

EVALUATION OF EIGHT DRY CLEANING SHOPS WITH  
STATE-OF-THE-ART CONTROL EQUIPMENT

REPORT ON TASK 1

INTERAGENCY AGREEMENT BETWEEN OSHA AND NIOSH

PERCHLOROETHYLENE IN DRY CLEANING SHOPS

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## EXECUTIVE SUMMARY

In the first of two tasks as part of an Interagency Agreement between NIOSH and OSHA, eight dry cleaning shops with state-of-the-art controls to reduce employee exposure to perchloroethylene (Perc) were evaluated to determine the extent of exposure and the technological feasibility of controlling worker exposure to Perc. This work was conducted by the Engineering and Control Technology Branch, DPSE, NIOSH. In this study, dry cleaning plants were selected and data taken to characterize worker exposure levels and control technology for "fourth generation" closed-loop, dry-to-dry machines (with an integrated, in-line refrigerated condenser and a carbon absorber to recover Perc vapors during the dry cycle); and "fifth generation" machines, having the same features as fourth generation machines plus an internal monitor / interlock system to prevent door opening at Perc concentrations above a set level. In task two under that agreement, described in a separate report, local exhaust ventilation was added to a "third generation" dry-to-dry machine with refrigerated condenser to measure its effectiveness.

Full shift time weighted average (TWA) and short duration ceiling and 15 minute Short Term Exposure Level (STEL) Perc exposures were measured on several workers in each shop, including the operators who were expected to have the highest exposures. Information was collected at each dry cleaning plant regarding the equipment, controls, materials and procedures at that facility to correlate Perc measurements with controls and equipment and also to enhance inter-facility comparisons.

Data gathered at the eight dry cleaning shops monitored indicate that in almost all instances the full shift TWA concentration of Perc were below the 5 to 10 ppm level. Of the 96 charcoal tube measurements made, only 2 were greater than 10 ppm, and these were in the one shop which also operated an older (3<sup>rd</sup> generation) machine used occasionally in addition to the newer unit. The measurements of both the TWA exposure and the short duration exposures when this 3<sup>rd</sup> generation machine was used were higher than in all other instances.

Half the measurements of ceiling and STEL levels of Perc were below the medians of 168 ppm and 4.2 ppm, respectively. The maximum instantaneous ceiling measurement in 97 of the 106 samples was below 1,000 ppm. The maximum STEL in 105 of the 106 samples was below 50 ppm, and in 99 of the 106 samples was below 25 ppm.

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## I. INTRODUCTION / STATEMENT OF WORK

The Occupational Safety and Health Administration (OSHA) funded a study of control technologies for perchloroethylene (Perc) in the dry cleaning industry to determine the extent of exposure and to gather control and operational information to assist in determining technological feasibility of controlling worker exposure to Perc. That study, conducted by the Division of Physical Sciences and Engineering (DPSE) of the National Institute for Occupational Safety and Health (NIOSH), was described in an interagency memorandum of agreement attached as Appendix 1A to this document.

The study was designed to determine the extent of exposure of employees and control technology in small and medium sized dry cleaning establishments to provide OSHA with data to be utilized in determining technological feasibility of controlling worker exposure to Perc. This report describes task one of the study, in which dry cleaning plants were selected and data taken to characterize worker exposure levels and control technology for "fourth generation" closed-loop, dry-to-dry prinmachines (with an integrated, in-line refrigerated condenser and a carbon absorber to recover Perc vapors during the dry cycle); and "fifth generation" machines, having the same features as a fourth generation machines plus an internal monitor / interlock system to prevent door opening at Perc concentrations above a set level. In task two, described in a separate report, local

exhaust ventilation was added to a “third generation” dry-to-dry machine with refrigerated condenser to measure its effectiveness.

## II. PROCEDURES

The specific goals and aims for conducting this study were discussed by OSHA and NIOSH and outlined in a protocol prior to initiating the work. This protocol, attached as Appendix 1B, briefly described how the dry cleaning shops would be selected, what types of data would be collected, and how that data would be obtained. The techniques used for a) site selection, b) sampling, and c) collection of data on equipment and controls are detailed below.

### A. Selection of sites

After a review of data collected in the NIOSH dry cleaning intervention study, consideration of available resources, and consultation with statistical staff, a plan was developed to assess exposure of workers at eight (8) dry cleaning shops for two days each. To facilitate this protocol, shops were selected in groups of 2 or 3, with the shops in each group geographically close to each other to facilitate travel. Other criteria for selection were that the shops have generally only one (but no more than two) Perc machines, that these machines be of 4<sup>th</sup> or 5<sup>th</sup> generation design (not retrofits), that the shops be full-time operations where garments were cleaned several hours per day, and that the owners of these shops were willing to

participate in the study. Sites were selected by NIOSH researchers, with OSHA approval.

It was decided to concentrate on locating 4<sup>th</sup> and 5<sup>th</sup> generation shops to participate in this study in California and New York because of the rigorous state and regional environmental regulations in these states, which encourage the upgrade of dry cleaning equipment to newer models. Local experts on environmental exposure to Perc were contacted in Los Angeles, San Francisco, and New York City to assist in locating shops meeting the study criteria. The eight shops selected, and the dry cleaning equipment used in each, are described in Section III A below.

#### B. Sampling strategy and methodology

The study protocol determined two basic sampling techniques to be used in this study to quantify exposure of workers in the selected dry cleaning shop to Perc. The first was the use of long duration samplers to measure full shift time weighted average (TWA) Perc concentrations. The other was the use of real time monitoring instruments to measure peak and short term Perc concentrations.

1. Personal and area TWA measurements

All exposed job categories in the selected shops were monitored during the evaluation to determine full shift time weighted average breathing zone exposures to Perc. Samples were collected on sorbent tubes using battery powered personal sampling pumps worn by the workers. Additional samplers were placed at selected locations throughout the shop to measure the Perc concentration at these locations. Sampling and analysis was according to method 1003 in the NIOSH Manual of Analytical Methods (copy attached as Appendix 2). Sampling trains were calibrated on-site to the appropriate flow rates and analysis was by an accredited contract laboratory. Sample data was recorded on a data sheet developed for this purpose.

A separate second set of personal TWA measurements was made on selected personnel (primarily operators) using passive "badge" samplers. This set of measurements represents two days of sampling done concurrently with the method 1003 sampling, plus three days of sampling done following the NIOSH visit. The simultaneous sampling allowed for a comparison of methods and the subsequent sampling allowed for additional information regarding the distribution of exposures. The cleaners were instructed in how to collect their own samples using these devices, and asked to submit the samples along with a log of cleaning activity in a pre-addressed postage paid mailer.

## 2. Real-time monitoring for peak exposures

Machine operators were monitored during several exposure events using a Photovac model 2020 photoionization detector (PID) monitor (Perkin Elmer Photovac, Norwalk, CT) to determine breathing zone Perc concentration on a real time basis. Exposure events are primarily unloading / loading operations, but also included any repair, maintenance or other operation which resulted in increased Perc exposure. The PID monitor was calibrated on-site with a commercially procured Perc calibration gas (Scott Specialty Gas, Troy, MI), and operated according to manufacturers instructions. These instruments included data-logging capabilities, and were downloaded to laptop computers for data storage. Each exposure event was monitored for the duration of that event, and for a sufficient time prior and subsequent to establish a background concentration such that 5, 10 and 15 minute average exposures can be calculated. Sample data was recorded on a data sheet developed for that purpose.

### C. Equipment, controls, and physical facilities

Background information was collected at each dry cleaning plant regarding the equipment, controls, materials and procedures at that facility. The purpose of this information was to correlate Perc measurements with controls and equipment and also to enhance inter-facility comparisons. Typical data collected included:

- the make, model, age and repair history of all dry cleaning machines;
- a record of machine use including the number and size of loads processed by each dry cleaning machine during the days of monitoring;
- the number of employees at each shop;
- construction of the building including size, age, and materials;
- control systems in use, including personal protective equipment as well as general and local ventilation systems;
- any unusual occurrences during the sampling periods such as spills or leaks which would produce unusual exposures.

#### D. Data analysis

Calculation of TWA exposures is based on measurements of full shift samples although in several instances these were less than 8 hours duration due to the nature of the work. Ceiling measurements were the recorded maximum values measured by the continuously monitoring PID instruments and approximate the true instantaneous maximum Perc concentration during the exposure excursion.

These real-time monitoring devices also calculated and recorded time-weighted average Perc measurements over 15 second intervals. These 15 second average measurements were used with the operators TWA concentration to calculate a 15

minute STEL exposure for the machine operators according to the following equation:

$$\text{STEL} = \frac{\sum_{i=1}^n \text{PID}_i + [\text{TWA} (60 - n)]}{60}$$

where  $\text{PID}_i$  = the series of 15 second average PID measurements of Perc concentration in the operators breathing zone during the monitored exposure excursion

$n$  = the number of measurements of PID in the series

TWA = the operators time weighted average exposure on the day during which the calculated STEL is determined

60 = the number of 15 second periods in 15 minutes

This procedure for calculating a STEL produces a slightly biased estimate for that quantity in those instances where the STEL was a large portion of the TWA. This bias was considered insignificant, however, since there was typically two orders of magnitude difference between the TWA and STEL values.

### III.

### TASK I RESULTS

#### A Description of shops

Eight dry cleaning shops using (fourth generation) dry-to-dry, closed loop dry cleaning machines with refrigerated condensers and carbon adsorbers were selected, as described in Section IIA above, for testing as part of this study. These shops were given letter designations and are identified by those letters in this paper. Data were collected regarding the physical facilities, work load, ventilation, equipment, and other relevant parameters. Some data, such as numbers of loads per day, are in some cases estimates since some shops kept detailed records on the number and size of each load processed and other shops did not. In all shops an operating cycle would require 45 minutes to an hour from load to unload, regardless of the size of the machine. Those data are summarized in Table IIIA 1, below, followed by a description of each shop.

In all shops the machines visually appeared to be kept clean, and general housekeeping ranged from fair to excellent. No liquid was observed leaking from or puddling around any machine. Perc odor was minimal to non-detectable. No shop had personal protective equipment in use during the on-site monitoring, with the exception of occasional glove usage, although some did have air purifying respirators hanging at various locations.

The number of employees includes everyone from the owners and operators of the shops (frequently the same person) to the workers at the counter who were

sometimes in different building from the dry cleaning machines. In some cases, these are all family members of the owner, and in all cases this includes both full time and part time people.

All of the machines in the shops evaluated were relatively recent installations, ranging from seven months to three years at the times of the on-site evaluations. None of these units had required significant post-installation maintenance.

Table III A 1

## DEMOGRAPHICS OF DRY CLEANING SHOPS

Sampled under NIOSH / OSHA interagency agreement on perchloroethylene

Parameter / Shop I. D.	F		N		L		T		G		D		A
	Los Angeles	Los Angeles	San Francisco	New York	New York	New York	New York						
Location	Los Angeles	Los Angeles	San Francisco	New York	New York	New York	New York						
Machine make	Renzacci	Lindus	Union	Union	Union	Union	Permac	Permac	Realstar	Columbia	Columbia	Realstar	
Machine model	650	S600	L353	L353	L353	L353	P546	P546	RS373	123 IMS	123 IMS	RS640	
Number of machines	2	1	1	1	1	1	1	1	1	1	1	2	
Size of machine	60#	60#	35#	35#	35#	35#	45#	45#	45#	80#	80#	70#	
Age of machine	3 yrs	8 mo	1 yr	18 mo	18 mo	7 mo	7 mo	18 mo					
No. of employees	30	11	3-4	3	3	3	4	5	5	9	9	25	
Loads - 1st day of test	10 & 10	6	8	6	6	6	3	5	5	5	5	12 & 12	
Loads - 2nd day of test	10 & 10	8	7	5	5	5	3	(5)	(5)	3	3	12 & 12	
Loads - day before test	12 & 12	?	4	5	5	5	?	(5)	(5)	5	5	12 & 12	
Loads - daily average	10 & 10	(7)	5	5	5	5	(3)	(5)	(5)	(5)	(5)	12 & 12	
Union shop	y	n	n	n	n	n	n	n	n	n	n	n	
No. of shifts	2	1	1	1	1	1	1	1	1	1	1	1	
PPE observed	gloves	none	none	cotton gloves	none	cotton gloves	none	latex gloves	respirator	respirator	respirator	none	
Comments	1	2, 3, 4, 5	6, 7	6	4, 6, 8	4, 9	4, 9	4, 9	4, 9	4, 9	4, 9	4, 9	

All machines evaluated were closed loop, dry-to-dry machines with refrigerated condensers and carbon adsorbers (4<sup>th</sup> generation) with other controls as noted. No shops had personal protective in use during the testing, although some shops did have PPE available.

- 1 - the Perc monitor which prevents the doors from opening (making this a 5th gen. Machine) were disabled
- 2 - this shop had a second machine (15# Omega), but it was smaller and not used as frequently as the first, and was not evaluated
- 3 - no information was available on the number of loads on days other than when testing was done
- 4 - numbers in parentheses are estimates
- 5 - this machine had a fan (fugitive emissions control) which pulled air from room into drum to carbon when door open, was not operating during tests
- 6 - all 3 San Francisco shops had machines in barrier rooms
- 7 - There was a box in storage area with dust masks (not approved), dirty goggles, gloves & ear muffs.
- 8 - owner claims volume (number of loads run) is down due to weather
- 9 - respirator seen hanging from plumbing near machine

## SHOP F

### LOS ANGELES

[PHOTOGRAPH NOT AVAILABLE]

Shop F was the first facility evaluated during this study, with on-site monitoring being conducted on February 3 and 4, 1998, followed by independent sampling on the 5<sup>th</sup> through the 9<sup>th</sup>. It was in a stand-alone building, as opposed to a co-residential facility as discussed below, of concrete block construction with a concrete floor. Shop F was one of only two shops which operated two dry cleaning machines, the other being Shop J, the last facility evaluated.

Shop F operated two 60 pound Renzacci Model 650 day cleaning machines, both purchased approximately three years prior to this study. When purchased these machines included an interlock which prevented the doors from being opened until the perc concentration in the drum was below a set level. Due to problems encountered with this system, however, this interlock was by-passed, in effect reverting this fifth generation machine back to a fourth generation. A total of about 30 employees worked two shifts at the dry cleaning production facility and at a separate wet cleaning facility a few miles distant. Both facilities housed customer pick-up and drop-off facilities, and garments were transferred between them depending on whether wet or dry cleaning was required. This shop averaged 10 loads of day cleaning per machine per day.

Ambient temperatures were generally near 70°F, with humidity ranging around 50%. There were few operable windows in the building, but a couple of large doors which were opened to allow for natural ventilation.

## SHOP N

### LOS ANGELES



The second shop evaluated was also in the Los Angeles, CA, metropolitan area and was a stand-alone facility consisting of two buildings. The front building (on the left in the preceding photo) functioned as the store where customers would drop off or pick up garments to be cleaned. The back (right) building was the production facility where the dry and wet cleaning was done. This corrugated metal production building was approximately 55 feet by 36 feet with an 18 foot roof sloping down at a 4/12 pitch. The floor was poured concrete.

On-site monitoring at this shop was done on February 4 and 5, 1998, with passive samples collected independently on February 10 and 11, 1998.

Shop N had one Lindus 60 pound Model S600 dry cleaning machine installed approximately eight months prior to our sampling. This machine processed six to eight loads per day on one shift with 11 employees in both buildings. This shop had one other dry cleaning machine, an older 15 pound Omega, which was used infrequently and not evaluated. Any perc emissions from this second machine would, of course, add to the TWA exposure of the employees and would have been measured as part of their personal exposure monitoring.

In addition to the dry cleaning machines, this shop also had four large and one small wet laundry machines and two dryers.

On the days of monitoring the weather was mild (70° F, 50% relative humidity), and by noon most doors and windows were open.

## SHOP L

### SAN FRANCISCO



Shop L was the first of three shops in San Francisco, CA, monitored for this study. It occupied the first two floors of a multi-story building contiguous with other similar structures on the block. Regional air quality regulations regarding the control of perc emissions have produced several dry cleaning shops in San Francisco which have vapor barrier rooms designed to enclose the dry cleaning machines and prevent fugitive emissions from migrating to adjacent living and working areas, so called co-located or co-residential shops. This is one such shop. Air flow through this room was measured at 1,000 cubic feet per minute.

The brick building is approximately 20 feet wide and 50 feet front to rear. The counter operation and production occupy the front and rear of the first floor, respectively, and the second floor housed the tailoring and alterations. Above this is residential space. On-site monitoring at this shop was conducted on February 17 and 18, 1998, and independent samples were collected from the 19<sup>th</sup> through the 21<sup>st</sup>. During this time the weather was cool and overcast, with rain on the 19<sup>th</sup> and 20<sup>th</sup>, but some doors and windows were open providing natural ventilation through the shop.

Shop L had one 35 pound Union model L353 dry cleaning machine, installed approximately one year prior to our sampling. This shop and Shop T (discussed below) were the smallest shops evaluated in terms of machine size, garments processed and shop area. This machine included a door interlock on a timer. An inspector for the Bay Area Air Quality Control District said it also had a fugitive emissions control system, however our ventilation testing showed no detectable air flow during any door open events. Four to five employees in this shop ran an average of 5 loads per day, working one shift, over the two week period prior to our sampling, although on the two days of this test they did 8 and 7 loads.

SHOP T  
SAN FRANCISCO



Shop T was the second of three San Francisco facilities monitored. Like Shop L, it is co-located with businesses both left and right and a residence on the level above. This shop occupies an estimated 30 feet wide by 40 feet deep space, with the front left corner being devoted to a coin operated self-service wet laundry facility. On-site monitoring at this shop was done on February 18 and 19, 1998, followed by independent sampling on the 20<sup>th</sup> through the 24<sup>th</sup>.

Also like Shop L, Shop T had one Union, Model L353, 35 pound dry cleaning machine which had been installed approximately one year prior. It employed three people who ran an average of five loads per day. Air flow through the vapor barrier room at this shop was measured at 1,300 cubic feet per minute when the door was open.

