to ensure that Ninety-five Percent (95%) of all dry cleaners in King County properly dispose hazardous wastes.

During initial visits businesses received advice on proper storage and disposal of hazardous materials, and safety practices. **All dry cleaning establishments visited were properly disposing dry cleaning machine filters and still bottoms through an established service that provides periodic pick up of drums of material.**

Improper disposal of separator water was the primary hazardous waste management issue encountered in the industry. The water that is generated during the distillation of the dirty PERC typically contains levels of the solvent in the 18-210 PPM range. The dry cleaners visited in King County generate on the average seven gallons (approx. sixty three pounds) per month of this waste stream. Disposal options include sending the waste to a licensed TSDF or filtering the material through commercially available filtration units that utilize activated charcoal and then atomize or evaporate the water to the surrounding environment. The use of these separator water treatment units is a relatively recent practice that has been allowed by Ecology only since 1994. Prior to the recent field visits, the popularity of such pretreatment equipment was unknown.

On our initial visits, sixty-three of 306 businesses were improperly disposing separator water.

Table 2 illustrates the various methods of disposal for separator water being utilized by dry cleaners in King County. Nearly one-half of the businesses dispose of separator water as a hazardous waste with a licensed treatment, storage, and disposal company that provides regular pick up service. One quarter of the companies utilize pre-treatment systems manufactured by several different companies. Twenty-one percent, or more than one-fifth, of the businesses improperly dispose of separator water by directly evaporating the water on a heating device (16 %), permitting evaporation in the boiler room or another indoor location (2%), or by pouring the water down a sewer or storm drain (3%).

Table 2. Treatment of separator water by 306 King County Dry Cleaners upon initial visits to the industry during 1997-2000.

DISPOSAL METHOD	NUMBER OF BUSINESSES	METHOD ACCEPTABLE?	PERCENTAGE
HARD PLUMBED FILTRATION	3	YES	1%
TSDF	169	YES	55%
FILTRATION / EVAPORATION	71	YES	23%
DIRECT EVAPORATION	49	NO	16%
SEWER/STORM SEWER	9	NO	3%

RETURN TO BOILER OR COOLING TOWER	5	NO	2%
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There were 165 follow-up visits conducted from November 1998 through July 2000. Ninety-three of the visits concentrated on the management of separator water. Eighty-five (eighty-five percent) of the businesses improved their management of separator water. Seven businesses continued to evaporate their separator water as previously observed. One business continued to discharge the water to the sewer. **Of the 306 businesses visited, 298 (ninety-seven percent) were handling separator water correctly after the first and/or follow-up visits.**

Table 3. Disposal methods of separator water by Ninety-three (93) King County dry cleaners at time of follow-up visit to business.²

DISPOSAL METHOD	NUMBER OF BUSINESSES	METHOD ACCEPTABLE?	PERCENTAGE (of 60 revisited)
TSDF	54	YES	58%
FILTRATION/ EVAPORATION	31	YES	33%
DIRECT EVAPORATION	7	NO	8%
SEWER	1	NO	<1%

The second impact objective stated that eighty percent (80%) of dry cleaners with hazardous materials handling, storage, and disposal problems would make improvements in one or more of the following areas:

Hazardous Waste Disposal: Eighty-six percent of the businesses that were improperly handling separator water at the time of the baseline visit corrected this practice. Table 2. demonstrates the methods used by the dry cleaners at the first visit.

Storage, mostly a lack of secondary containment was a second hazardous waste issue affecting the industry. Separator wastewater, still bottoms, and spent filters were the

² This figure does not include all dry cleaners that generate separator water as a waste.

typical hazardous materials stored on site. Operators were encouraged to provide secondary containment for both containers containing waste and for older dry cleaning machines that originally were not installed with containment.

Initial visits showed sixty-six deficiencies in secondary containment of still bottoms and/or separator water. Follow-up visits were made to forty-one businesses where this issue was considered. Thirty-five (eighty-five percent) of the businesses resolved these problems.

A third impact objective aimed to increase the number of businesses with proper personal protective equipment by fifty percent.

Health and Safety issues primarily involved the need for respiratory protection, eye protection, and material safety data sheets. Use of respirators with organic vapor cartridges and eye protection was encouraged during the times that operators maintained the equipment and came into close contact with spent filters and still bottoms.

During initial visits, health and safety problems were noted at 121 businesses. Fifty-nine follow up visits were conducted where health and safety issues were discussed. Forty-seven (seventy-nine percent) of the businesses had made improvements by purchasing respirators, goggles, or gloves. There were still twelve (Twenty-one percent) businesses that had not made any improvements in this area at the time of the follow-up visits.

A fourth impact objective was to increase the rate of voucher redemption by fifty percent. This implied an increase from the typical thirty percent redemption to sixty percent.

Of the 206 vouchers issued to dry cleaners, sixty-seven (thirty-two percent) were reimbursed for a total of \$25,000. During the period 1998-2000, there were thirty purchases of separator water treatment units accomplished with assistance from the voucher incentive program.

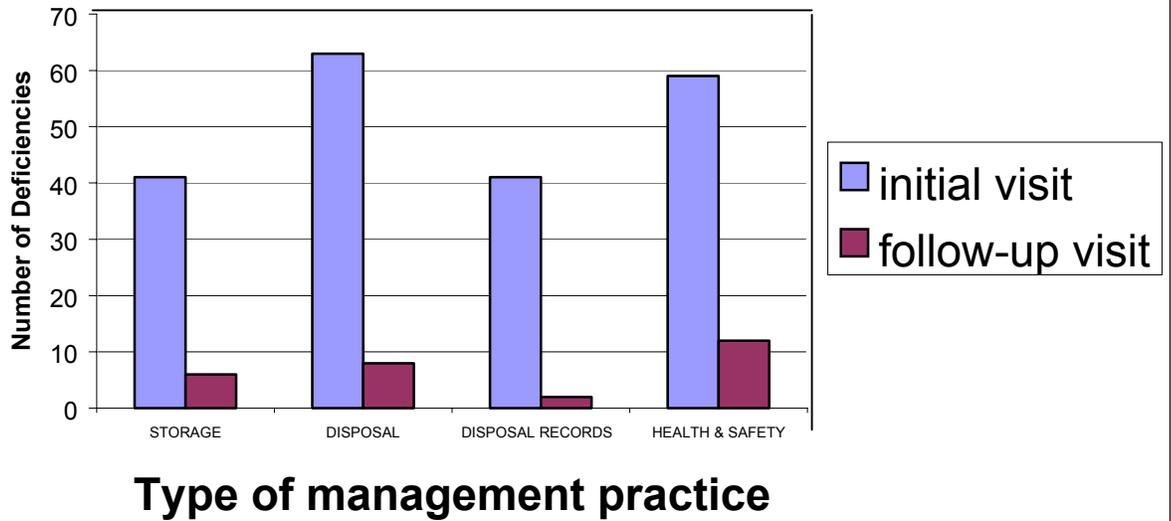
A fifth impact objective was to encourage at least ten dry cleaners to apply for EnviroStar status.