## SHOP G

### SAN FRANCISCO

#### PHOTO NOT AVAILABLE

The fifth shop studied, Shop G was the only one of the three in San Francisco which was a stand-alone as opposed to a co-located facility, and it was larger than the other two San Francisco shops although no measurement of size was made. The building was of brick and wood construction, with a concrete floor in the production area which was a few steps lower than the counter and storage areas. Air velocity through the vapor barrier room was claimed by the owner to be approximately 1,700 cfm, although the ducts were not readily accessible and no measurements were made during this study.

Shop G operated with one Permac Model P546, 45 pound, dry cleaning machine about one year old. It employed four people and processed three loads per day during the time of this study, although the owner claimed that this was below average due to the weather which was rainy around the time of this study. (This relationship between rain and work load was claimed by other shop operators during this study also.) The temperature was cool, being generally in the 60 to 70°F range, yet a large garage door and a small door opposite were both open at all times, creating a rapid air exchange through the production area. The on-site monitoring was done on February 19 and 20, 1998, with independent sampling on the 23<sup>rd</sup> through the 25<sup>th</sup>.

## SHOP D

### NEW YORK



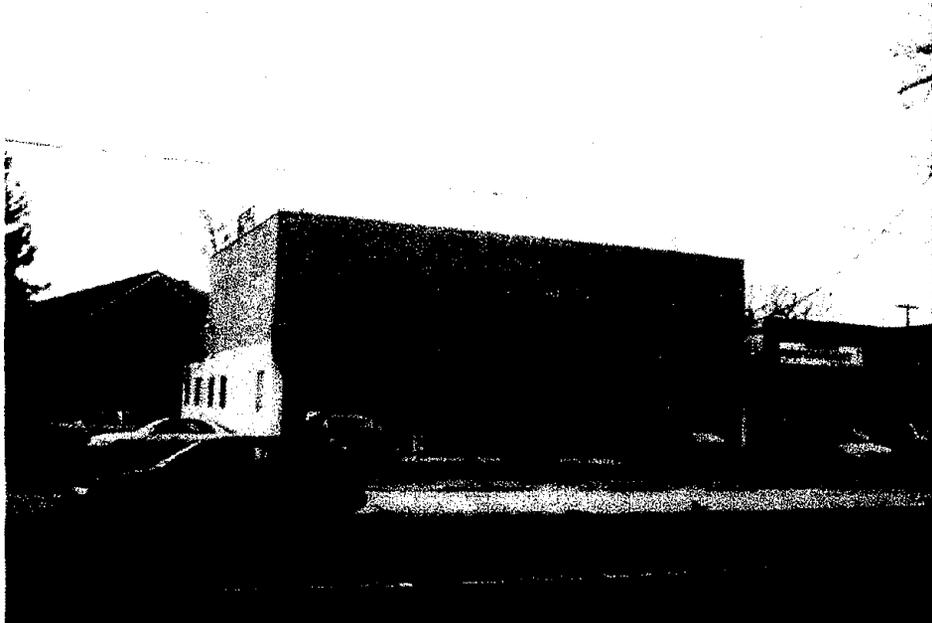
The last three dry cleaning facilities evaluated, starting with Shop D, were in metropolitan New York city. Shop D was a co-located facility, bordered left and right by other businesses and situated below a residence. It was a brick veneer building approximately 25 feet wide and 50 feet long. The basement below the shop was also used for storage of cleaned garments as well as supplies.

Shop D employed five people and had one Realstar model RS373 45 pound dry cleaning machine which processed an average of five loads per day. At the time of this testing it was approximately 18 months old. This machine had no fugitive emissions control, but the owner said that the air in the drum was circulated through a carbon adsorber and back into the drum when the door was open.

The owner of Shop D appeared to be concerned about minimizing perc emissions and also about providing good cleaning for garments, and to accomplish both goals he undersized the loads, running 35 pounds in his 45 pound machine, and he ran "good morning" cycles, designed to remove perc vapor from the drum, not only at the beginning of the day but at any time the machine had not been used for a period of time.

Shop D was a corner building and therefore did not have as much natural ventilation as some of the other shops which could create cross drafts with open doors and windows. However, it did have a general area exhaust fan and three canopy hoods over specific operations. Measurements of general ventilation indicated as much as 9,000 cfm through the shop, with the canopy hoods exhausting from 250 and 1000 cfm from above pressing stations and 500 cfm from a spotting area near the machine.

SHOP A  
NEW YORK



Shop A, in New York, is a stand-alone plant in a two story, flat roofed, concrete block building about 40 feet wide and 45 feet long. The ground level, with concrete floor, houses both the counter operation and production facilities for both dry and wet cleaning, while the second story is primarily storage. Sampling was done on April 15 and 16, 1998, on-site, followed by independent sampling done from April 17 through April 20.

This shop operated one 80 pound Columbia Model 123 IMS dry cleaning machine which had been installed seven months prior to this study. The nine employees typically ran five loads per day through this machine.

General area ventilation through the shop was provided primarily by a set of double doors in front and a single door opposite in the rear wall. This could be aided by a wall fan in the rear or a fan in the roof, located above the dry cleaning machine. However, during the two days of on-site testing neither of these fans operated for a significant duration.

SHOP J  
NEW YORK



The final shop evaluated with fourth generation equipment was Shop J, and like the first shop it had two dry cleaning machines. J was a stand-alone shop in the New York metropolitan area situated in a single story, flat roofed, concrete block building approximately 50 feet wide by 60 feet long. On-site sampling at this shop was done on April 16 and 17, 1998, with independent samples collected between the 20<sup>th</sup> and 22<sup>nd</sup>.

Dry cleaning equipment was two 70 pound capacity Realstar model RS640 machines, both installed approximately 18 months prior to the dates of this study. During that time, both machines had the door gaskets replaced and one had a thermostat replaced. Both machines ran an average of 12 loads per day, and a maximum of 65 pounds per load was observed. The shop operated on one shift with a total of 25 employees.

## B TWA data

The following tables and plot show time weighted average data collected for the duration of a work shift by charcoal tube samples at all 8 shops. These data are arranged to show results grouped first by shop (Tables III B 1 a through h), then by job in order of decreasing concentration (Tables III B 2 a through d), and finally are plotted in rank order from lowest to highest grouped by shop for all charcoal tube samples (Table III B 3 a) and for personal charcoal tube samples (Table III B 3 b).

Table III B 1 a

TWA PERC CONCENTRATION

SHOP F

<u>DATE</u>	<u>JOB TITLE</u>	<u>PERC CONC.</u> (PPM)
02/03/98	Operator	5.38
	Presser #6	1.12
	Presser #2	0.76
	Area near computer station at front counter	0.88
	Presser #1	0.73
	Presser #4	1.04
	Area / BZ level behind machine	2.05
	Garment hanger	2.45
02/04/98	Operator	3.15
	Presser #6	1.05
	Area near computer station at front counter	0.89
	Presser #1	1.30
	Presser #4	0.87
	Presser #2	0.97
	Area / BZ level behind machine	0.86
	Operator / sorter	1.05
	Mean =	1.54
	Median =	1.05
	N =	16

"AREA" indicates an area rather than personal sample, collected in location indicated  
 "BZ" signifies breathing zone level, approx. 5' above floor  
 "OPERATOR" is the person most frequently operating cleaning machine

Table III B 1 b

TWA PERC CONCENTRATIONSHOP N

<u>DATE</u>	<u>JOB TITLE</u>	<u>PERC CONC. (PPM)</u>
02/04/98	Washer	2.32
	Area / head high 6' in front of machines	2.61
	Area / front counter, head high	0.03
	Operator	12.22
	Assembler	1.22
	Presser	1.78
	Presser	1.56
02/05/98	Area / front counter, head high	0.06
	Operator	16.75
	Area / head high 6' in front of machines	5.34
	Washer	2.81
	Presser	1.86
	Assembler	1.70
	Presser	1.57
	Mean =	3.70
	Median =	1.82
	N =	14.00

"AREA" indicates an area rather than personal sample, collected in location indicated

"BZ" signifies breathing zone level, approx. 5' above floor

"OPERATOR" is the person most frequently operating cleaning machine

Table III B 1 c

TWA PERC CONCENTRATION

SHOP L

<u>DATE</u>	<u>JOB TITLE</u>	<u>PERC CONC.</u> (PPM)
02/17/98	Operator	0.68
	Counter person	0.04
	Alterations person on second story	0.10
	Area / BZ level outside barrier room	0.14
	Area / BZ level inside barrier room	0.52
02/18/98	Operator	2.09
	Alterations person on second story	0.06
	Counter person	0.22
	Area / BZ level inside barrier room	0.66
	Area / BZ level outside barrier room	0.18
	Operator	1.07
	Mean =	0.52
	Median =	0.22
	N =	11.00

"AREA" indicates an area rather than personal sample, collected in location indicated

"BZ" signifies breathing zone level, approx. 5' above floor

"OPERATOR" is the person most frequently operating cleaning machine

Table III B 1 d

TWA PERC CONCENTRATION

SHOP T

<u>DATE</u>	<u>JOB TITLE</u>	<u>PERC CONC. (PPM)</u>
02/18/98	Operator	0.49
	Presser	0.19
	Counter person	<0.008
	Area / BZ level outside barrier room	0.16
	Area / BZ level inside barrier room	0.59
02/19/98	Operator	0.32
	Counter person	0.02
	Presser	0.20
	Area / BZ level outside barrier room	0.15
	Area / BZ level inside barrier room	0.41
	Mean =	0.25
	Median =	0.20
	N =	10.00

"AREA" indicates an area rather than personal sample, collected in location indicated

"BZ" signifies breathing zone level, approx. 5' above floor

"OPERATOR" is the person most frequently operating cleaning machine

Table III B 1 e

TWA PERC CONCENTRATIONSHOP G

<u>DATE</u>	<u>JOB TITLE</u>	<u>PERC CONC. (PPM)</u>
02/19/98	Operator	0.59
	Presser	0.36
	Presser	0.47
	Area / BZ level inside barrier room	0.19
	Area / BZ level outside barrier room	0.17
02/20/98	Operator	0.18
	Presser	0.18
	Presser	0.40
	Area / BZ level inside barrier room	0.20
	Area / BZ level outside barrier room	0.06
	Mean =	0.28
	Median =	0.20
	N =	10.00

"AREA" indicates an area rather than personal sample, collected in location indicated  
 "BZ" signifies breathing zone level, approx. 5' above floor  
 "OPERATOR" is the person most frequently operating cleaning machine

Table III B 1 f

TWA PERC CONCENTRATIONSHOP D

<u>DATE</u>	<u>JOB TITLE</u>	<u>PERC CONC.</u> (PPM)
4/14/98	Operator/presser	0.73
	Assembler	0.38
	Area - on top of machine	1.47
	Manager/operator	0.73
	Area - BZ on counter	0.17
	Presser	0.69
	Basement, center of hanging clothe	0.35
4/15/98	Manager/operator	1.49
	Operator/presser	0.63
	Assembler	0.55
	Area - on top of machine	2.66
	Area - upstairs residential hallway	0.07
	Presser	0.73
	Mean =	0.82
	Median =	0.69
	N =	13.00

"AREA" indicates an area rather than personal sample, collected in location indicated

"BZ" signifies breathing zone level, approx. 5' above floor

"OPERATOR" is the person most frequently operating cleaning machine

Table III B 1 g

TWA PERC CONCENTRATIONSHOP A

<u>DATE</u>	<u>JOB TITLE</u>	<u>PERC CONC. (PPM)</u>
4/15	Operator	2.28
	Area-BZ midway between machine & spotting table	1.25
	Presser #1	0.38
	Laundry operator	0.12
	Presser #2	0.56
	Head level behind counter	0.15
4/16	Operator	1.52
	Presser #1	0.49
	Presser #2	0.42
	Wet laundry operator	0.18
	Area-BZ midway between machine & spotting table	1.01
	Mean =	0.76
	Median =	0.49
	N =	11.00

"AREA" indicates an area rather than personal sample, collected in location indicated  
 "BZ" signifies breathing zone level, approx. 5' above floor  
 "OPERATOR" is the person most frequently operating cleaning machine

Table III B 1 h

TWA PERC CONCENTRATIONSHOP J

<u>DATE</u>	<u>JOB TITLE</u>	<u>PERC CONC. (PPM)</u>
4/16/98	Operator	1.95
	Presser #2	0.92
	Assistant operator	5.29
	Presser #3	1.08
	Presser #1	0.53
4/17/98	Operator	2.27
	Presser #2	0.98
	Presser #1	0.51
	Presser #3	0.66
	Assistant operator	3.29
	Area - on top of machine	2.51
	Mean =	1.82
	Median =	1.08
	N =	11.00

"AREA" indicates an area rather than personal sample, collected in location indicated

"BZ" signifies breathing zone level, approx. 5' above floor

"OPERATOR" is the person most frequently operating cleaning machine

Table III B 2 a

TWA PERC CONCENTRATIONOPERATOR SAMPLES

<u>JOB TITLE</u>	<u>SHOP</u>	<u>PERC (PPM)</u>
Operator	N	16.75
Operator	N	12.22
Operator	F	5.38
Operator (assistant)	J	5.29
Operator (assistant)	J	3.29
Operator	F	3.15
Operator	A	2.28
Operator	J	2.27
Operator	L	2.09
Operator	J	1.95
Operator	A	1.52
Operator / manager	D	1.49
Operator	L	1.07
Operator / sorter	F	1.05
Operator/presser	D	0.73
Operator / manager	D	0.73
Operator	L	0.68
Operator/presser	D	0.63
Operator	G	0.59
Operator	T	0.49
Operator	T	0.32
Operator	G	0.18
	Mean =	2.92
	Median =	1.51
	N =	22

Table III B 2 b

TWA PERC CONCENTRATION

PRESSER SAMPLES

JOB TITLE	SHOP	PERC (PPM)
Presser	N	1.86
Presser	N	1.78
Presser	N	1.57
Presser	N	1.56
Presser #1	F	1.30
Presser #6	F	1.12
Presser #3	J	1.08
Presser #6	F	1.05
Presser #4	F	1.04
Presser #2	J	0.98
Presser #2	F	0.97
Presser #2	J	0.92
Presser #4	F	0.87
Presser #2	F	0.76
Presser	D	0.73
Presser #1	F	0.73
Presser	D	0.69
Presser #3	J	0.66
Presser #2	A	0.56
Presser #1	J	0.53
Presser #1	J	0.51
Presser #1	A	0.49
Presser	G	0.47
Presser #2	A	0.42
Presser	G	0.40
Presser #1	A	0.38
Presser	G	0.36
Presser	T	0.20
Presser	T	0.19
Presser	G	0.18

Mean = 0.81  
 Median = 0.73  
 N = 30

Table III B 2 c

TWA PERC CONCENTRATIONMISCELLANEOUS PERSONAL SAMPLES

<u>JOB TITLE</u>	<u>SHOP</u>	<u>PERC (PPM)</u>
Washer	N	2.81
Garment hanger	F	2.45
Washer	N	2.32
Assembler	N	1.70
Assembler	N	1.22
Assembler	D	0.55
Assembler	D	0.38
Counter person	L	0.22
Wet laundry operator	A	0.18
Laundry operator	A	0.12
Alterations person, second story	L	0.10
Alterations person, second story	L	0.06
Counter person	L	0.04
Counter person	T	0.02
Counter person	T	<0.008
	Mean =	0.82
	Median =	0.23
	N =	15

Table III B 2 d

TWA PERC CONCENTRATIONAREA SAMPLES

<u>JOB TITLE</u>	<u>SHOP</u>	<u>PERC (PPM)</u>
Area / head high 6' in front of machines	N	5.34
Area / on top of machine	D	2.66
Area / head high 6' in front of machines	N	2.61
Area / on top of machine	J	2.51
Area / BZ level above garment traps	F	2.05
Area / on top of machine	D	1.47
Area / BZ midway between machine & spotting table	A	1.25
Area / BZ midway between machine & spotting table	A	1.01
Area near computer station at front counter	F	0.89
Area near computer station at front counter	F	0.88
Area / BZ level behind machine	F	0.86
Area / BZ level inside barrier room	L	0.66
Area / BZ level inside barrier room	T	0.59
Area / BZ level inside barrier room	L	0.52
Area / BZ level inside barrier room	T	0.41
Area, Basement, center of hanging clothes	D	0.35
Area / BZ level inside barrier room	G	0.20
Area / BZ level inside barrier room	G	0.19
Area / BZ level outside barrier room	L	0.18
Area / BZ on counter	D	0.17
Area / BZ level outside barrier room	G	0.17
Area / BZ level outside barrier room	T	0.16
Area / BZ level outside barrier room	T	0.15
Area / Head level behind counter	A	0.15
Area / BZ level outside barrier room	L	0.14
Area / upstairs residential hallway	D	0.07
Area / front counter, head high	N	0.06
Area / BZ level outside barrier room	G	0.06
Area / front counter, head high	N	0.03
	Mean =	0.89
	Median =	0.41
	N =	29

TABLE III B 3 a

Charcoal tube samples (personal and area) arranged in rank order, by shop  
(Perc concentration in ppm)

Shop	F	N	L	T	G	D	A	J
	0.73	0.03	0.04	<0.008	0.06	0.07	0.12	0.51
	0.76	0.06	0.06	0.02	0.17	0.17	0.15	0.53
	0.86	1.22	0.10	0.15	0.18	0.35	0.18	0.66
	0.87	1.56	0.14	0.16	0.18	0.38	0.38	0.92
	0.88	1.57	0.18	0.19	0.19	0.55	0.42	0.98
	0.89	1.70	0.22	0.20	0.20	0.63	0.49	1.08
	0.97	1.78	0.52	0.32	0.36	0.69	0.56	1.95
	1.04	1.86	0.66	0.41	0.40	0.73	1.01	2.27
	1.05	2.32	0.68	0.49	0.47	0.73	1.25	2.51
	1.05	2.61	1.07	0.59	0.59	0.73	1.52	3.29
	1.12	2.81	2.09			1.47	2.28	5.29
	1.30	5.34				1.49		
	2.05	12.22				2.66		
	2.45	16.75						
	3.15							
	5.38							
Mean		1.33						
Median		0.73						
Geometric mean		0.63						
N		96						