At the time of this report, the project team was still finalizing the EnviroStar worksheet, which includes the criteria for each star level. Nineteen dry cleaning businesses have applied for membership to the recognition program.

A sixth impact objective was two dry cleaners attaining EnviroStar stature.

At the time of this report, applications are under review by the program.

Table 4. Baseline and Follow-up hazardous waste deficiencies for King County Dry Cleaners.



CONCLUSIONS AND RECOMMENDATIONS

The dry cleaning industry is dynamic and evolving in its process technology. In King County, Washington approximately 340 dry cleaning establishments were visited during the period 1997-2000. All businesses are properly handling dry cleaning filters and still bottom wastes properly. However, there are a variety of practices for the management of separator water that is a by-product of the distillation of the PERC. **More than one-half of the businesses appear to send separator water off-site to a TSDF.**

A surprising twenty-three percent of the operators use a commercially available filtration unit that treats the separator water and evaporates or mists the filtrate. During the course of this project, an additional thirty units were purchased using the vouchers offered by the Local Hazardous Waste Management Program. This appears to be the trend and results in less hazardous waste generated by the industry. Many operators are reluctant to send separator water to hazardous waste disposal for a variety of reasons, primarily the fact that it does not readily meet the definition of hazardous from their perspective, especially in contrast to spent filters and still bottom waste generated by the dry cleaning process.

Preliminary laboratory analysis results of separator water influent and effluent indicate that maintained equipment effectively treats the waste to the required level of 0.7 PPM. However, sampling and testing of influent and effluents from treatment units indicated failure by at least one manufacturer. The particular manufacturer was notified of the results and is in the process of modifying their equipment. There does not appear to be a regular maintenance schedule for the filters that are the integral component of the equipment. We would recommend that operators of separator water treatment units 1) follow manufacturer's recommended maintenance schedule and 2) keep a maintenance log in the same manner as the dry cleaning machine.

Operators readily corrected secondary containment of hazardous wastes when the auditor pointed out this deficiency. However, it was more difficult to encourage the installation of secondary containment around older dry cleaning machines that were not originally installed with secondary containment. Dry cleaning machines must be lifted to install the secondary containment. The size and weight of these machines makes the installation complex. There was some success with getting operators to seal the floor around the machine and several businesses took advantage of the voucher to purchase appropriate sealers or have the service done by a professional contractor.

Many of the dry cleaners in King County are owner-operated and the owners are the primary responsible people for operation and maintenance. It is apparent from our visits that there was a reluctance to use personal protective equipment when performing maintenance operations that would expose the operator to PERC vapors. Both the Occupational and Safety Health Administration and Washington Industrial and Safety Health Administration recommend that time weighted average of eight hours not exceed 100 ppm PERC. Nearly eighty percent of the operators did purchase protective equipment but we do not have evidence of routine usage. Our recommendation is to continue to provide accurate and understandable information on the health risks of

working with PERC. This information can be disseminated through various sources, such as the trade association, Puget Sound Clean Air Agency (who issues annual permits to operators), or the Washington State Department of Labor and Industries.

There was a concerted effort to return to make additional contact with dry cleaners that continued to improperly dispose separator water. There are eight businesses who continue to evaporate directly (7) or send to sewer (1) separator water even after repeated efforts by field staff to change this behavior. The project team has recommended referring these businesses to the Washington and Korean Dry Cleaners Associations for their review. Ultimately, the names of these businesses will be passed on to the Washington State Department of Ecology's Northwest Regional Office unless the operators correct their mismanagement of separator water.

LESSONS LEARNED

1. If the project team had known how prevalent the use of separator water treatment systems would be, we would have sampled the different systems earlier in the project and incorporated the importance of maintenance of the equipment at the onset of the project.
2. Korean translations on health effects of perchloroethylene (PERC) and work practice recommendations for dry cleaners assisted in helping some operators to understand our message.
3. All of the dry cleaners visited were properly disposing of the dry cleaning machine filters and still bottoms through a hazardous waste disposal company. The private disposal company was filling a need based on early Ecology guidelines. Information had been conveyed to the dry cleaning industry through a number of channels, trade associations, Puget Sound Clean Air Agency (PSCAA), Local Hazardous Waste Management Program in King County and Washington Department of Ecology. We were somewhat surprised by the overwhelming compliance in this area.

NEXT STEPS

REPORT DISTRIBUTION

1. Copies of the report will be available on the LHWMP web site
2. Copies of the report will be available by calling (206) 263-3051.
3. Copies of the report will be sent to the Dry Cleaner Associations.

4. Copies of the report will be distributed within the program and to the Northwest Regional Office of the Washington State Department of Ecology and PSCAA.

Continued Work with the Industry

1. Envirostar/Incentives, working with the Dry Cleaner Associations, has hired a consultant to aid the industry in completing the Envirostar application.
2. Dry Cleaner shop owners like using the misting machines to treat separator water. Ecology plans to prepare Best Management Practices (BMPs) for the handling of separator water in misting machines. They are grateful for our test data and will incorporate the results into their BMPs.
3. The small number of businesses who are still incorrectly disposing of separator water have been referred to Trevor Fernandes on the On-Site team. He will continue to work with them on an individual basis.
4. The industry does a good job managing their hazardous waste. We will continue to do follow up visits related to Envirostar applications. Businesses with further questions or those who did not receive a visit are encouraged to contact the business waste line at (206) 296-3976.

APPENDIX A

SUCCESS STORIES

Bellevue Way Cleaners (Bellevue) on December 1, 1999, Larry Brown visited Bellevue Way Cleaners. He found PERC waste storage barrels standing by a floor drain; separator collection buckets not labeled for hazardous waste; and personal safety gloves and emergency eye wash not on hand. Larry discussed these safety and environmental issues with the manager. Mike Kaufmann did a follow-up check on May 18, 2000. He found the cleaners neat and clean. The barrels containing waste filters, still bottoms and separator water were standing smartly on secondary containment pallets with hazardous waste labels. New safety goggles and eye wash kits were on hand and properly stored in Zip Lock bags. The manager had a very positive demeanor, was proud of correcting the discrepancies found by Larry, and seemed anxious to do more for us if possible. Mike complimented him and issued him a voucher to help pay for the safety and environmental improvements he had promptly completed.