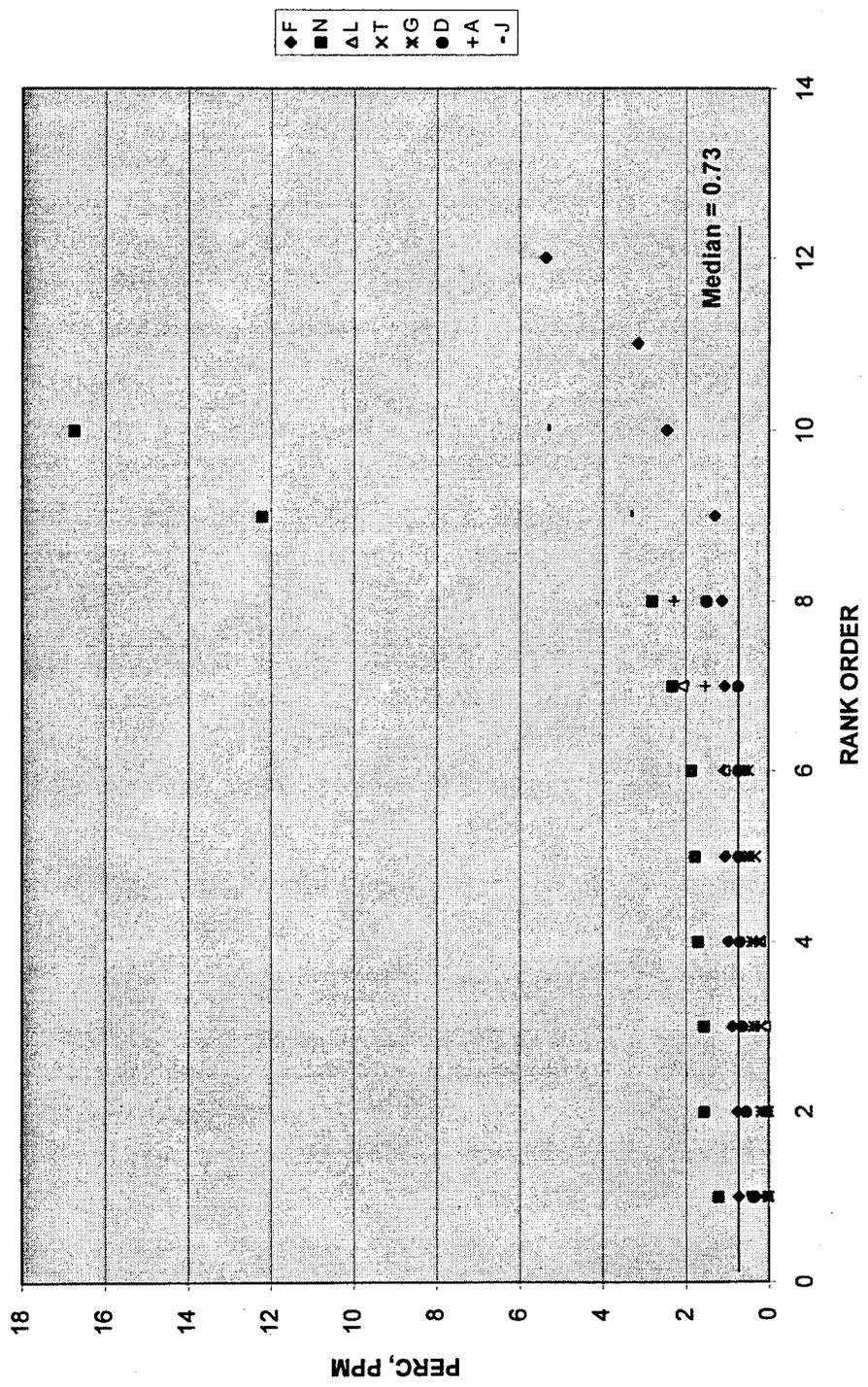
TABLE III B 3 b

Personal charcoal tube samples arranged in rank order, by shop  
(Perc concentration in ppm)

Shop	F	N	L	T	G	D	A	J
	0.73	1.22	0.04	0.01	0.18	0.38	0.12	0.51
	0.76	1.56	0.06	0.02	0.18	0.55	0.18	0.53
	0.87	1.57	0.10	0.19	0.36	0.63	0.38	0.66
	0.97	1.70	0.22	0.20	0.40	0.69	0.42	0.92
	1.04	1.78	0.68	0.32	0.47	0.73	0.49	0.98
	1.05	1.86	1.07	0.49	0.59	0.73	0.56	1.08
	1.05	2.32	2.09			0.73	1.52	1.95
	1.12	2.81				1.49	2.28	2.27
	1.30	12.22						3.29
	2.45	16.75						5.29
	3.15							
	5.38							

Mean	1.50
Median	0.73
Geometric Mean	0.71
N	67

FIGURE III B 3  
 PERSONAL TWA PERC SAMPLES  
 PLOTTED IN INCREASING CONCENTRATION, GROUPED BY SHOP



## C STEL and Ceiling data

The following plots (labeled Figures III C 3 a through p) show data collected for each of the 8 dry cleaning shops monitored using the real-time instruments as described in Section 2A above. These plots show the concentration of Perc measured in real time (designated "Maximum conc." in the plots) and also the concentration of Perc averaged over 15 second periods (indicated as such) during short duration exposure excursions which were expected to exceed the TWA exposure of the worker. These measurements are plotted as a function of the time at which they were taken.

Tabulated below the plots are the ceiling and 15 minute STEL exposures for each of the exposure excursions. The ceiling values are the maximum concentration measured by the real time monitor during each of these exposure events. The STELs were calculated, as described above in Section 2D, by using the series of 15 second averages from the real time monitor and the TWA exposure of the operator for the unmonitored duration of the 15 minute period.

The table also contains a brief description of the excursion event, usually an operation where the machine is unloaded and reloaded between runs, along with the time of day when these measurements were made, and this data is keyed by a lettered event with peaks on the plot. In many instances there is more than one peak on the plot associated with an event on the table, and these are designated by an alpha-numeric on the plot.

In the 8 shops evaluated in this task, a total of 106 sets of ceiling and STEL measurements were made. All of these measurements were collected in the breathing zone of the machine operator. The mean, median and range for these measurements are shown below. The C and STEL measurements are plotted in rank order in Figures III C 1 and III C 2, respectively.

	Ceiling	STEL
N	106	106
Mean	323 ppm	8.5 ppm
Median	168 ppm	4.2 ppm
Geo. Mean	107 ppm	4.8 ppm
Low	2 ppm	0.2 ppm
High	2000 ppm	60.0 ppm

Figure III C 1

Plot of Ceiling concentration measurements in rank order

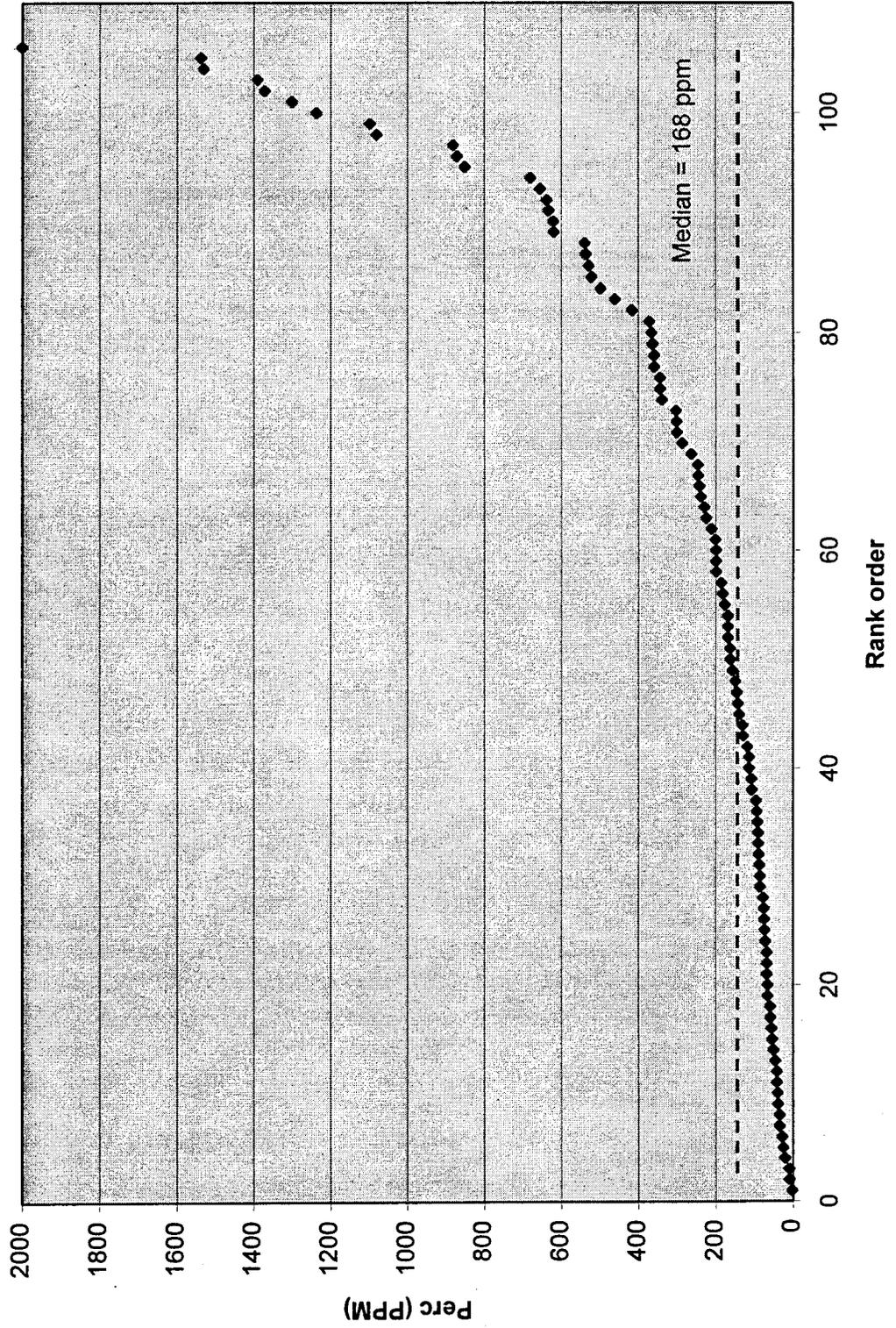


Figure III C 2

Plot of STEL measurements in rank order

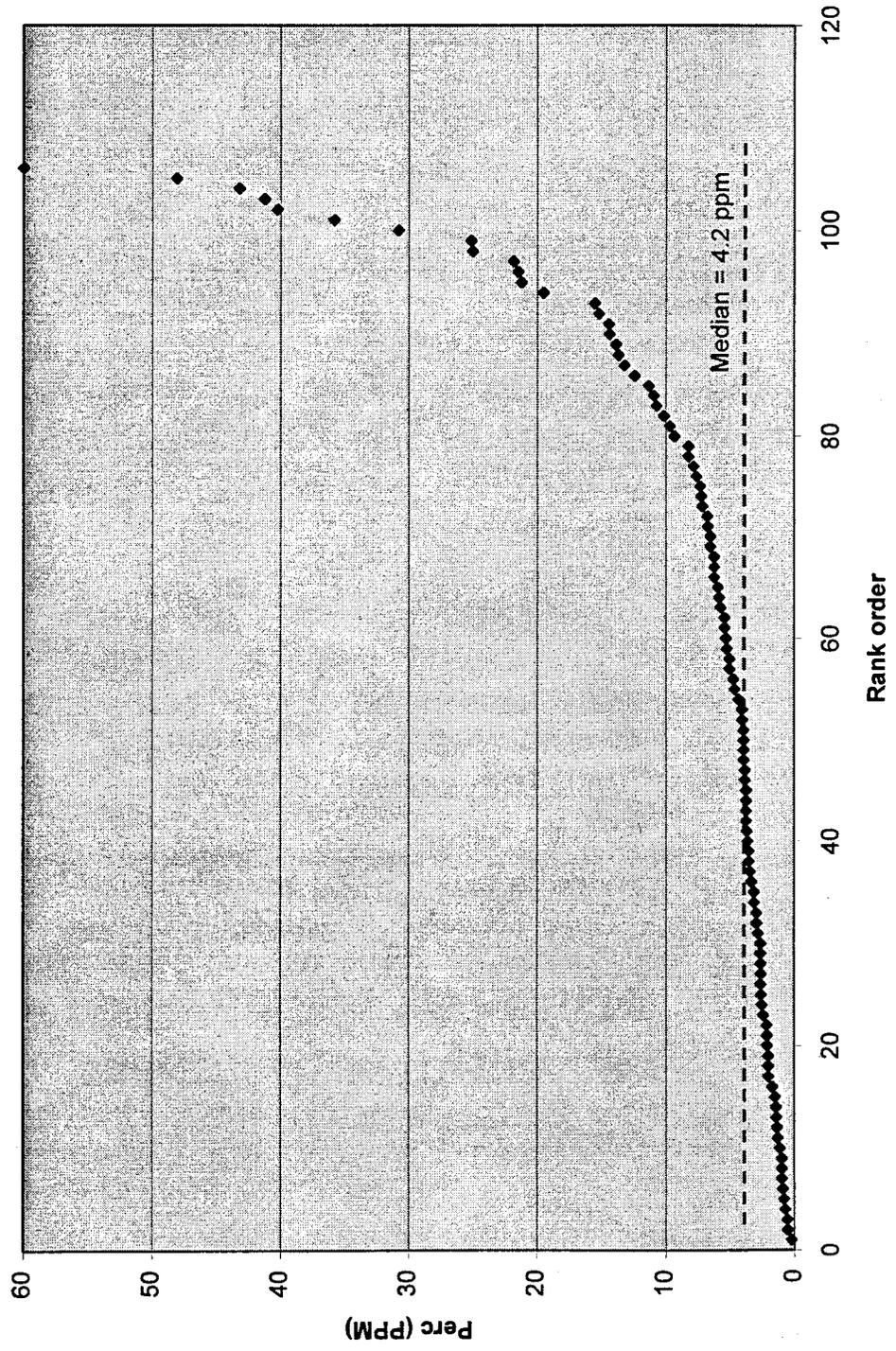
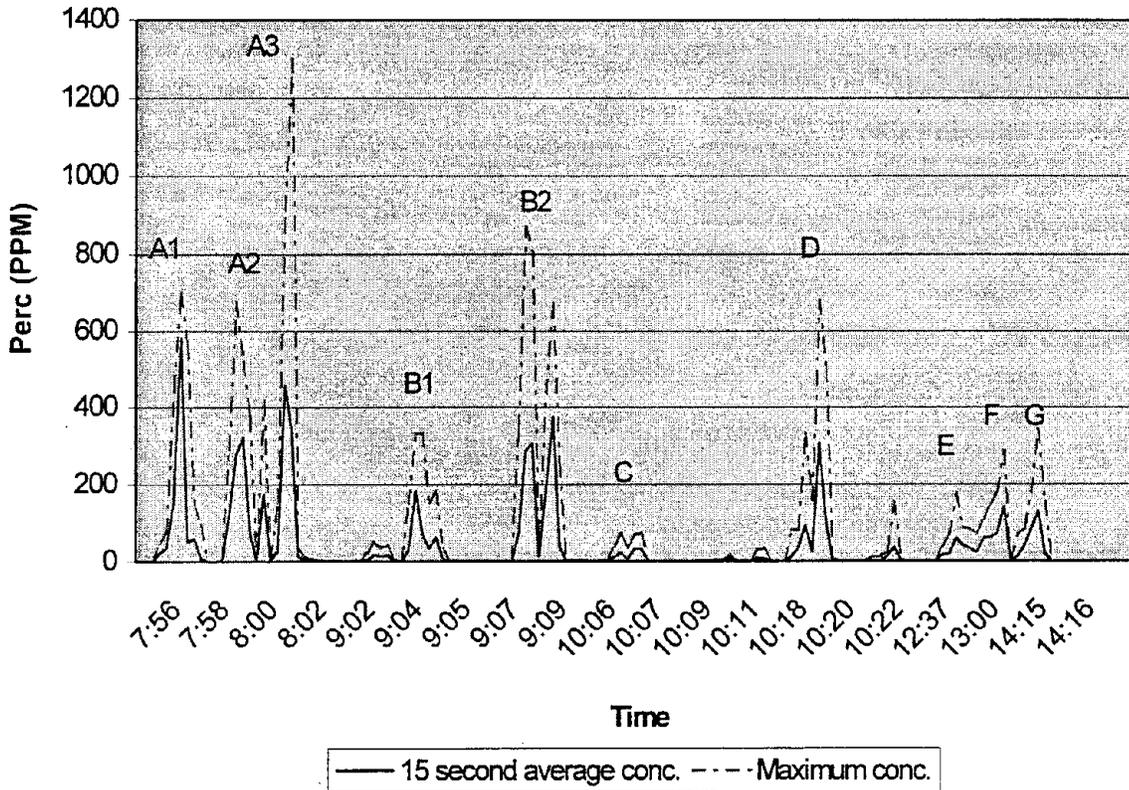


Figure III C 3 a  
 STEL and CEILING MEASUREMENTS

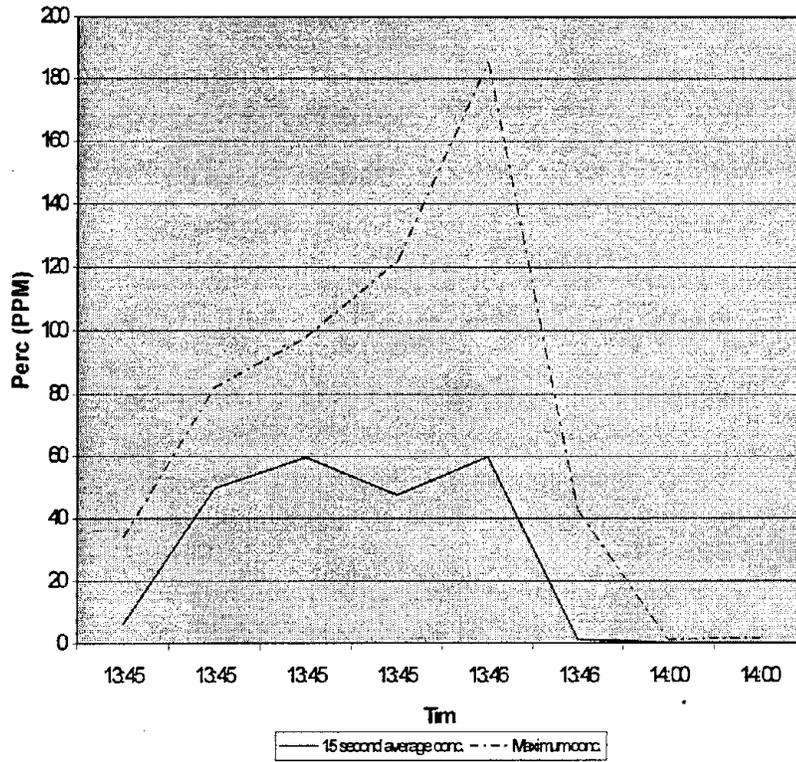
SHOP F, DAY 1



EVENT	TIME	DESCRIPTION	CEILING	15 MINUTE STEL
A	7:55 - 8:02	Unload / load both machines	1300 ppm	48.1 ppm
B	9:01 - 9:09	Unload / load both machines	871	30.8
C	10:05 - 10:11	Unload / load machine 2	74	5.3
D	10:18 - 10:21	Unload / load machine 1	680	14.4
E	12:36 - 12:38	Unload / load machine 2	176	7.6
F	12:59 - 13:00	Unload / load machine 1	286	10.9
G	14:13 - 14:14	Unload / load machine 1	343	9.6

Figure III C 3 b  
 STEL and CEILING MEASUREMENTS

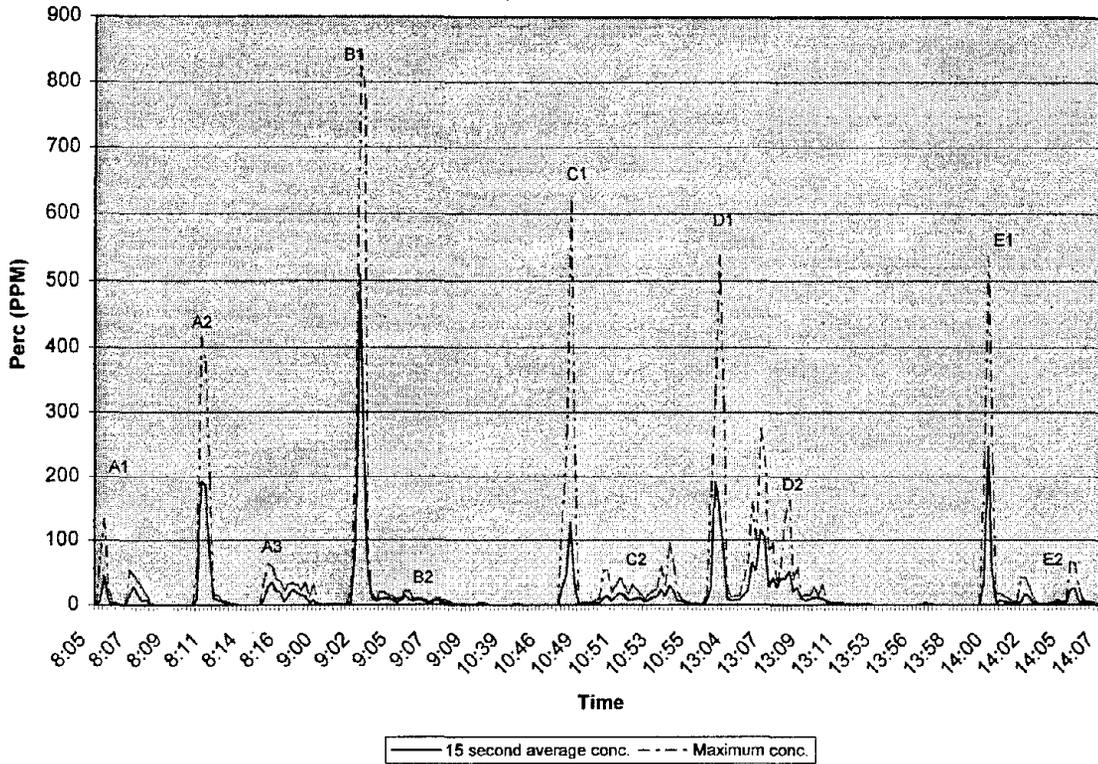
SHOP F, DAY 2



<u>EVENT</u>	<u>TIME</u>	<u>DESCRIPTION</u>	<u>CEILING</u>	<u>15 MINUTE STEL</u>
A	13:45 – 14:00	Unload / load	185 ppm	6.5 ppm

Figure III C 3 c  
 STEL and CEILING MEASUREMENTS

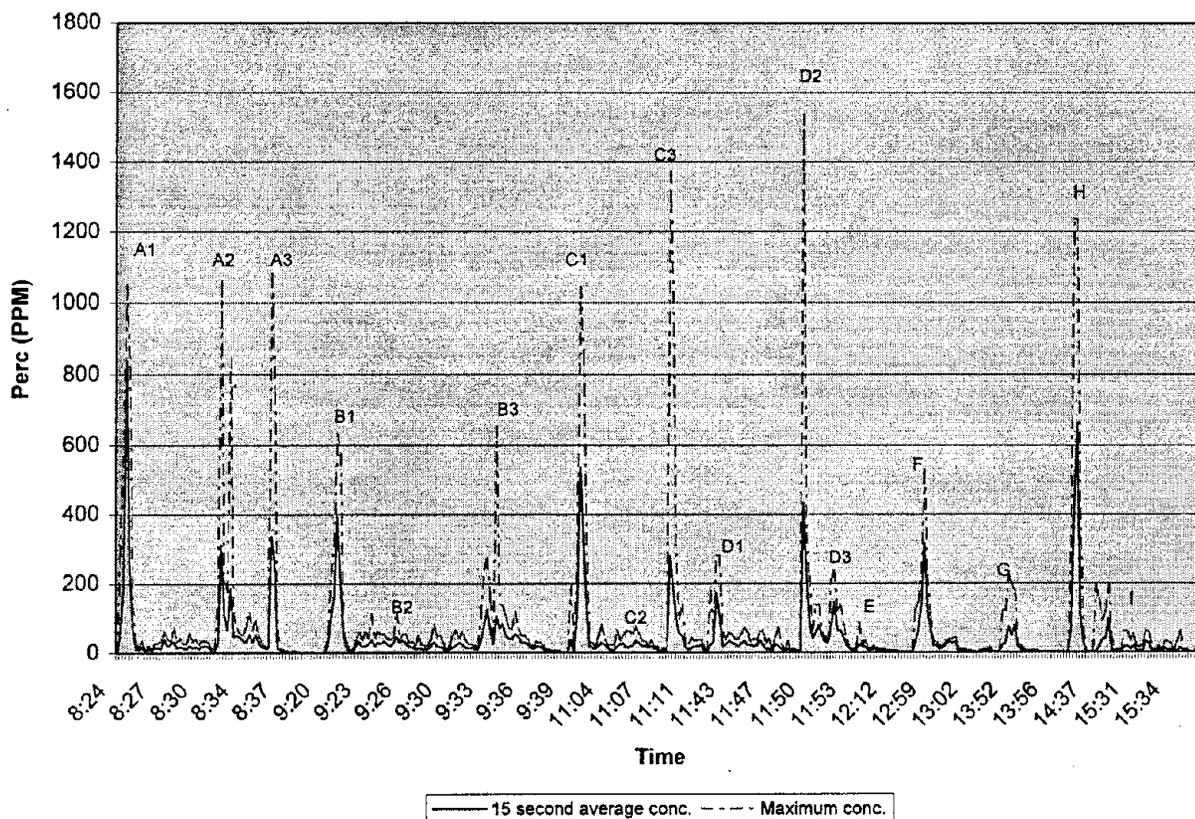
SHOP N, DAY 1



EVENT	TIME	DESCRIPTION	CEILING	15 MINUTE STEL
A	8:05 - 8:18	Spotting, unloading, hanging	416 ppm	15.2 ppm
B	9:01 - 9:10	Unload / load Lindus	850	21.8
C	10:47 - 10:56	Unload / load Lindus	619	13.2
D	13:03 - 13:11	Unload / load Lindus	538	25.1
E	13:59 - 14:06	Unload / load Lindus, hang, & clean lint trap	536	13.7

Figure III C 3 d  
 STEL and CEILING MEASUREMENTS

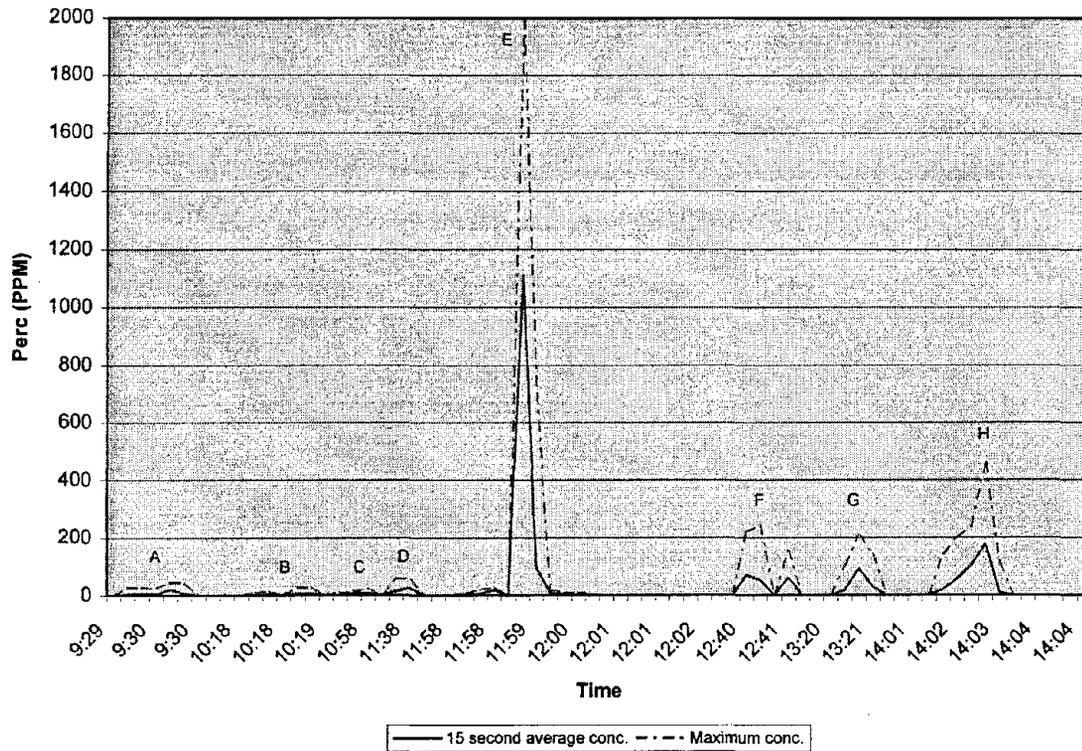
SHOP N, DAY 2



EVENT	TIME	DESCRIPTION	CEILING	15 MINUTE STEL
A	8:24 - 8:38	Unload / load both machines	1080 ppm	60.0 ppm
B	9:20 - 9:35	Unload / load both machines	654	41.2
		& sort garments		
C	11:01 - 11:12	Unload / load both machines	1371	43.2
		& hang garments		
D	11:42 - 11:54	Unload / load	1537	40.2
E	12:09 - 12:13	Load Lindus	85	14.4
F	12:57 - 13:04	Unload / load Lindus	528	25.0
G	13:51 - 13:57	Unload Lindus	224	15.5
H	14:35 - 14:37	Load Lindus	1236	35.8
I	15:28 - 15:36	Unload / load both machines	200	13.9
		& sort garments		

Figure III C 3 e  
 STEL and CEILING MEASUREMENTS

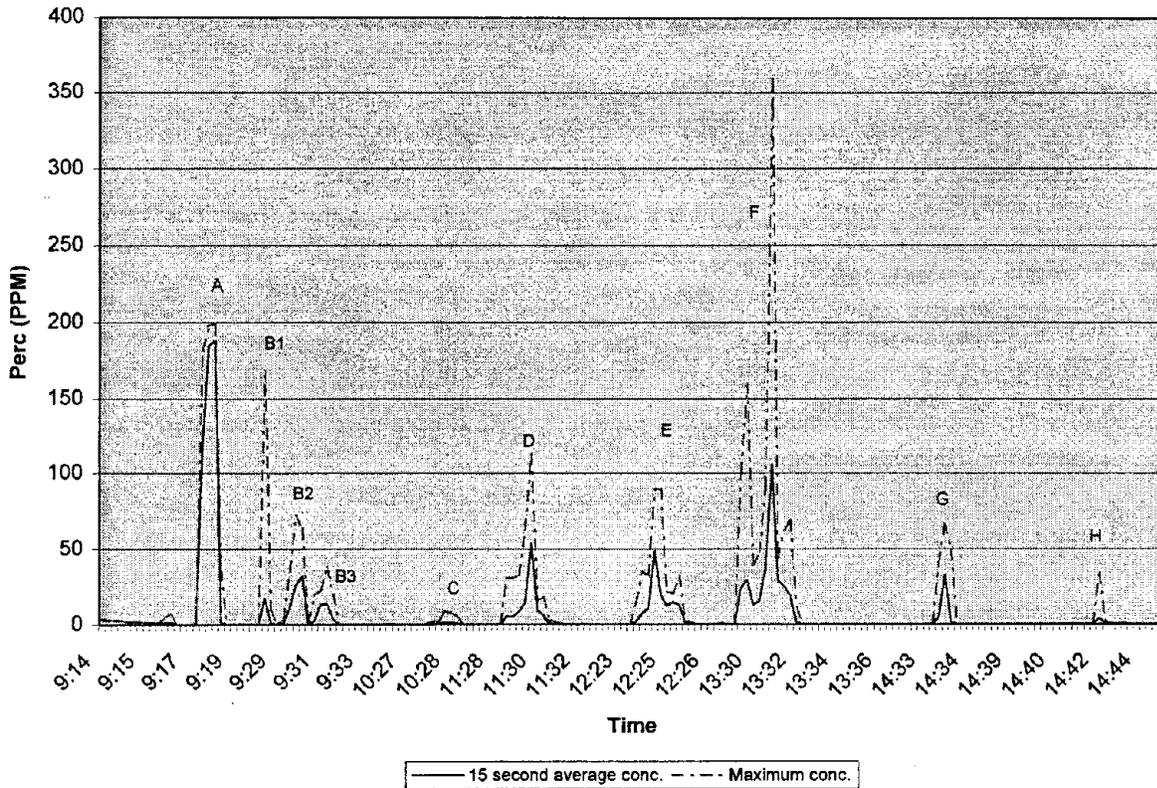
SHOP L, DAY 1



EVENT	TIME	DESCRIPTION	CEILING	15 MINUTE STEL
A	9:29 - 9:31	Unload / load machine	45 ppm	1.3 ppm
B	10:17 - 10:19	Unload / load machine	27	1.0
C	10:57 - 10:58	Unload / load machine	25	0.9
D	11:37 - 11:38	Unload machine	59	1.3
E	11:58 - 12:00	Load machine	>2000	21.4
F	12:40 - 12:41	Unload / load machine	242	3.7
G	13:20 - 13:21	Unload / load machine	210	2.9
H	14:01 - 14:03	Unload / load machine	460	6.7