Mac's Cleaners (Renton) Larry Brown checked Mac's Cleaners October 15, 1999. It is a drop off facility and all dry cleaning is done elsewhere. However one barrel of unknown waste was found. Larry issued a voucher for disposal and Safety-Kleen removed the barrel. Mike Kaufmann did a follow-up check in May 2000. The operator at the drop off site said she had used our voucher for disposal and proudly displayed her receipt from Safety- Kleen.

Fabricare Dry Cleaners (Redmond) Larry Brown visited Fabricare Dry Cleaners December 30, 1999. He found the separator water buckets unlabeled for hazardous waste, no receipts on site for proper waste disposal and personal safety equipment for working with PERC unavailable. Mike Kaufmann did a follow-up check on May 25, 2000. He noted the buckets were properly labeled and receipts for hazardous waste disposal on site. New PERC resistant gloves and safety goggles completed the safety items checklist. The manager emphasized he liked our program and wanted us to inspect yearly so that he would not miss important environmental and safety issues.

Overlake Cleaners (Redmond) Larry Brown inspected Overlake Cleaners December 23, 1999. The separator collection bucket was not labeled for hazardous waste and was too full to be easily handled. Spillage from the bucket had occurred around the Mist-It machine and the full bucket was not stored in secondary containment. A respirator, safety goggles and gloves were not on hand. Mike Kaufmann followed-up on May 25, 2000. The bucket spillage problem was corrected by the installation of plastic tubes from the machine to the Mist-It disposal machine and all the safety items recommended were available. The manager mentioned that our Korean Language Fact Sheet concerning the health affects of PERC was very helpful and instrumental in his desire to correct the discrepancies noted by Larry Brown.

Dry Cleaner in West Seattle. A business located in West Seattle (in operation less than 6 months) was unknowingly disposing of their separator water into a storm drain outside their back door. The storm sewer led directly into Puget Sound. Penny Chencharick explained the potential impact PERC has on the environment (and the legal implications).

The operator chose to send the 8-10 gallons of separator water generated monthly with their other hazardous wastes. A voucher was issued to help offset the cost of disposal and during June 2000, they installed a SmartMist evaporation machine, further reducing costs.

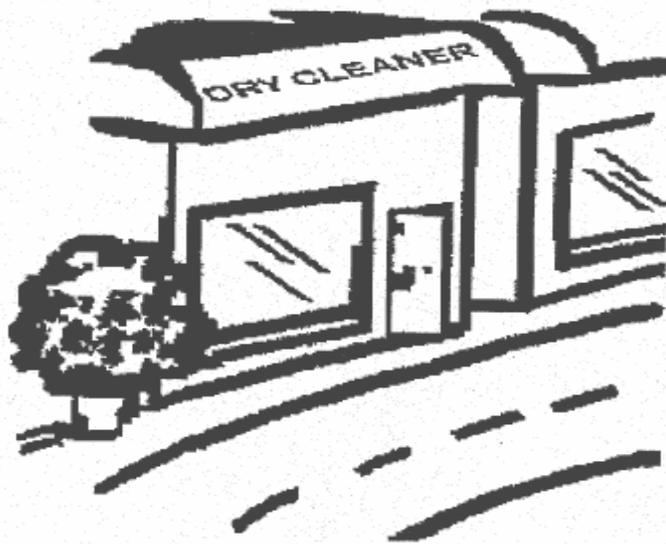
Dry Cleaner in North Seattle. After being in the same location for over 50 years, one of the few dry cleaners still using Stoddard solvent in King County needed all the help it could get. Reluctant to have an auditor in their shop in the first place, the owner cordially agreed to allow Penny Chencharick to proceed with the visit. There were many discrepancies during the initial visit. The biggest concern however was site contamination with solvent. Past improper practices, primarily solvent spills, were evident by soil stains. There were concerns about solvent reaching storm water drains. The discussion led to liability issues. Best management practices, good housekeeping, storing, waste management and spill prevention & clean-up procedures were reviewed. After numerous unsuccessful attempts of just "showing up" to re-evaluate things, an appointment was made to re-visit this facility. The owner has completely re-organized his way of doing business and procured the needed safety supplies. We are in the process of working together to assess the site contamination level and prevent further liability. The grateful operator responded, "Out of all the governmental agencies that have come here, none have treated me as fairly and as respectfully as you have." Bottom line, treat other as you would like to be treated in business and it's remarkable how you can effectively change behaviors through information.

APPENDIX B



Dry Cleaner Reference Manual

Complying with Washington State and Federal Environmental Regulations



Publication No. 01-04-018
Revised January 2004

 *printed on recycled paper*

<http://www.ecy.wa.gov/pubs/0104018.pdf>

APPENDIX C

워싱턴주 및 연방 환경부 법규의 준수를 위한

세탁인참고서



WASHINGTON STATE
DEPARTMENT OF
E C O L O G Y

워싱턴주 환경부
(Department of Ecology)

1996년 4월

Publication No. 96-200

<http://www.ecy.wa.gov/pubs/0104018k.pdf>

APPENDIX D

Dear Dry Cleaner Owner/Operator:

Beginning in September, in coordination with the Northwest Dry Cleaners Association, Environmental Health Specialists from Public Health-Seattle & King County will conduct educational visits to Dry Cleaners located within King County. These visits are part of the Local Hazardous Waste Management Program in King County, a program mandated by the Washington State Department of Ecology to provide businesses with technical assistance on the proper management of moderate risk wastes.

The Local Hazardous Waste Program in King County was established by Seattle, King County, and suburban cities “to protect public health and the environment from adverse effects resulting from the improper handling and disposal of hazardous waste generated by small business and households.”

During shop visits, Environmental Health Specialists from Public Health will review hazardous waste management practices with shop owners and managers. After the visit, Environmental Health Specialists provide the business owners with information and technical support in order for the business to follow Best Management Practices (BMP’s) for the industry.

Dry Cleaner owners are eligible to receive a financial incentive from King County in the form of a redeemable voucher. The voucher program can reimburse a business up to \$500 of their hazardous waste management and disposal costs. Dry Cleaners may also apply to become an EnviroStar. This program publicly recognizes qualified business for their efforts at responsibly managing hazardous wastes. This recognition gives businesses a valuable tool when working with environmentally conscientious clients.

The Business Waste Line, 206-296-3976, is a hotline staffed by environmental professionals who can answer questions on waste disposal options, regulatory concerns, and health risks posed by various products. The lines are open 9AM to Noon and 1PM to 4PM Monday through Friday.

If you have any questions or concerns, or if you wish to have your visit scheduled in advance, please feel free to call Trevor Fernandes at 206-263-3066 or Bill Lawrence at 206-296-3968.