Figure III C 3 f  
 STEL and CEILING MEASUREMENTS

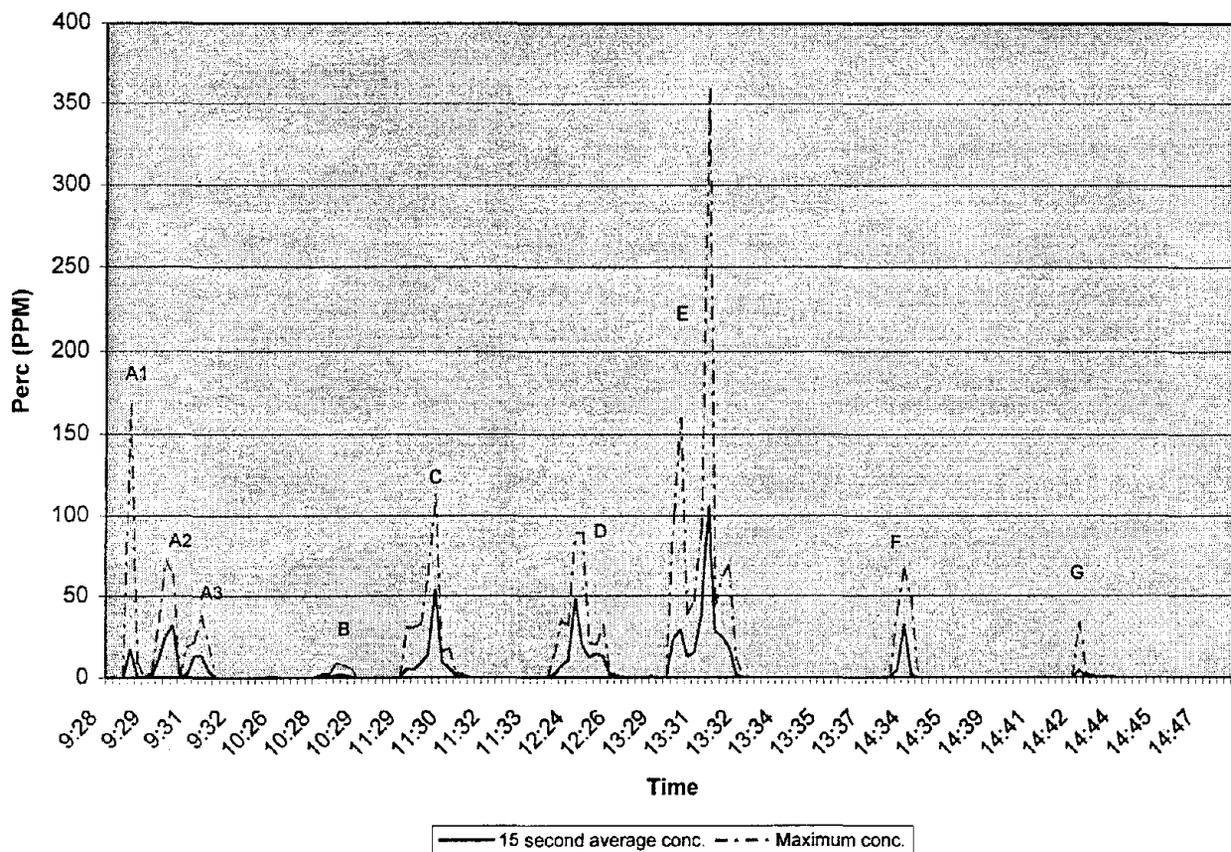
SHOP L, DAY 2



EVENT	TIME	DESCRIPTION	CEILING	15 MINUTE STEL
A	9:14 - 9:19	Unload machine	199 ppm	1.7 ppm
B	9:29 - 9:31	Load machine	168	3.7
C	10:28 - 10:29	Unload / load machine	9	2.0
D	11:29 - 11:31	Unload / load machine	113	3.5
E	12:23 - 12:26	Unload / load machine	90	3.9
F	13:30 - 13:32	Unload / load machine	359	6.7
G	14:33 - 14:34	Hanging garments	66	2.6
H	14:42 - 14:43	Unload	34	2.0

Figure III C 3 g  
 STEL and CEILING MEASUREMENTS

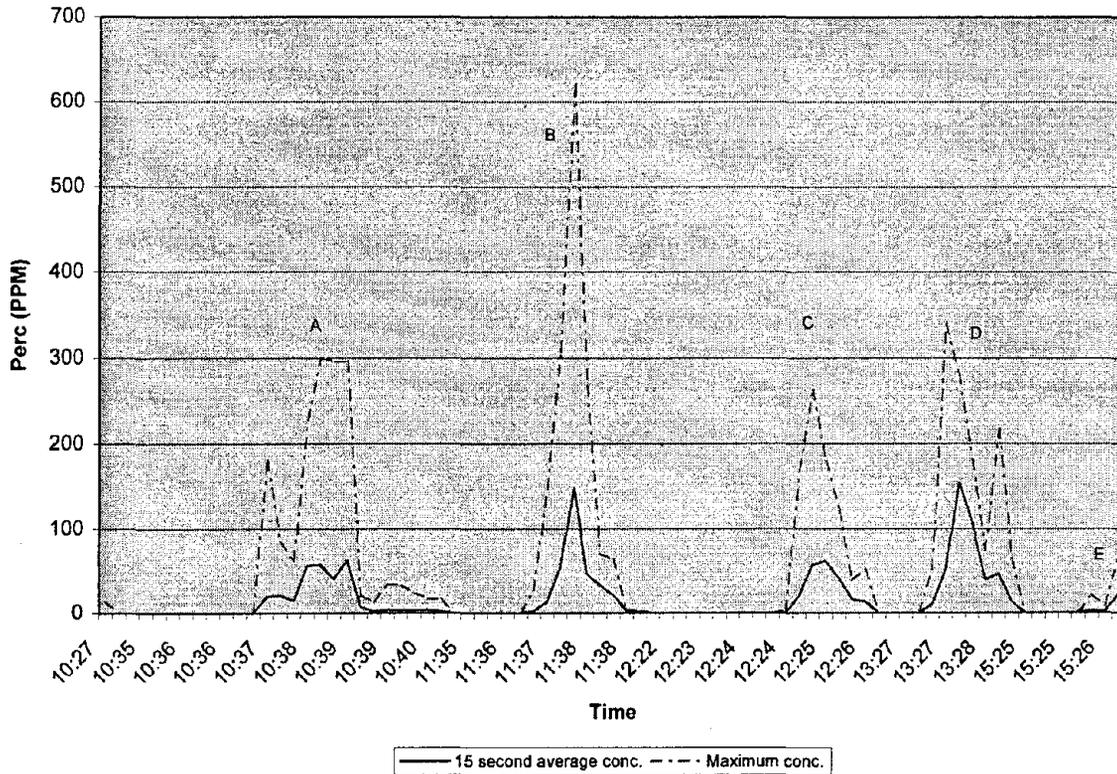
SHOP T, DAY 1



EVENT	TIME	DESCRIPTION	CEILING	15 MINUTE STEL
A	9:28 - 9:33	Unload / load machine	168 ppm	2.4ppm
B	10:27 - 10:29	Unload / load machine	9	0.5
C	11:29 - 11:31	Unload / load machine	113	2.1
D	12:23 - 12:26	Unload / load machine	89	2.6
E	13:30 - 13:32	Unload / load machine	359	5.4
F	14:33 - 14:34	Unload machine	66	1.1
G	14:42 - 14:43	Clean lint trap	34	0.5

Figure III C 3 h  
 STEL and CEILING MEASUREMENTS

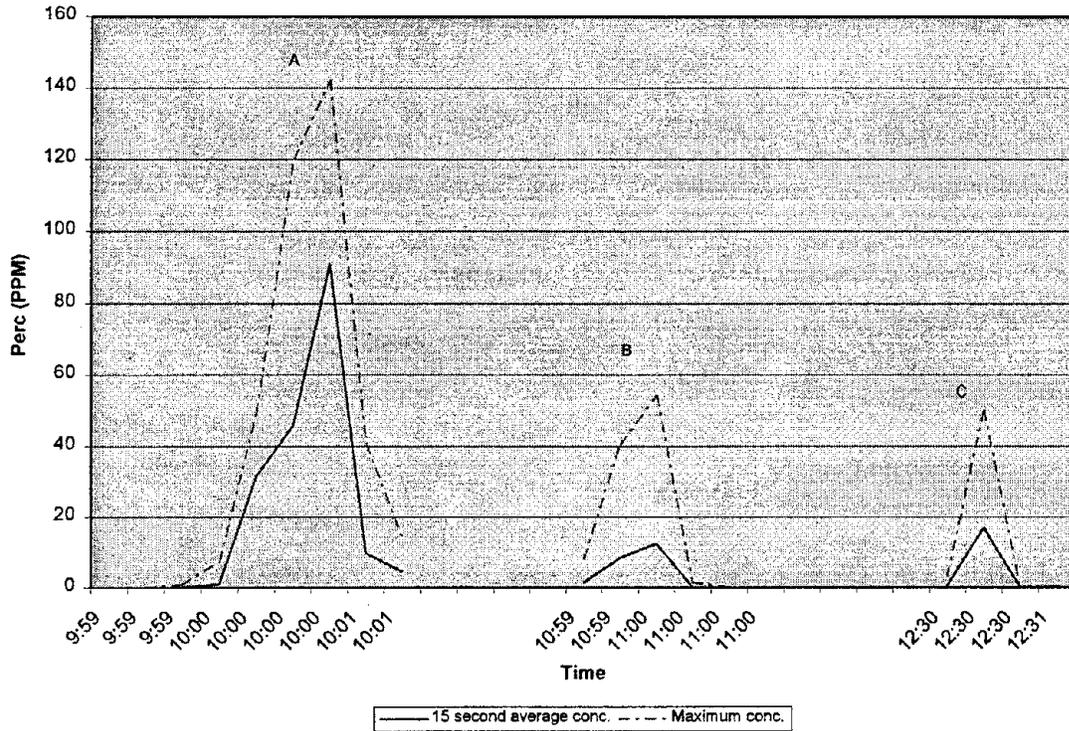
SHOP T, DAY 2



EVENT	TIME	DESCRIPTION	CEILING	15 MINUTE STEL
A	10:37 - 10:40	Unload / load machine	300 ppm	5.2 ppm
B	11:37 - 11:39	Unload / load machine	620	5.7
C	12:24 - 12:26	Unload / load machine	263	3.8
D	13:27 - 13:29	Unload / load machine	339	7.3
E	15:26 - 15:26	Unload machine	67	0.7

Figure III C 3 i  
 STEL and CEILING MEASUREMENTS

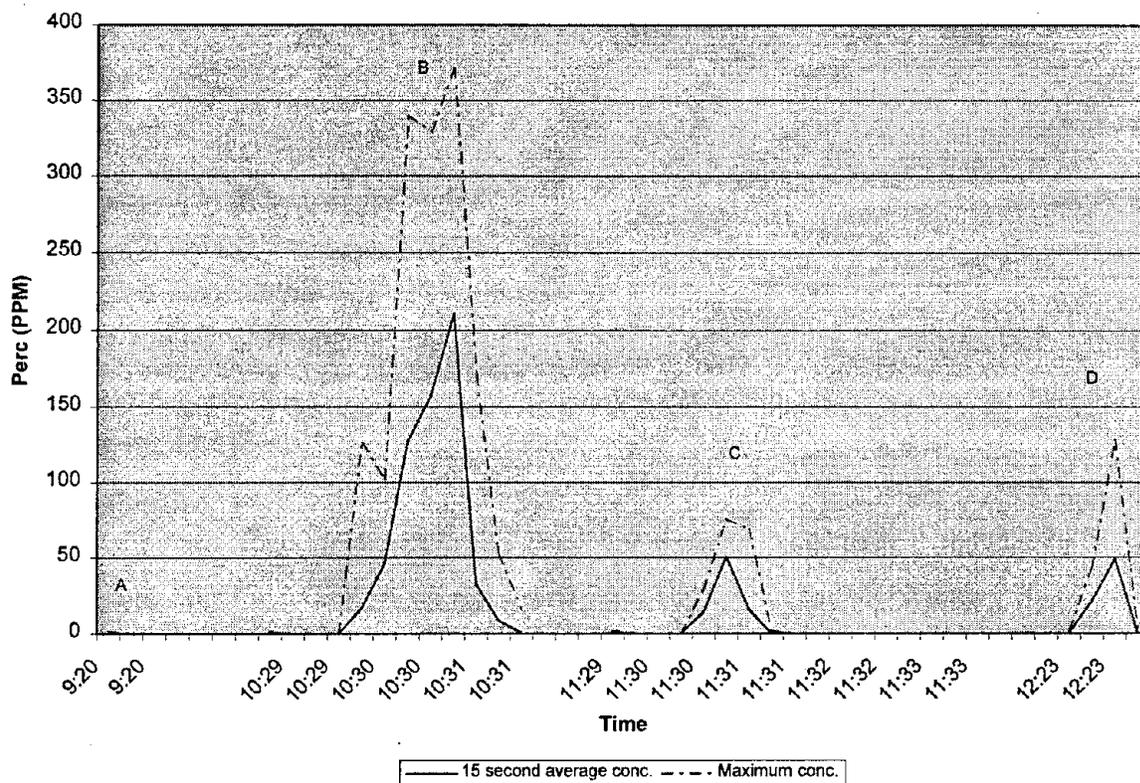
SHOP G, DAY 1



EVENT	TIME	DESCRIPTION	CEILING	15 MINUTE STEL
A	9:59 - 10:01	Unload / load machine	142 ppm	3.6 ppm
B	10:59 - 11:00	Unload / load machine	54	0.9
C	12:30 - 12:31	Unload / load machine	50	0.9

Figure III C 3 j  
 STEL and CEILING MEASUREMENTS

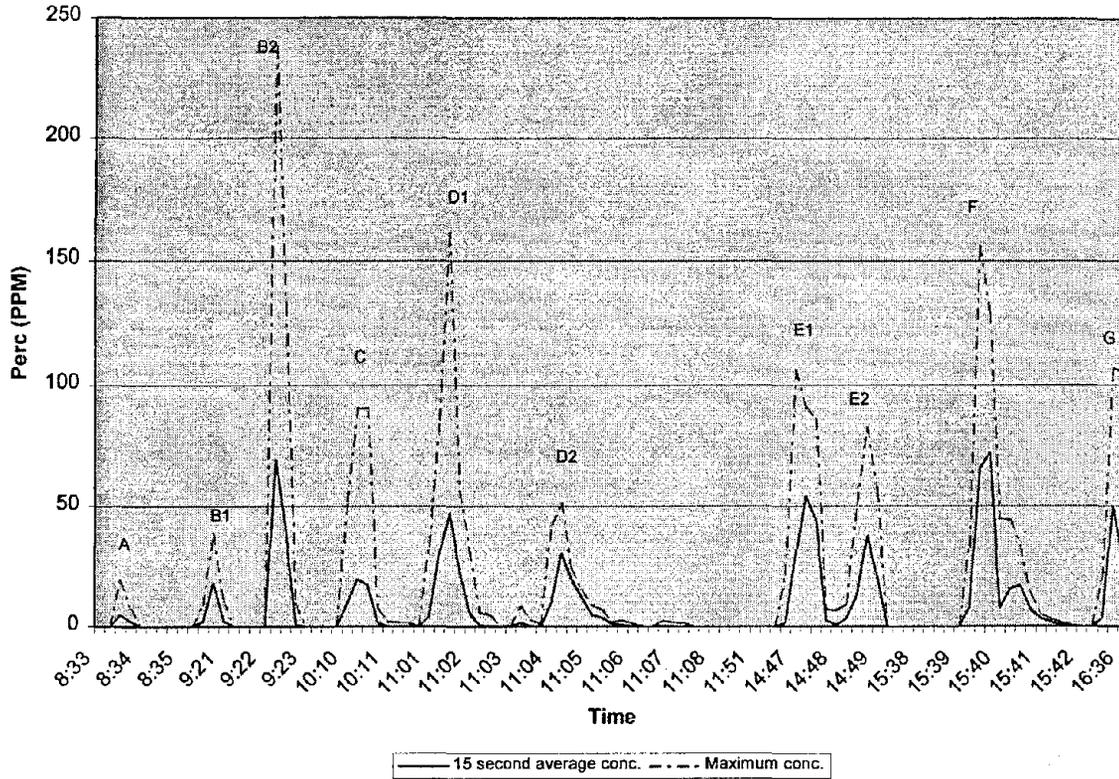
SHOP G, DAY 2



EVENT	TIME	DESCRIPTION	CEILING	15 MINUTE STEL
A	9:20 - 9:21	Cleaning machine	2 ppm	0.2 ppm
B	10:29 - 10:31	Unload / load machine	371	10.1
C	11:29 - 11:33	Unload / load machine	75	1.5
D	12:23 - 12:23	Unload / load machine	128	1.4

Figure III C 3 k  
 STEL and CEILING MEASUREMENTS

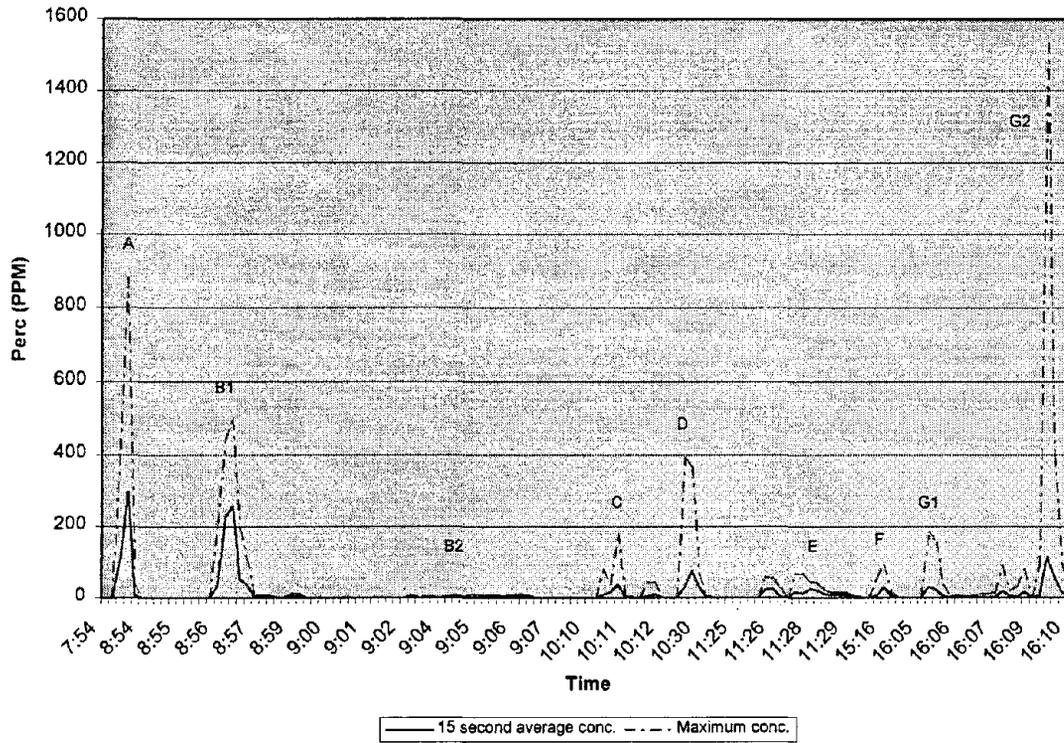
SHOP D, DAY 1



<u>EVENT</u>	<u>TIME</u>	<u>DESCRIPTION</u>	<u>CEILING</u>	<u>15 MINUTE STEL</u>
A	8:33 - 8:34	Load machine	20 ppm	0.8 ppm
B	9:20 - 9:23	Unload / load machine	238	2.8
C	10:10 - 10:12	Unload / load machine	91	1.4
D	11:01 - 11:07	Unload / load machine & clean filters and traps	161	3.7
E	14:47 - 14:49	Unload / load machine	106	4.0
F	15:39 - 15:41	Unload / load machine & clean button trap	156	3.9
G	16:36 - 16:36	Unload / load machine	107	2.0