APPENDIX F

LOCATIONS OF BUSINESSES VISITED

THE TABLE BELOW SHOWS THE LOCATIONS OF KING COUNTY BUSINESSES THAT WERE VISITED DURING WORK WITH THE DRY CLEANING INDUSTRY.

Dry Cleaner Visits by City			
Auburn	10	Preston	0
Bellevue	37	Redmond	19
Burien	4	Renton	20
Carnation	0	Sea Tac	2
Des Moines	6	Seattle	124
Enumclaw	2	Shoreline	10
Federal Way	17	Snoqualmie	0
Issaquah	9	Tukwila	2
Kent	26	Unincorporated King County	4
Kirkland	29	Vashon	0
Mercer Island	7	Woodinville	2
Newcastle	1	Other	9
North Bend	2	Total	340

FACT SHEET

Work Practice Recommendations for Dry-cleaners

Exposure to PERC can be reduced by proper work practices. For example, operators should not exceed the machine's rated capacity, shorten the drying cycle, or open machine doors while the machine is operating because each of these activities will increase worker exposure.

- Solvents or hazardous waste should never be left standing in an open container.
- Dry-cleaning machines should never be loaded beyond the manufacturer's capacity rating. Drying times and temperatures should be regularly monitored.
- All ventilation systems within the dry-cleaning room should be operating when the dry-cleaning machine is in operation.
- All forms of machine maintenance should be performed when the machine and solvent are under cold conditions. Machine maintenance, such as cleaning the button/lint trap, should never be performed when the machine is in operation.
- Machine maintenance should be performed on a routine basis, in accordance with machine manufacturer's guidelines.
- All doors on dry-cleaning machines should be opened for a minimal amount of time.
- Leak checks should be regularly performed, and any leak that is identified should be immediately repaired.

Personal Protective Equipment Recommendations

Though not recommended by NIOSH because PERC is a potential human carcinogen, respirators (half-mask face piece with organic vapor cartridges) used for short-term exposures to low concentrations of PERC must have the cartridges changed prior to breakthrough. Regular cartridge changes are important because the odor threshold of PERC is 27 ppm, and a worker may not smell PERC until significant breakthrough and exposure have occurred.

When employees must wear respirators, an appropriate written respiratory protection program in accordance with WAC 296-62-071 must be instituted. This regulation contains provisions for:

- A written standard operating procedure.
- Respirator selection based upon hazards.
- Instruct and train the user about the proper use and limitations of respirators.
- regular cleaning, disinfection, and proper storage of respirators.
- Medical review of the health of the respirator user.
- Use of certified respirators, which have been designed according to standards established by competent authorities.

It is recommended that at a minimum, operators should use proper respirators and gloves during machine maintenance and waterproofing operations.

Chemical splash goggles should be worn to prevent eye injury when workers are using PERC or other hazardous chemicals. Use of chemical splash goggles is particularly important during machine maintenance operations, waterproofing, and spotting. **An eye wash station should be located near the dry-cleaning machine and the spotting station.**

Gloves and goggles should be used to reduce exposure to PERC during machine maintenance or other activities where the skin may come in direct contact with solvent. Gloves provide limited dermal protection and should be made of solvent-resistant materials, such as Viton® fluoroelastomer, polyvinyl alcohol, or unsupported nitrile.

For **FREE** consultation services or information about this information call (206) 281-5470

드라이-클리너를 위한 실행 준수 권장 내용

Perc에 노출되는 것은 적절한 작업 수칙 준수로 감소시킬 수 있다. 예를 들어, 작동자가 기계의 용량을 초과하거나, 드라이링 사이클을 짧게 하거나, 기계의 작동중 기계의 문을 열거나 하면 작업자가 Perc에 노출될 기회를 증가함으로써, 절대로 하지 말아야 한다.

- 솔벤트나 위험 폐기물은 항상 밀폐 상태로 보관해야 한다.
- 드라이클리닝 기계를 제조업체의 용량을 초과해서 사용하지 않는다. 건조 시간과 온도를 정기적으로 점검한다.
- 기계의 작동시 드라이 클리닝 장소의 모든 통풍 시스템을 작동시킨다.
- 기계의 모든 점검은 기계와 솔벤트가 상온 상태일 때 점검하여야 한다. 고정판청소/린트 제거등의 기계 정비를 기계가 작동하는 중에는 하지 않는다.
- 기계 점검은 기계 제조업체의 지침서에 따라 정기적으로 하여야 한다.
- 드라이 클리닝 기계의 모든 문은 최소 시간만 열고 항상 닫아 두어야 한다.
- 누수 검사를 정기적으로 행하고 발견시에는 즉시 수리하도록 한다.

개인 보호 장비 권장 내용

비록 NIOSH에 의한 권장 사항은 아니지만 PERC가 발암성 물질이므로 저농도 PERC에의 단기노출에 대해 사용하는 마스크(올가닉 베이퍼 카트리지가 부착된 마스크)의 카트리지는 다 소모되기 전에 교체하여야 한다. PERC의 냄새 역치값 단위는 27ppm이며 카트리지의 효능이 다 소모되어 작업자가 PERC에 이미 노출이 된 상황까지 작업자가 그 냄새를 느끼지 못할 수 있기 때문에 카트리지의 정기적 교체는 매우 중요하다.

피고용원이 마스크를 착용하여야 하는 경우에는 WAC 296-62-071에 의거하여 마스크 프로텍션 프로그램의 적절한 서면 통고를 공시하여야 한다. 이 규정은 다음의 조항들을 포함한다:

- 서면상의 기본 작동 방법
- 위험 종류에 따른 마스크의 종류 선택
- 사용방법 및 마스크의 한계에 대한 사용자 교육 및 훈련
- 마스크의 정기적 청소, 소독 및 보관
- 마스크 사용 대상자에 대한 건강 검토
- 허가치에 의해 설정된 준수내용에 따라 디자인된 인가품 마스크를 사용할 것.

기계 관리 및 방수 처리 작업중, 작동자는 최소한 적절한 마스크와 장갑을 착용할 것이 권장된다. 작동자가 PERC나 다른 위험한 화학용액을 다룰 때는 눈을 보호하기 위해 화학용품 보호 안경을 착용하여야 한다. 보호 안경의 착용은 기계 정비작업, 방수처리 작업 및 스포팅 작업시 특히 중요하다. 눈 세척 장소가 드라이 클리닝 기계와 스포팅 장소 근처에 있어야 한다.

기계 정비 또는 피부가 화학 용품과 직접 접촉할 수 있는 다른 작업중 PERC에 노출되는 것을 감소하기 위해 장갑과 보호 안경을 착용하여야 한다. 장갑은 제한된 피부 보호를 제공하며 Viton® 플루로일레스토머, 폴리비닐 알코올 또는 순수 나이트릴과 같은 화학 용품 저항 재료로 만든 것이라야 한다.

이 안내에 대한 무료 상담이나 정보를 원할 경우에는 (206) 281-5470으로 전화하십시오.

FACT SHEET

테트라클로로에텐의 신체 부작용 증세

(PERC)

Perc는 어지럼, 두통, 불면, 혼미, 구토 그리고 애들의 중추신경 부작용등을 유발할 수 있다. 이러한 증상들은 거의 전체 작업장에 걸쳐 발생할 수 있다. 작업장의 공기중 Perc 함량 수준을 낮게 유지하는 것이 매우 중요하다. 드라이크리닝 업장의 공기중 Perc 함량은 외부업장에서 발견되는 것보다 훨씬 높이가 나타날 수 있다.

적절한 장비관리 및 폐기물 용기의 뚜껑을 잘 닫아두는 것이 공기중 Perc 함량을 최소화하는 데 도움을 줄 것이다.

작업장의 환풍을 돕기 위한 통풍기의 사용은 작업장의 공기중 Perc 함량 감소에 도움이 된다. 통풍기와 통풍기 필터에 린트가 없도록 유지하며, 통풍기 및 필터에서 제거된 린트는 높은 농도의 Perc를 함유할 수 있으므로 위험 폐기물 용기에 보관한다. 좋은 통풍은 작업장을 시원하게 유지하고 작업자의 편안함을 증가시킨다.

고정판(stillbottom)을 청소하거나 먼지 제거 및 필터를 갈아 끼울 때는 장갑과 마스크(작용할 장갑과 마스크의 종류는 유인물에 있음)를 착용하도록 한다.

부절제한 Perc의 사용은 작업원의 건강, 드라이크리닝 업체 근처의 주민, 일반 공공인의 건강 그리고 나아가 킹 카운티의 환경에 유해한 중요한 원인이 된다.

Health Effects of TETRACHLOROETHENE

(Perc)

Perc can cause central nervous system (Brain) effects leading to dizziness, headache, sleepiness, confusion, nausea and difficulty in speaking and walking. These symptoms occur almost entirely in the work environment. It is important that efforts be made to prevent high levels of Perc in the air in the workplace. The Perc levels in the air at dry-cleaning operations can result in exposures that are much higher than those found in the outside environment.

Proper equipment maintenance and keeping the lid on the waste container will help to minimize the amount of Perc in the air.

Use of fans to provide ventilation will help to reduce the concentration of Perc in the workplace. Keep the fans and fan filters free of lint, when you remove lint from the fans and filters place the lint in the hazardous waste drum as it may have high concentration of Perc. Good Ventilation will help to keep the workplace cool and increase worker comfort.

Use gloves and a respirator when you clean out the still bottoms or muck and when you change filters. (See handout for types of gloves and respirators)

The uncontrolled use of PERC has the potential to cause widespread harm to the health of the workers, the people living near dry cleaning shops, the general public, and the King County environment.

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APPENDIX I

ENVIROSTARS APPLICATION/WORKSHEET FOR DRY CLEANERS

How do I qualify for certification?

Your business must be a small quantity generator (SQG) of hazardous waste or progressing towards SQG status and meet minimum standards for hazardous waste handling. You should be able to check all of the following items in the Dry Cleaners Waste Management checklist to meet EnviroStars standards. [An SQG business generates less than 220 pounds (about 27 gallons, or half a drum) of hazardous waste per month and accumulates no more than 2,200 pounds (about 5 drums) of hazardous waste on site at any time.]

An on-site consultant will go through these items and your options with you in a site visit, which will be scheduled at your convenience. The next step is to identify what you are already doing, and what you might be able to start doing, to prevent pollution beyond these requirements. You will find examples throughout the worksheet.

RATING SYSTEM

2-STAR: Complete the waste management checklist and outline a goal to reduce hazardous waste or maintain your current status, in Section 1.

3-STAR: Identify ways you have reduced hazardous waste through practices, products and procedures in Sections 1-5.

4-STAR: Show how waste prevention is built into your operations, marketing, management and accounting systems in Sections 1-8.

5-STAR: Demonstrate that you are a proactive leader, committed to preventing waste and spreading an ethic of environmental responsibility by completing Sections 1-10.

**** 2-STAR BUSINESS**

Section 1: Dry Cleaners Waste Management Checklist

Used perc ...	<input type="checkbox"/> Does not go down the drain
Equipment filters ...	<input type="checkbox"/> Do not go into the garbage
Dry to dry equipment...	<input type="checkbox"/> No transfer cleaning equipment
Untreated separator water...	<input type="checkbox"/> Is not discharged to the sewer, septic system or ground
Solvent still bottoms/sludge	<input type="checkbox"/> Are not disposed of down the drain, in the garbage or on the ground

Dry Cleaners Waste Management Checklist (continued)

STORAGE

Hazardous waste must be stored in containers that are:

- Compatible with the waste they hold
- Kept closed when not in use
- Kept inside or under cover
- Not in direct contact with soil or located over a drain

LABELING

Each container with hazardous waste must have a label which includes:

- A description of the waste and its hazards (filters, sludges, still bottoms, separator water... HW code=F002)
- The words "Hazardous Waste" clearly marked on the label

Transportation

Hazardous waste must be transported so that:

- No hazardous waste will spill or be released
- Spill materials and a response plan are available (an example spill kit and response plan are available)

IDENTIFICATION, TREATMENT & DISPOSAL

Hazardous waste must be identified to ensure proper disposal methods:

- Hazardous waste is either treated so that it is no longer hazardous or sent to a permitted recycling company, moderate risk waste facility, or treatment, storage and disposal facility (TSDF)

Recordkeeping

- MSDSs are available for hazardous products
- Documentation exists for all hazardous wastes being handled off-site (such as manifests, receipts, bills of lading, DOT shipping papers, vendor certificates)

For office use only

Audit form: sections 1, 2, 4, & 5 have no minuses; Consultation form: sections 1, 2, 3, & 4 have no minuses. Field staff signature.....Date.....

SECTION 1 CONTINUED: WASTE REDUCTION GOAL

Write a waste reduction goal for the year. We have included some ideas. Please write your own goal in the space provided. Be as specific as possible. Explain how you intend to achieve your goal by writing the results you want to achieve, the steps you will take, include timelines and who will be responsible.

Recommendation: Save this section for the end, and use some of the checked items in the "Future" column or "Other Ideas" space of other sections as your goal.