Figure III C 3 1  
 STEL and CEILING MEASUREMENTS

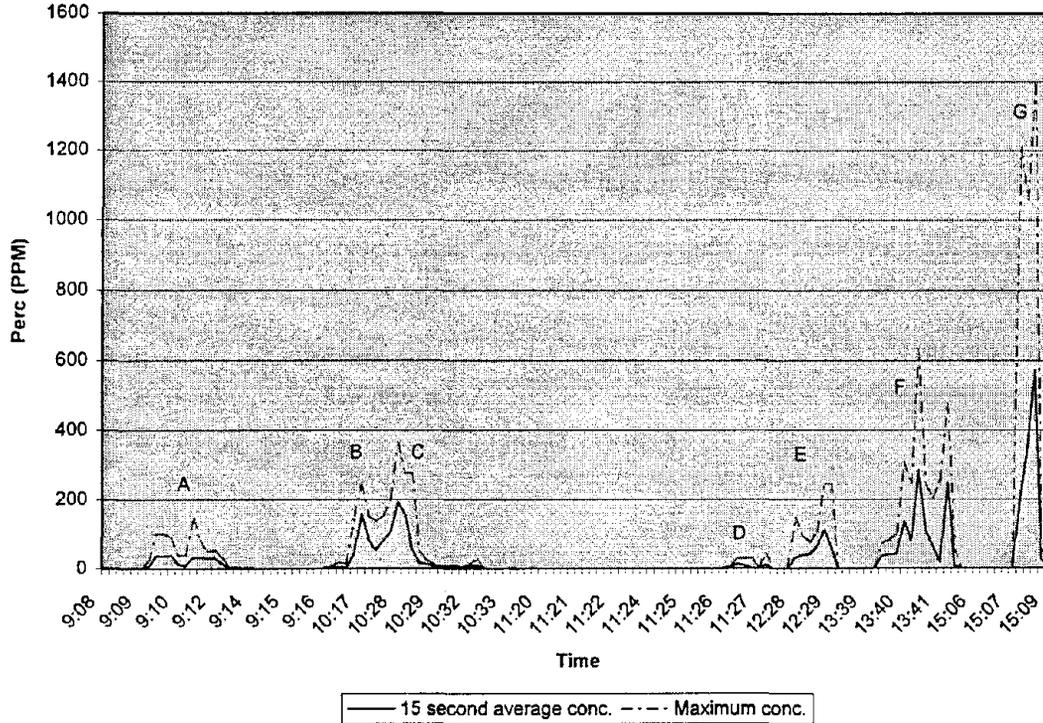
SHOP D, DAY 2



EVENT	TIME	DESCRIPTION	CEILING	15 MINUTE STEL
A	7:54 - 7:55	Loading machine	881 ppm	8.2 ppm
B	8:56 - 9:07	Unloading / loading machine & hanging garments	498	11.3
C	10:10 - 10:12	Unloading / loading machine	181	2.6
D	10:29 - 10:30	Unloading / loading machine	366	3.7
E	11:26 - 11:29	Unloading / cleaning lint traps	67	3.8
F	15:15 - 15:16	Loading	93	2.1
G	16:05 - 16:10	Unload / load onto cart	1530	6.2

Figure III C 3 m  
 STEL and CEILING MEASUREMENTS

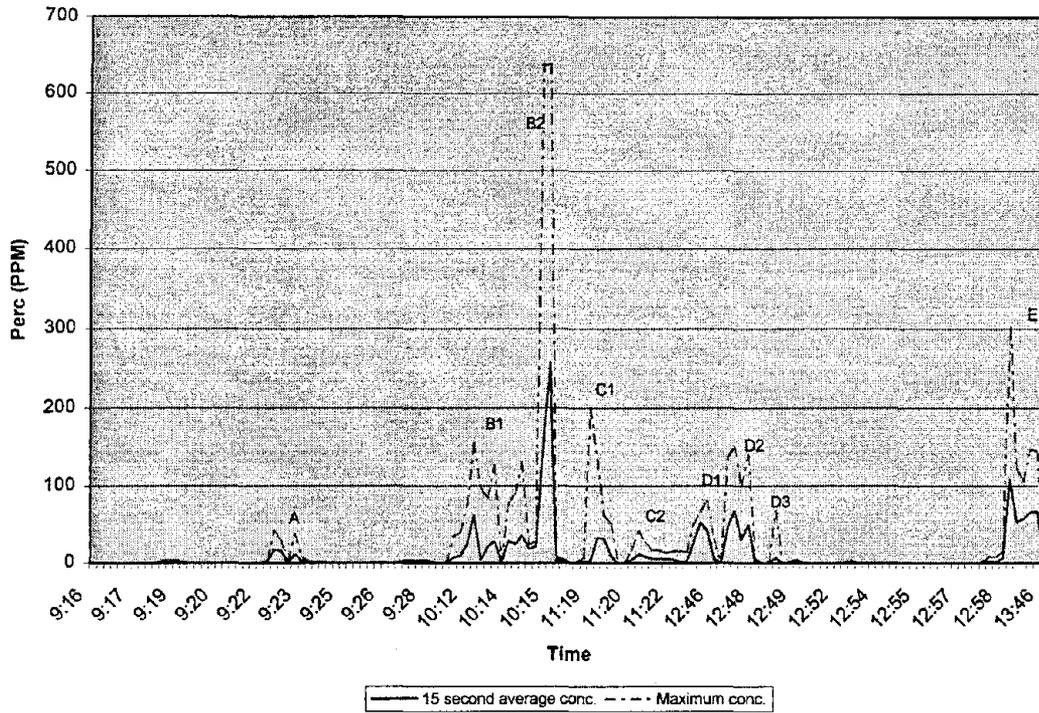
SHOP A, DAY 1



EVENT	TIME	DESCRIPTION	CEILING	15 MINUTE STEL
A	9:08 - 9:17	Unload / load machine, clean traps & hang garments	145 ppm	5.9 ppm
B	10:17 - 10:18	Unload machine	245	10.7
C	10:28 - 10:34	Load machine & hang garments	363	9.3
D	11:26 - 11:28	Unload / load machine	41	2.6
E	12:28 - 12:29	Unload / load machine	246	7.8
F	13:39 - 13:42	Unload / load machine	632	19.5
G	15:08 - 15:09	Work with special garments	1390	21.2

Figure III C 3 n  
 STEL and CEILING MEASUREMENTS

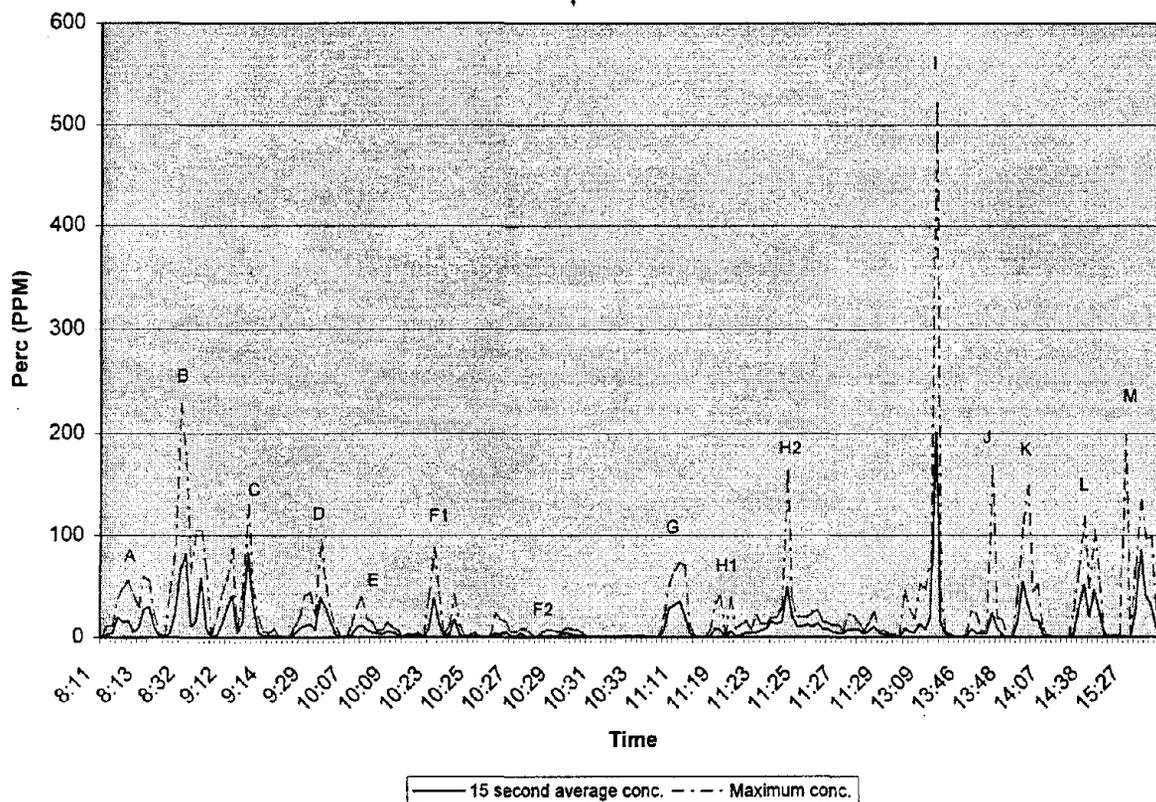
SHOP A, DAY 2



EVENT	TIME	DESCRIPTION	CEILING	15 MINUTE STEL
A	9:22 - 9:24	Unload / load machine	41 ppm	2.1 ppm
B	10:12 - 10:17	Unload / load machine	638	12.4
C	11:19 - 11:22	Unload machine	199	3.1
D	12:45 - 12:49	Unknown	139	6.5
E	13:45 - 13:46	Unknown	301	7.2

Figure III C 3 o  
 STEL and CEILING MEASUREMENTS

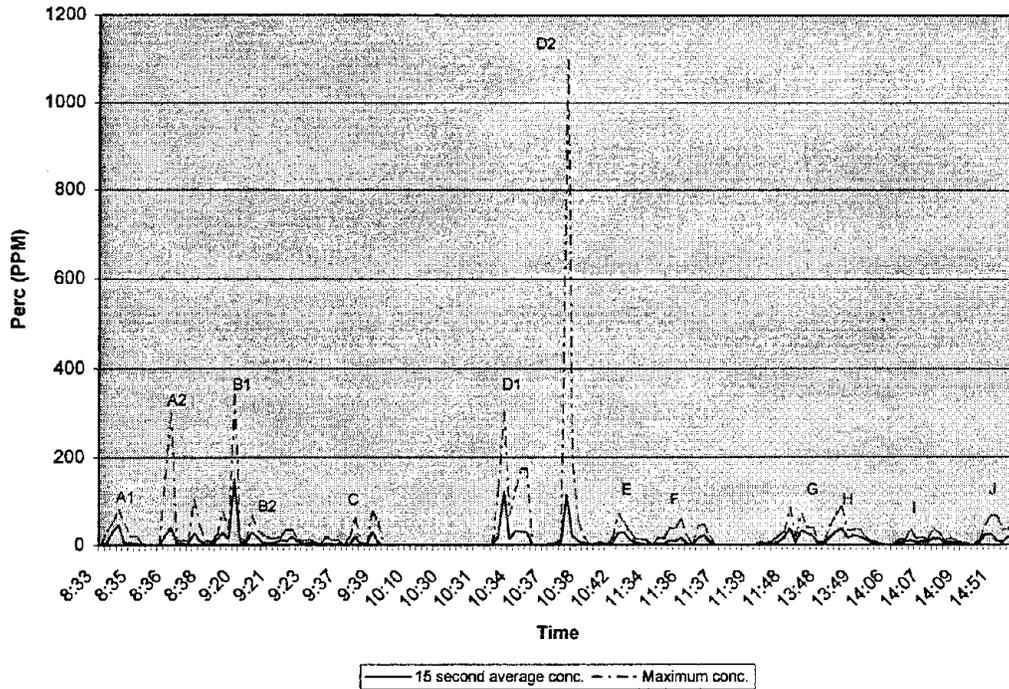
SHOP J, DAY 1



EVENT	TIME	DESCRIPTION	CEILING	15 MINUTE STEL
A	8:11 - 8:14	Unload / load machine #1	55 ppm	3.9 ppm
B	8:31 - 8:33	Unload / load machine #2	229	6.2
C	9:12 - 9:15	Unload / load machine #1	130	5.4
D	9:28 - 9:30	Clean traps, machine #2	95	3.7
E	10:07 - 10:11	Unload / load machine #1	39	2.5
F	10:23 - 10:34	Unload / load machine #2 & hang garments	88	2.6
G	11:10 - 11:12	Unload / load machine #1	73	3.9
H	11:18 - 11:30	Unload / load machine #2 & hang garments	162	5.8
I	13:07 - 13:10	Clean traps, machine #2	521	6.2
J	13:45 - 13:48	Unload / load machine #1	168	2.6
K	14:05 - 14:07	Unload / load machine #2	149	4.0
L	14:37 - 14:39	Unload / load machine #1	118	4.6
M	15:27 - 15:28	Unload / load (machine not specified)	199	5.0

Figure III C 3 p  
 STEL and CEILING MEASUREMENTS

SHOP J, DAY 2



EVENT	TIME	DESCRIPTION	CEILING	15 MINUTE STEL
A	8:33 - 8:38	Unload / load machine 2 & clean traps	303 ppm	5.0 ppm
B	9:19 - 9:23	Unload / load machine 1	343	7.1
C	9:36 - 9:39	Unload / load machine 2	77	2.9
D	10:33 - 10:39	Unload / load machine 2, & inspect back of machine	1097	8.2
E	10:42 - 10:43	Unload / load machine 1	71	3.4
F	11:35 - 11:37	Unload / load machine 2	58	3.3
G	11:47 - 11:49	Unload / load machine 1	85	4.3
H	13:48 - 13:50	Unrecorded events	87	4.7
I	14:05 - 14:09	Unrecorded events	38	3.1
J	14:50 - 14:52	Unrecorded events	67	3.5

### III D. Passive sampling data

In addition to the two days of personal sampling conducted by NIOSH researchers using charcoal tubes with personal sampling pumps for TWA measurements of Perc, a second set of personal TWA measurements was made using passive “badge” samplers (Organic vapor samplers, SKC Inc., Eighty Four, PA). This second set of measurements consisted of two days of passive sampling done concurrently with the charcoal NMAM method 1003 sampling, plus three days of subsequent sampling on selected personnel (primarily operators) following the NIOSH visit. The concurrent sampling allowed for a comparison of methods and the subsequent sampling allowed for additional information regarding the distribution of exposures. The cleaners were instructed in how to collect their own samples using these devices, and asked to submit the samples along with a log of cleaning activity in a pre-addressed postage paid mailer.

The use of these passive sampling devices had not been previously validated for Perc measurements in dry cleaning facilities, but this was done as part of the overall work in this project. It was found that there was a significant correlation for these samplers with the charcoal tube samples when collected side-by-side ( $CV = 0.97$ ). Section III D 1, below, presents the data on this charcoal tube / passive sampler comparison. The data from the passive samplers for the 8 shops evaluated in Task 1 is then summarized in Section III D 2, with raw data in Appendix 5A.

### III D 1. Comparison of charcoal tube and passive sampler measurements.

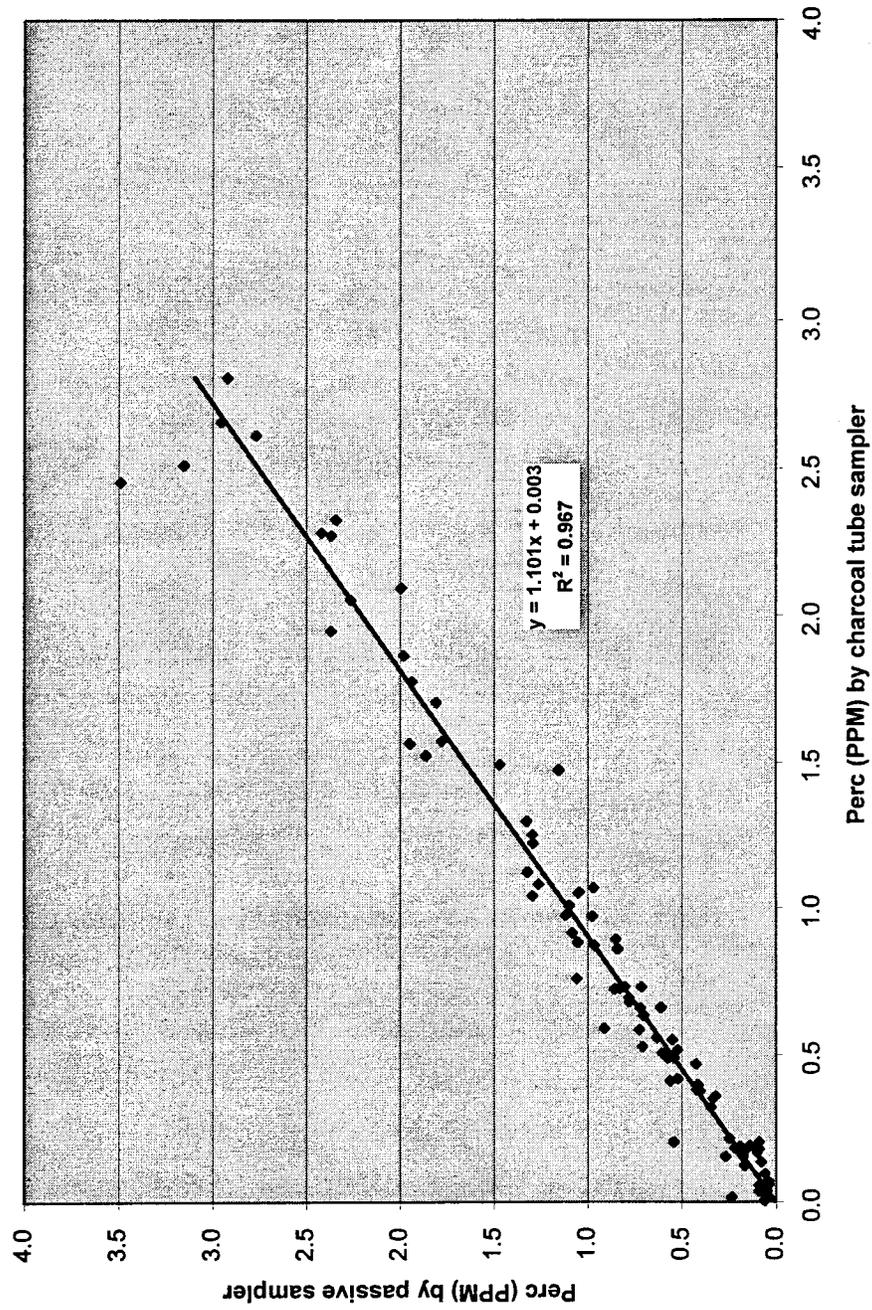
Data collected by sampling with the charcoal tubes and passive badges placed side-by-side on the worker or in the areas of the dry cleaning shops indicated a coefficient of variation of 0.967 for the 89 sets of measurements made. The linear regression statistics for this correlation were:

N	89		
slope	1.101	intercept (b)	0.003
std error for coeff	0.022	std error for b	0.024
R2 (correlation coeff)	0.967	std error for y	0.151
F statistic	2551.7	deg of freedom	87
regression sum of sq.	58.133	residual sum of sq.	1.982

A plot of the data is shown on the following page.