Example Goals:

- Establish and follow a preventative maintenance program to avoid, detect and repair leaks in equipment.
- Consolidate spot cleaners to only those you really need, multi-purpose where possible.
- Purchase third or fourth generation cleaning equipment.
- Provide customers with waste minimization options such as re-usable or no plastics, and hanger recycling.

SECTION 2: CLEANING

Can you clean more efficiently, less often, using less hazardous materials?

Yes

No

Future

Requirement for 3-star: In order to reduce spills, we use spigots, pumps and funnels when dispensing and transferring liquids instead of freely pouring them

Requirement for 3-star: We keep spill containment materials near potential spill sites

We use a minimum amount of spot cleaner, just enough to do the job

We ask customers to identify stains and what they might be from, then use appropriate stain removers only

We sweep floors and spot-clean as necessary

Other ways we (could) reduce our use of hazardous materials and/or hazardous waste in our cleaning processes

SECTION 3: PRODUCT AND WASTE STORAGE

How do you prevent spills, leaks and contamination of non-hazardous materials?

Yes

No

Future

Requirement for 3-star: We make sure our Waste Service Company provides fasteners to keep lids, bungs and/or clamping funnels in place on all containers when not in use

Requirement for 3-star: Waste containers are provided with secondary containment

- which are made of durable, leak-proof materials (such as a bermed room, containment pallet, or sump), and can hold largest potential spill amount
- We assign one person to be responsible for routine inspections of product and waste containers

Other ways we (could) prevent leaks and spills or mixing of non-hazardous with hazardous waste

SECTION 4: PURCHASING AND INVENTORY MANAGEMENT

How do you minimize the number of hazardous products used and/or wasted?

Yes
No
Future

- Requirement for 3-star:** We review material safety data sheets before purchasing products
- We ask vendors to provide alternatives to hazardous products and/or write this into purchasing contracts

Other ways we (could) reduce our use of hazardous materials, alternative products we could try/have tried

SECTION 5: EMPLOYEE INVOLVEMENT

What do you do to train, educate, inform or involve employees in reducing wastes and air pollution?

Yes

No

Future

- Requirement for 3-star:** We ensure that employees have training on safety equipment and practices (e.g. respirators and gloves), and keep children away from areas where they could be exposed to perc
- Requirement for 3-star:** We post our EnviroStars goal(s) and/or pollution prevention policy statement
- We make publications available with waste management or pollution prevention information for easy reference
- We include discussion of hazardous waste/air pollution reduction and management in our routine meetings, training, and/or newsletters
-

Other ways we (could) involve employees in hazardous waste pollution reduction

SECTION 6: OPERATIONS

How much waste is generated by your processes? Can more be prevented, reduced or recycled?

Yes
No
Future

Requirement for 4-star: We schedule solvent service to fit volume and frequency needs (if the solvent is good through 8 or 16 weeks instead of 4, re-negotiate your contract!)

- Requirement for 4-star:** We recycle:
- Perchloroethylene
 - Plastics/garment bags
 - Hangers
 - Charity clothing

If we use wet-cleaning, we keep the water temperature at 80 degrees for optimal cleaning results

If we use wet-cleaning, we have an energy-efficient dryer (rated by EnergyStar?)

Other ways we (could) reduce hazardous waste in our production processes

SECTION 7: MARKETING

What have you done to share your environmentally responsible actions with your customers, your community and your industry?

Yes

No

Future

- | | | | |
|--------------------------|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Requirement for 4-star: We make our commitment to reducing hazardous waste & protecting the environment clear within our shop so that employees understand our ethic |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | We discuss environmental or waste management issues in newsletters |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | We explain our environmentally responsible practices to customers |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | We advertise our environmental efforts in the phone book and/or other marketing |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |

Other ways we (could) promote waste and pollution reduction

SECTION 8: MANAGEMENT AND ACCOUNTING SYSTEMS

Do you know how much time, money, training, and paperwork it takes to manage your hazardous wastes? Do you have enough information to chart a course for improvement?

Yes

No

Future

- | | | | |
|--------------------------|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Required for 4-star: We keep disposal and recycling records and compare the amount of waste generated with past years to monitor progress |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Required for 4-star: We assign a person (s) to regularly monitor and record in a log our equipment maintenance |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | We review the activities of vendors, consultants, or contractors that we hire, and require documentation of any waste disposal activities that they provide |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | We use HOC (halogenated organic carbon) detection devices when maintaining, repairing or monitoring dry cleaning and waste treatment equipment |

SECTION 9: LEADERSHIP

How does your business compare with others in your industry? Are you creating changes?
Are you providing encouragement to others?

Yes

No

Future

Requirement for 5-star: at least one item checked from the following list...

- We give tours of our facility to other shop owners, customers, environmental groups, and/or business associations.
- We share successes, cost savings and environmental tips with others through trade association meetings, trade publications or industry-related conferences
- We play an active role in developing environmentally sensitive products, equipment or garments (such as CO2, glycol ether, or other solvent alternatives; addressing cleaning labels in garments...)
- We have created new technology, product, or service innovations that have resulted in reduced wastes or prevented pollution
- We offer wet cleaning as an option to customers
- We have helped other specific businesses or shop owners to improve their practices

Describe in more detail the activities you have checked above:

-

How do you plan to become (or stay) a leader in pollution prevention?

SECTION 10: ENVIRONMENTAL PROTECTION

Are your efforts comprehensive? Do you consider impacts on air, water, land and municipal waste systems?

Yes

No

Future

- Requirement for 5-star:** Incorporate a recycling program for solid waste and become a member of Green Works (For assistance call 206-296-8800)
- Adopt proper Storm and Surface Water Management practices to protect area water bodies and salmon habitat (Contact 206-296-1900 for more information, or the Salmon hotline at 1-877-salmon-9)
- Find ways to conserve energy by participating in the EPA Green Lights/Energy Star program (Call 202-775-6650 for more information)
- Host a neighborhood cleanup, tree-planting, or other environmental project in your community
- Create tools or programs to educate your employees or customers about steps they can take to prevent pollution at home
-

Are there any other future plan or things you are doing now to reduce waste comprehensively that you'd like to mention?

*General Information that helps us do better publicity for you
(Please answer what you can)*

What is your local/neighborhood newspaper?

Are you a member of International Fabricare Institute/Northwest Dry Cleaners Association, Korean Dry Cleaners Association? _____

Do you belong to any other business or community groups (such as Kiwanis, Chamber of Commerce, etc)? _____

***DON'T FORGET TO RETURN TO SECTION 1
FILL OUT YOUR GOAL AND SIGN THE APPLICATION***

Congratulations! We look forward to adding your company to the EnviroStars Program!

Mail your application to EnviroStars, 130 Nickerson St, Ste 100 Seattle, WA 98109 or fax it to 206-263-3070; an EnviroStars representative will call you to schedule a site walk through if you have not already had one in the past 12 months to verify current practices and to see if we can suggest any new pollution prevention measures. We will review your application and notify you of your star rating.

APPENDIX J

Evaporator/Misting Machine Manufacturer List

FILTER- SAFE™ AND QUICK EVAP™

Environmental Technologies and Solutions, Inc.
12700 Biscayne Blvd., Suite 401
N. Miami, FL 33181
(800) 404-0443, (305) 895-9788, Fax: (305) 892-1998

Web Page: <http://www.filtersafe.com/f-safe.htm>

E-Mail: epai@aol.com

Contacts: Donna McKibbon

Local Distributors: None

Model / Cost: FS-320: \$1289

Filters / Cost: Replacement filters: \$49 (discounts and recycling available)

Filter Change Interval: Every 3 months or 125 gallons, whichever comes first.

Direct Feed or Pour: Both

Manufacturer Test:	<i>Initial Perchloroethylene Concentration (ppm)</i>	<i>Initial Perchloroethylene Concentration (ppm)</i>	<i>Comment</i>
<i>Model not provided</i>	<i>26.69</i>	<i>0.065 (after 60 gal.) 0.0527 (after 196 gal.)</i>	<i>11/96 and 12/96 data.</i>
<i>Model not provided</i>	<i>310</i>	<i>0.010</i>	<i>2/15/2000 report.</i>

FRE-VAP

Sunshine Laundry
3359 Clearbrook Rd
Sumas, WA 98295
(360) 988-8363 Fax: (360) 988-7064

Web Page: None

E-Mail: None

Contacts: Mike Olsen

Local Distributors: Cesco 824-9055

Model / Cost: Fre-Vap: \$699, may need accessories

Filters / Cost: Contact manufacturer

Filter Change Interval: Every 3-4 months.

Direct Feed or Pour: Direct feed

Manufacturer Test:	<i>Initial Perchloroethylene Concentration (ppm)</i>	<i>Initial Perchloroethylene Concentration (ppm)</i>	<i>Comment</i>
<i>Model Fre-Vap</i>	287	0.0039(2 gal.) 0.215(84 gal.) 1.150(192 gal.)	<i>Test started 9/24/97, run for 16 weeks.</i>

GALAXY

Quality Cleaning Fluids & Mfg. Co., Inc.
 9216 W. Grand Ave
 Franklin Park, IL 60131-3002
 (800) 708-2070, Fax: (847) 451-6654

Web Page: <http://hometown.aol.com/ddellegraz/myhomepage/index.html>

E-Mail: None

Contacts: Pat Dellegrazie 847 451-1190

Local Distributors: None

Model / Cost: #1220: \$630.00 (remote mister). A portable model is also available.

Filters / Cost: \$28.00 for bag of carbon, 18.95 for 2nd filter; pre filter bag \$14.00 (no need to replace)

Filter Change Interval: Once a year based on 0.5 gal per day

Direct Feed or Pour: Both

Manufacturer Test:	<i>Initial Perchloroethylene Concentration (ppm)</i>	<i>Initial Perchloroethylene Concentration (ppm)</i>	<i>Comment</i>
<i>Model not provided</i>	53.5	0.009	<i>Influent and effluent study.</i>

Kleen-Rite Hydro-Mist

Kleen-Rite, Inc.
 4444 Gustine Avenue
 St. Louis, Missouri 63116
 (314) 353-1712; (800) 805-5186, Fax: (314) 353-5340

Web Page: http://www.kleen-rite.com/kr_home.htm

E-Mail: [Product/Sales Information: kri@il.net](mailto:Product/Sales%20Information:kri@il.net)

Contacts: National Sales Manager: 800-805-5186

Local Distributors: None

Model / Cost: M-1: \$1495

Model / Cost: M-2: \$1587 (remote mister)

Filters / Cost: 2 for \$69

Filter Change Interval: 3 months (assuming 6 gal per day)

Direct Feed or Pour: Pour

Manufacturer Test:	<i>Initial Perchloroethylene Concentration (ppm)</i>	<i>Initial Perchloroethylene Concentration (ppm)</i>	<i>Comment</i>
<i>Model M-1</i>	<i>not provided</i>	0.0093	<i>Tested over a 1 ½ hour period.</i>
<i>Model not specified</i>	15.7	< 0.100	<i>Tested over a 12 day period.</i>

MILLENNIA 2000

Evaporation Technology International Inc.
 315 South Coast Highway 101, Suite U-54
 Encinitas, CA 92024
 (888) 382-7672, (760) 602-9995 Fax: (760) 602-9995

Web Page: None
E-Mail: sales@evaptech.com
Contacts: Jim Harris
Local Distributors: None
Model / Cost: P-2000-E: lease to own, \$190.42 start up fee, 22 payments of \$57 per month to own.
Filters / Cost: Contact manufacturer
Filter Change Interval: 4 months. Machine needs 6 month maintenance cleaning.
Direct Feed or Pour: Both

Manufacturer Test:	<i>Initial Perchloroethylene Concentration (ppm)</i>	<i>Initial Perchloroethylene Concentration (ppm)</i>	<i>Comment</i>
<i>Model P-2000-E</i>	33.7 31.9	0.02239 (fresh filter) 0.0023 (340hours)	<i>Bench Test</i>
<i>Model P-2000-E</i>	<i>not applicable</i>	<i>not detected in stack air</i>	<i>Bench Test, after 340 hours</i>
<i>Model-not available</i>	75	0.0095(6 months)	<i>Field test</i>

Safety Kleen Model 37 (manufactured by Evaporation Technology International Inc.)

Safety Kleen
 6303 212th St. SW
 Lynnwood WA 98036
 425-775-5328

Web Page: <http://www.safety-kleen.com/safetykleen.html>
E-Mail: None
Contacts: Heyler Davis 253 939 2022 (Auburn Division)
Local Distributors: Safety Kleen Lynnwood and Auburn
Model / Cost: Model 37: Leased at \$135 setup, \$75 a month covers all maintenance.
Filters / Cost: Filters are included in lease.
Filter Change Interval: Changed every 8 weeks by Safety Kleen..
Direct Feed or Pour: Both

Manufacturer Test:	<i>Initial Perchloroethylene Concentration (ppm)</i>	<i>Initial Perchloroethylene Concentration (ppm)</i>	<i>Comment</i>
<i>Model-37</i>	16 26.6	0.0284 0.0475	<i>Bench test over 17 days. Stack air had 0.048 ppm at end of test.</i>

SMARTMIST

JU'S SMARTMIST

10146 S. Roberts Rd.
Palos Hills, IL 60465
(708) 599-8383 (phone and Fax)

Web Page: None

E-Mail: None

Contacts: Yun Ju

Local Distributors: Mr. Kim (consultant for Korean Dry Cleaner association)

Model / Cost: SM-1: \$630 (indoors or outside)

Model / Cost: SM-2: \$730 (remote nozzle)

Filters / Cost: Two filters; \$28 and \$18. All SM-1 units must be retrofitted for these filters, as single filters are no longer available.