In effect, this comparison indicated that the passive samplers consistently produced measurements of Perc 10% higher than the corresponding charcoal tube samplers throughout all 8 dry cleaning shops.

Figure III D 1. Correlation between the charcoal tube and passive badge samples collected side-by-side at all 8 dry cleaning shops.



### III D 2 Data from the passive samplers for the 8 shops evaluated

To be able to collect data for more than the 2 days during which NIOSH researchers were on-site at each dry cleaning shop, passive samplers were left at each location as described above.

While the results of these passive samplers would be expected to be 10% higher than charcoal tube samplers collected in their stead, this bias was considered acceptable in consideration for the ability to collect the additional data.

One or two individuals were selected at each shop to wear the passive samplers for their 3 work days subsequent to the on-site monitoring. These individuals were chosen because they were thought to have the highest exposures. Figures III D 2 a – h show the results of the 5 consecutive days of sampling, plotted by shop, for those individuals.

Figure III D 2 a  
 Plot of Perc measurements by passive sampler  
 For indicated sample location and day

SHOP F

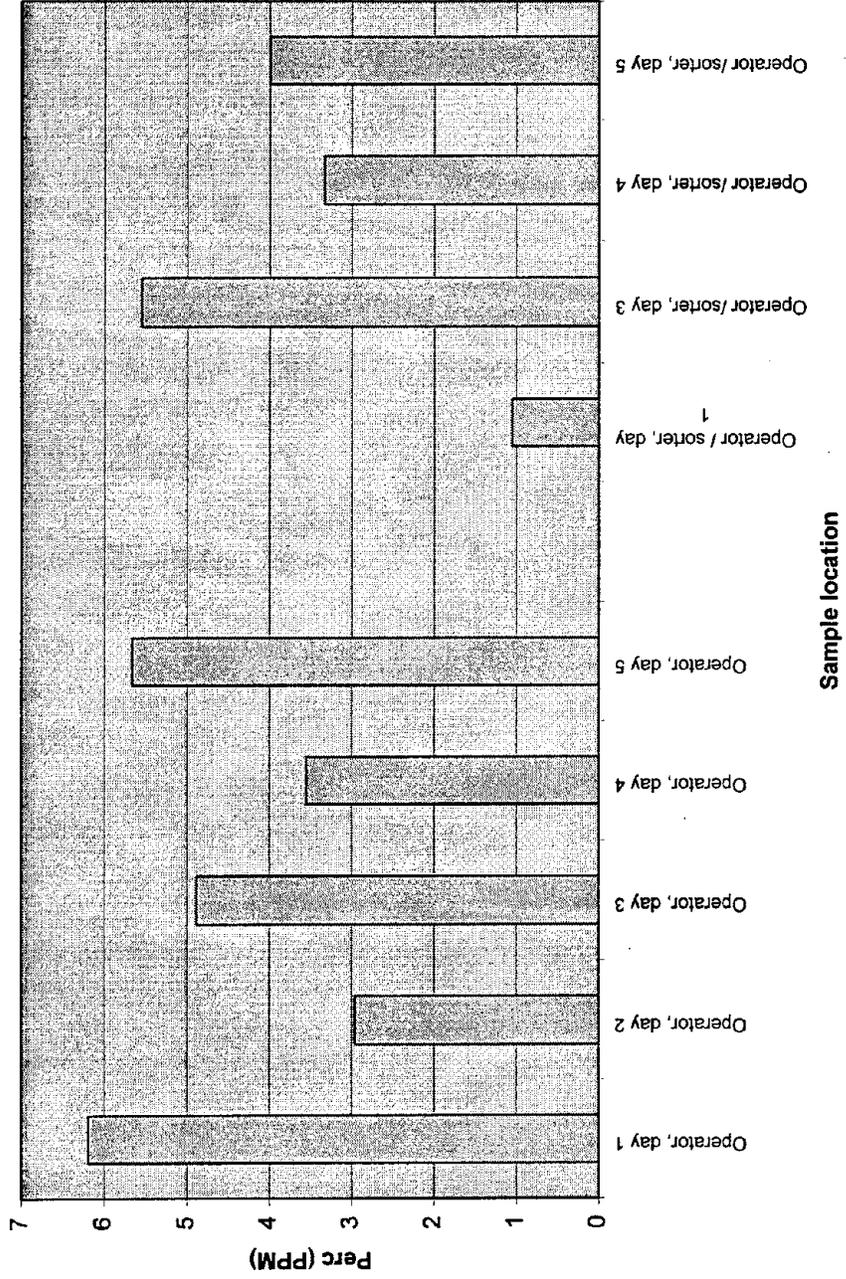


Figure III D 2 b  
 Plot of Perc measurements by passive sampler  
 For indicated sample location and day

SHOP N

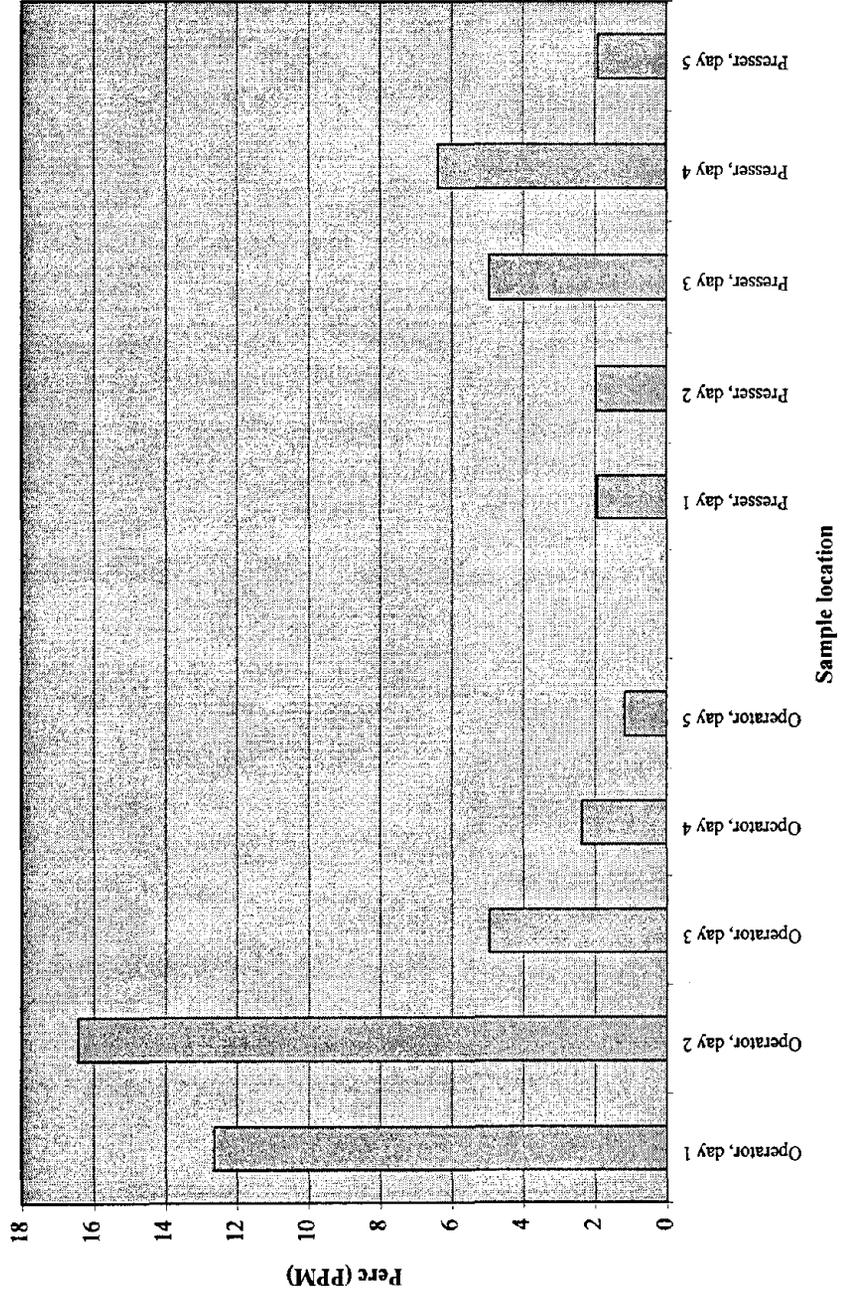
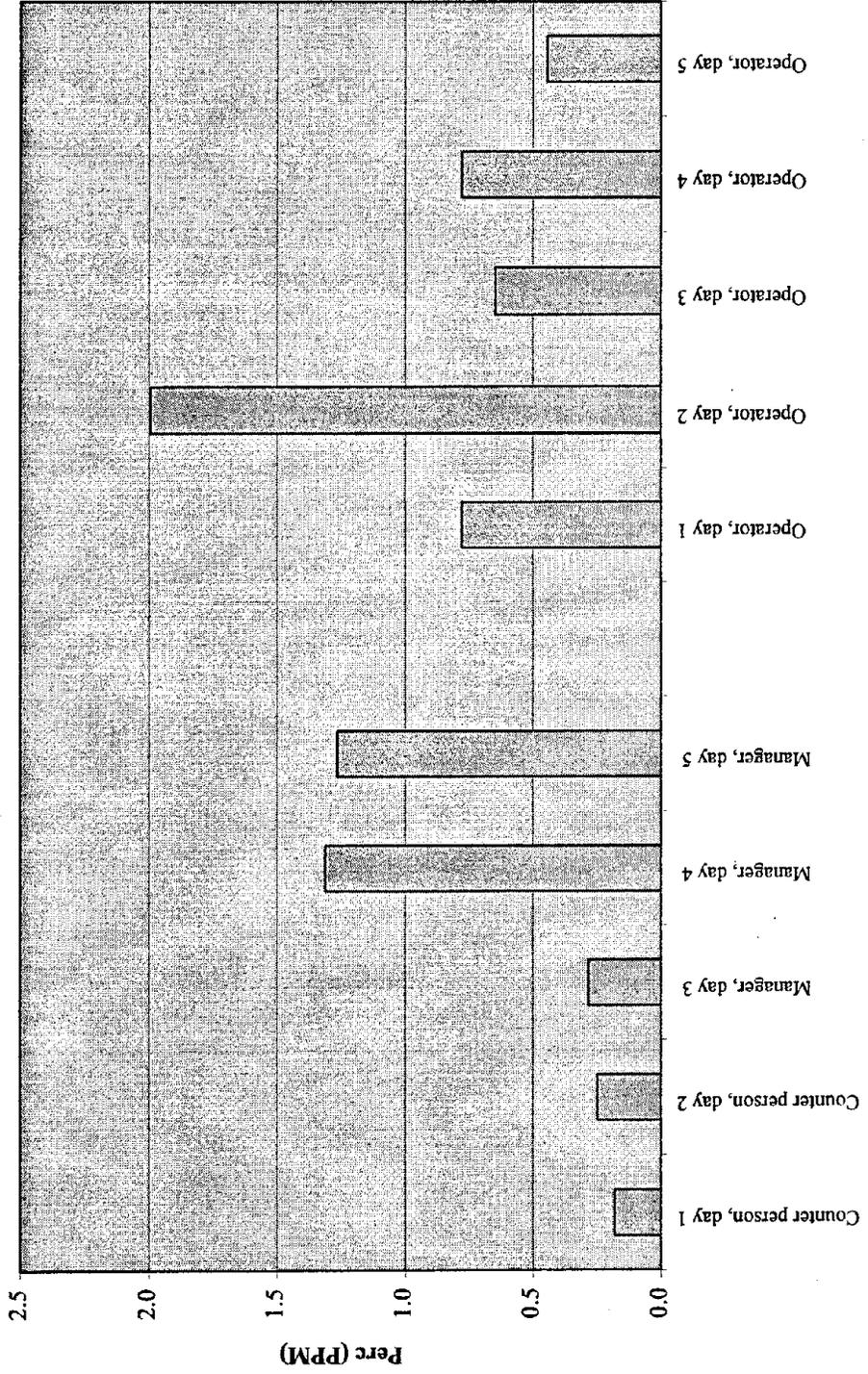


Figure III D 2 c  
Plot of Perc measurements by passive sampler  
For indicated sample location and day

SHOP L



Sample location

Figure III D 2 d  
Plot of Perc measurements by passive sampler  
For indicated sample location and day

SHOP T

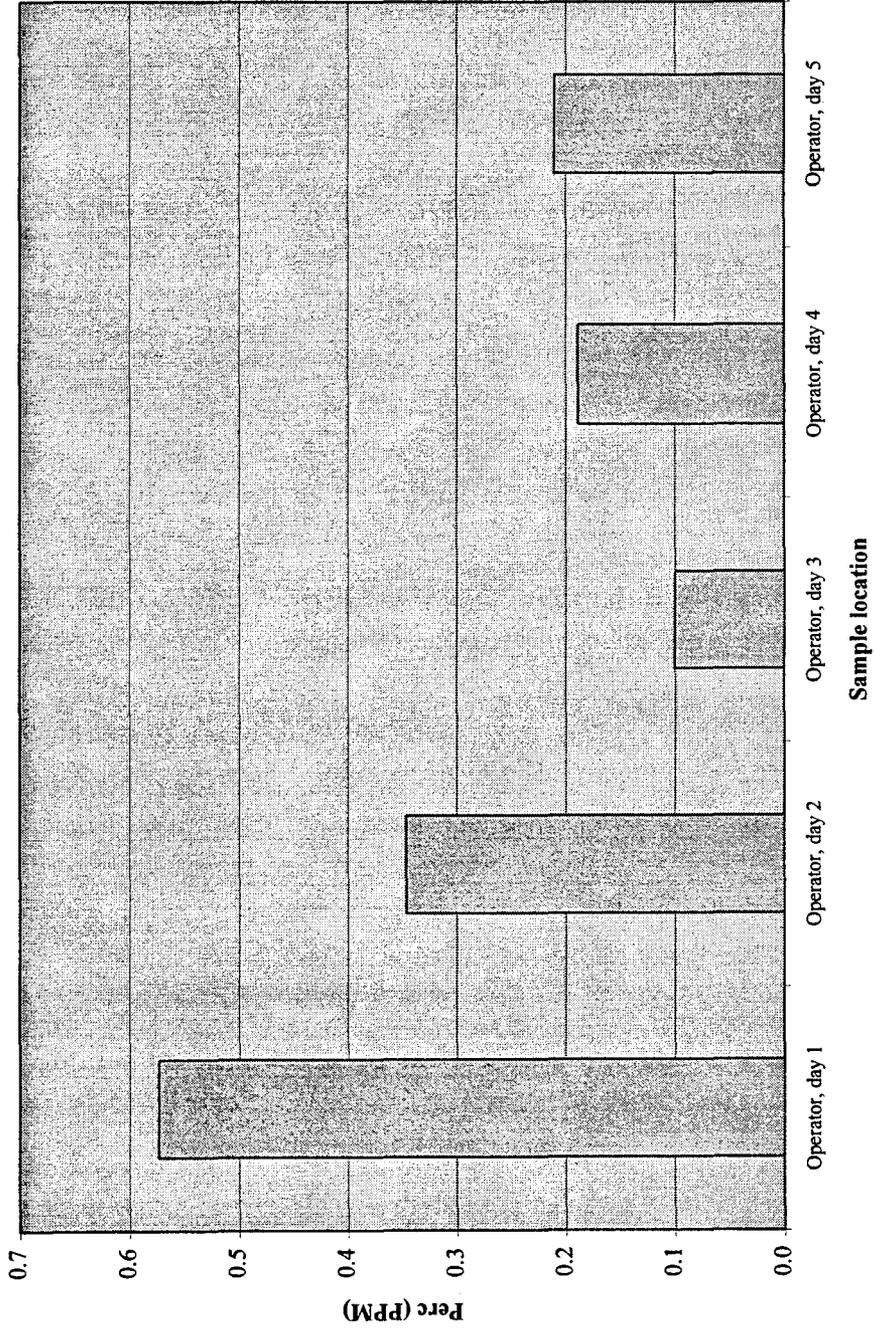


Figure III D 2 e  
Plot of Perc measurements by passive sampler  
For indicated sample location and day