Filter Change Interval: Filters should be changed every 200 gallons

Direct Feed or Pour: Both

Manufacturer Test:	<i>Initial Perchloroethylene Concentration (ppm)</i>	<i>Initial Perchloroethylene Concentration (ppm)</i>	<i>Comment</i>
<i>Model not provided</i>	<i>141.8</i>	<i>< 0.050</i>	<i>4/22/98 report date. Before and after study.</i>
<i>Model not provided.</i>	<i>not provided</i>	<i>0.350 (after 150 gal)</i> <i>0.480 (after 200 gal)</i> <i>1.820 (after 350 gal)</i>	<i>12/29/99 report date.</i>

ZEROWASTE / MISTIT

Air Quality Laboratories, Engineering Department
2503 Ardath Road
LA Jolla, CA 92037

(800) 746-0630, (619) 456-0630, Fax: (619) 456-0683

Web Page: <http://www.zerowaste.net/index.html>

E-Mail: aneuman@ix.netcom.com

Contacts: Alan Siedeman

Local Distributors: Dynamic Sales 425-823-4300

Model / Cost: mistIt: \$1495 (misting model)

Model / Cost: zeroWASTE: \$2000 (evaporator model)

Filters / Cost: Filters: \$17 per filter, uses two filters

Filter Change Interval: Check filters every 30 days for swelling. Change if swollen. If no PERC spikes hit the filters they should last 3 months based on 3 gallons a day.

Direct Feed or Pour: Both

Manufacturer Test:	<i>Initial Perchloroethylene Concentration (ppm)</i>	<i>Initial Perchloroethylene Concentration (ppm)</i>	<i>Comment</i>
<i>Model- zeroWASTE</i>	<i>120</i>	<i>0.010</i>	<i>Initial test</i>
	<i>65.58</i>	<i>0.010</i>	<i>After 1 month, all data from California ARB study.</i>

Additional Suppliers

The following companies also serve the dry cleaning industry.

Therm-O-Tek Industries

900 South Murphy Street

Pahrump, NV 89408

(800) 805-8656 or (702) 221-0323

VaPure:

2877 Sycamore Dr.

Semi Valley CA

(805) 522-1948, (805) 527-1452, (802)-933-5956

****Note:** this is not a comprehensive list of separator water treatment devices available and does not constitute an endorsement by the Local Hazardous Waste Management Program in King County.**

APPENDIX K

Concrete Coatings for Containment of Perchloroethylene

12/01/99 – Research done by Local Hazardous Waste Management Program in King County

In general, coatings are rated for both the chemical to be contained and the length of the exposure. Concrete coatings such as epoxy need to be applied to a surface that can be adhered to, this generally means new concrete or concrete that has undergone a preparation step, such as shot blasting. Cracks in the concrete need to be repaired. Installers also need access and this may require moving the machine.

Dry cleaners should regularly inspect their machines and fix leaks immediately. However, the coatings listed below for use under dry cleaning machines assume the worst. These coatings are intended to stand up to long term exposure, in the event that a machine had a slow, undetected leak. While this may not be a common scenario, the costs of moving a dry cleaning machine, surface preparation and coating, and down time are considerable and common sense dictates that coatings intended for use under dry cleaning machines should be rated for high chemical resistance. Coatings intended for containment under the dry cleaning machine should be professionally installed. Coatings listed for purchase and installation by shops are intended for splash protection only, and are not recommended by the vendors for continuous exposure,

Professional Installation – for under dry cleaning machines:

Products with high chemical resistance are summarized below; these should be professionally installed. Contractors should look at the site and provide a quote. Businesses should request a written warranty. Due to costs of installation and the likely need to move the dry cleaning machine to install a truly resistant coating, a metal tray remains a viable alternative.

Available test data are noted below. Products with the highest chemical resistance are listed. This generally means that a given coating has passed an immersion test with perchloroethylene (or a similar chlorinated solvent).

**ARMOR CLAD FLOORS - 206 762 8863 VICTOR
WINQUIST**

For their highest chemical resistance recommend DEX-O- TEX CHEM-REZ "N". This product has passed a 90-day immersion test for 1,1,1 trichloroethene (not perc). Exposure is not additive, and the product recovers fully after a short exposure.

It would cost at least \$7.50/sq.foot for a 10' x 10' installation, a total of \$750. Plus prep.

**LEEWENS CORPORATION 206 842 7661 PATRICK
LEEWENS**

(Mfg. referred by Nov-O-Rez Paul Anderson 281-397-0033)

NovoRez 360 Tested specifically for perchloroethylene. One of the recommended uses is *tank lining*. Warranty offered is one year, obviously this is a hardy product.

About \$10/sq. foot, \$1000 for a 10' x 10" area. \$0.40 / sq. foot for surface prep, for concrete this is a shot blast vacuum.

**INDUSTRIAL COATINGS & SEALANTS INC.- 425 742
5693 FAX 425 742 3415 – ANDREA**

Recommends two installers, they do have some experience with perchloroethylene. These two installers are Terry Spear, Spear Industrial Floors, 360 456 8874, and John Whitlock at Everett Chempro, 425-252-1691.

Shop Installed Paints – for general splash protection.

These products are intended for splash protection only. While these coatings can be purchased and installed by shops, saving considerably over professional installation, there are still issues that require consideration. It is advisable to conduct a moisture test, where a piece of clear plastic is taped to the concrete for 24 hours. If condensation is observed there will be difficulty in getting a coating to adhere.

Surfaces still require preparation, as in any painting project. While the shot blast vacuum is best, floor buffers can do an acceptable job. Also, paint stores may be able to recommend a degreaser to aid in surface preparation.

Shops need to ensure that they read the instructions and follow all safety directions.

Cloverdale Paints – Keith 206 762 9274

NSP 122, about \$80 for a 3 quart kit, to treat about 50 square feet.

Parker Paint South Seattle 206 467 8981

Contact Dan Couxton (sp?), at 206 300 3488 (cell).

Kelly Moore Paint 12012 Aurora. 363 0520. Spoke with Billy Carter, 559 7083 pager.
Enviropoxy is a 2 component epoxy that could be used. About 35-40 dollars a gallon, to cover 250 square feet.

They also have Rustoleum products, such as Rustoleum #9100, but this is oil based and more difficult for shops to work with.