SHOP G

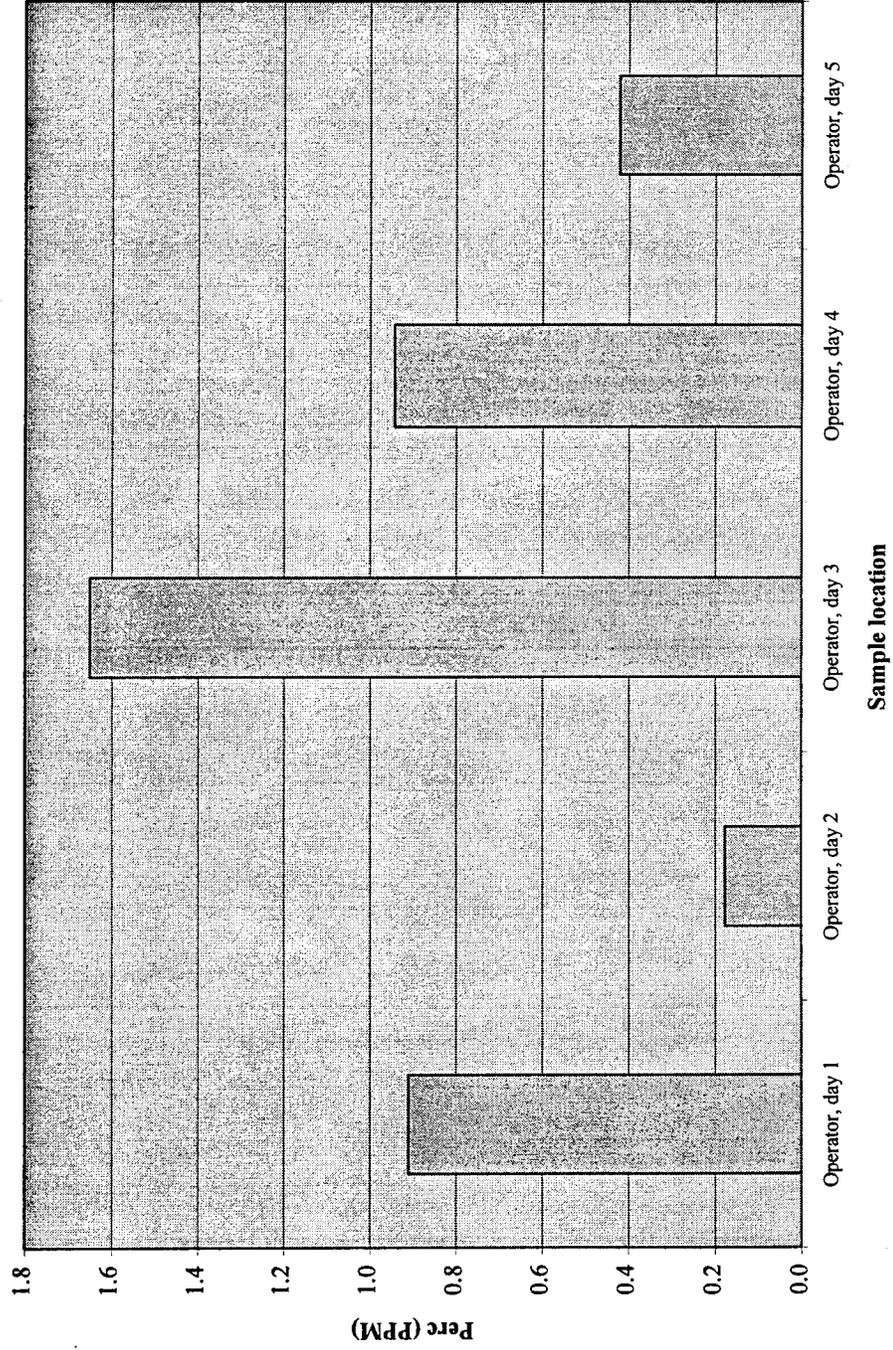


Figure III D 2 f  
 Plot of Perc measurements by passive sampler  
 For indicated sample location and day

SHOP D



Figure III D 2 g  
 Plot of Perc measurements by passive sampler  
 For indicated sample location and day

SHOP A

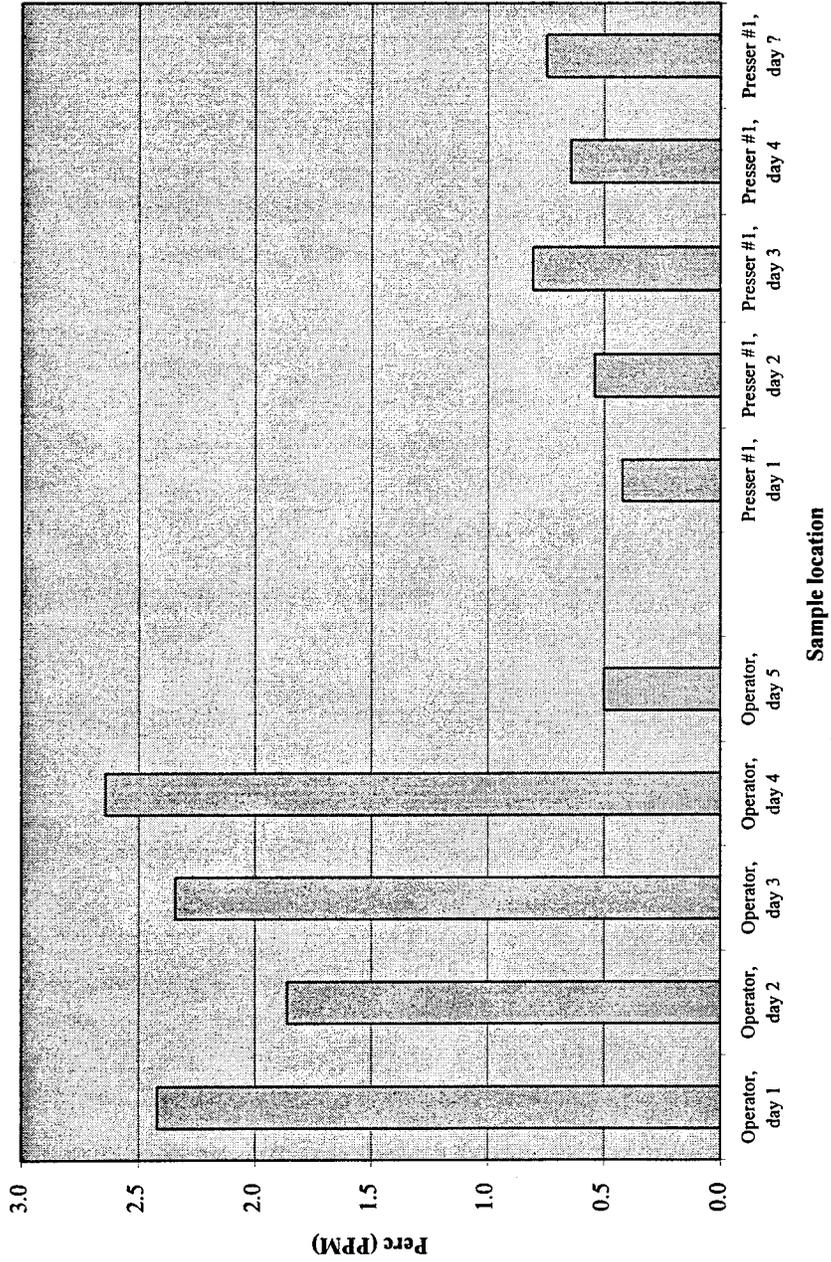
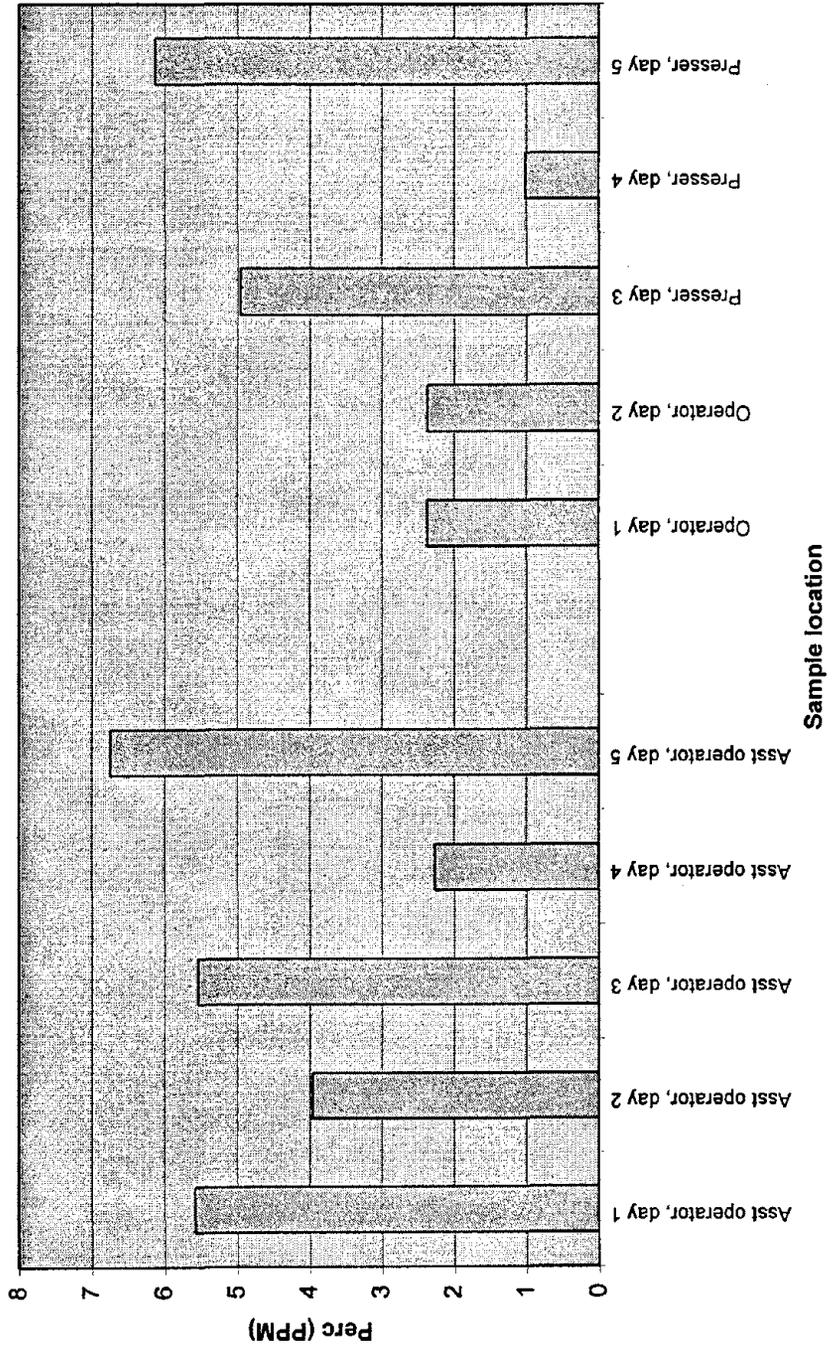


Figure III D 2 h  
 Plot of Perc measurements by passive sampler  
 For indicated sample location and day

SHOP J



#### IV. SUMMARY AND CONCLUSIONS

Under Task 1 of the Interagency Agreement regarding Perc, eight dry cleaning shops using 4<sup>th</sup> and 5<sup>th</sup> generation equipment were evaluated to determine the effectiveness of the systems on those machines to control occupational exposure of workers to Perc. Workers' exposure in shops in Los Angeles, San Francisco, and New York were measured using active and passive full shift monitoring devices and also using real-time monitors to measure short duration exposure excursions during lead change and other events anticipated to cause increased exposure. Information was also collected on the dry cleaning equipment used, local and general exhaust ventilation and work load.

##### A. Summary of TWA measurements

Results of TWA measurements for Perc are presented in Section III B of this report grouped by shop, by job, and also presented in rank order. Table IV 1 below summarizes the mean, median and number of charcoal tube samples collected at each shop. This table indicates a range of measurements from <0.008 ppm (the limit of detection for this analytical method) to 16.8 ppm for the 96 samples collected. The overall mean, median and geometric mean for these 96 samples was 1.33, 0.73 and 0.63 ppm, respectively. The duration for most personal samples was less than 8 hours. Observation of these workers during the un-sampled time, however, indicated that they were either not exposed (e.g., had

left the shop) or were not exposed to concentrations of Perc above that measured (e.g., were not performing Perc related work).

Table IV 1  
Summary Statistics for the 8 Dry Cleaning Shops Monitored  
(Perc concentration in ppm)

Shop	F	N	L	T	G	D	A	J
Mean	1.54	3.70	0.52	0.25	0.28	0.82	0.76	1.82
Median	1.05	1.82	0.22	0.20	0.20	0.69	0.49	1.08
Geo. Mean	1.27	1.59	0.27	0.15	0.23	0.58	0.51	1.37
N	16	14	11	10	10	13	11	11

Data in Table IV 1 indicate Shop N had both a mean and median almost twice the closest other shops. A probable cause for this was the presence of an older (3<sup>rd</sup> generation) machine which was used periodically during the time of this study. Because this machine was not 4<sup>th</sup> or 5<sup>th</sup> generation, short term measurements were not made during peak excursions, but it is anticipated that this machine could have produced the increased TWA measurements seen in Shop N.

As anticipated, the job category with the highest exposure was the machine operator. Table IV 2 shows how these workers compared with the other groupings selected for these samples.

Table IV 2  
Summary Statistics for Job Categories  
(Perc concentration in ppm)

Job category	<u>Operator</u>	<u>Presser</u>	<u>Miscellaneous</u>	
	<u>Area samples</u>			
Mean	2.92	0.81	0.82	0.89
Median	1.51	0.73	0.23	0.41
Geo. Mean	1.54	0.68	0.25	0.41
N	22	30	15	29

The range of operator exposures was from 0.18 to 16.8 ppm.

It is interesting to note that the measurements in San Francisco were as a group lower than in either of the other two cities. Table IV 3 groups samples by city for this comparison. The obvious difference between the 3 shops sampled in San Francisco and the other 5 shops was the use of vapor barrier rooms in San Francisco which enclosed the dry cleaning equipment and was vented to ambient. However, this difference could also have been due to a selection bias. While shops in all 3 cities were selected because they had relatively new equipment with state-of-the-art controls to reduce workers' exposure to Perc, the individual who assisted in the selection of the San Francisco sites was particularly knowledgeable in the exposure levels at many dry cleaning shops in that city. He might have been more successful in selecting shops with low levels of Perc than in the other 2 cities.

Table IV 3  
Summary Statistics by Shop Location  
(Perc concentration in ppm)

City <u>York</u>	<u>Los Angeles</u>		<u>San Francisco</u>		<u>New</u>	
	Operator	Other	Operator	Other	Operator	Other
Job category						
Mean	7.71	1.52	0.77	0.24	2.16	0.75
Median	5.38	1.22	0.59	0.18	1.95	0.55
Geo. Mean	5.16	1.09	0.59	0.16	1.79	0.54
N	5	25	7	24	9	26

B. Summary of real time measurements

Results of Perc measurements using the real-time PID are presented in Section III C of this report. A total of 106 exposure events, primarily load changes, were monitored, and C and STEL measurements were determined for each. The C measurements ranged from 2 to >2,000 ppm (the upper limit of quantification for the real time monitor). The STEL measurements ranged from 0.2 to 60 ppm. These data are presented in Section III C of this report and are summarized in Table IV 4 below.

Table IV 4  
Summary of Ceiling and STEL Measurements  
(Perc concentration in ppm)

	<u>Ceiling</u>	<u>STEL</u>
N	106	106
Mean 323 ppm	8.5 ppm	
Median	168 ppm	4.2 ppm
Geo. Mean	107 ppm	4.8 ppm
Low 2 ppm	0.2 ppm	
High 2000 ppm	60.0 ppm	

### C. Conclusions

Data gathered at the eight dry cleaning shops monitored as part of this project indicate that in almost all instances the full shift TWA concentration of Perc can be maintained below the 5 to 10 ppm level. Of the 96 charcoal tube measurements made, only 2 were greater than 10 ppm, and these were in the one shop which included an older (3<sup>rd</sup> generation) machine used occasionally in addition to the newer unit. The measurements of both the TWA exposure and also the short duration exposures when this 3<sup>rd</sup> generation machine was used were higher than in all other instances.

Data also indicate that ceiling and STEL levels of Perc were below the medians of 168 ppm and 4.2 ppm, respectively, in half the measurements. The maximum instantaneous ceiling measurement in 97 of the 106 samples was below 1,000 ppm. The maximum 15 minute STEL in 105 of the 106 samples was below 50 ppm, and in 99 of the 106 samples was below 25 ppm.

Cut points were calculated for various percentile fractions for the long and short duration measurements, and are presented in Table IV 5 below. These data show that, at the 95<sup>th</sup>ile, the TWA samples were below 3.3 ppm, the C measurements were below 1,300 ppm, and the STEL concentrations were below 36 ppm.

Table IV 5  
Cut Points for TWA, Ceiling and STEL Measurements  
(Perc concentration in ppm)

	<u>TWA</u>	<u>C</u>	<u>STEL</u>
50%ile (Median)	0.7	170	4
75%ile	1.5	400	10
90%ile	2.5	870	21
95%ile	3.3	1300	36
99%ile	12	1540	48

## APPENDICES

- APPENDIX 1A INTERAGENCY AGREEMENT BETWEEN THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION AND THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
- APPENDIX 1B PROTOCOL FOR THE EVALUATION OF CONTROL TECHNOLOGIES FOR PERCHLOROETHYLENE IN DRY CLEANING FACILITIES
- APPENDIX 2 SAMPLING AND ANALYTICAL METHOD FOR PERCHLOROETHYLENE IN AIR (NMAM METHOD 1003, HALOGENATED HYDROCARBONS)
- APPENDIX 3A SAMPLE COLLECTION BOOK-SHOP F
- APPENDIX 3B SAMPLE COLLECTION BOOK-SHOP N
- APPENDIX 3C SAMPLE COLLECTION BOOK-SHOP L
- APPENDIX 3D SAMPLE COLLECTION BOOK-SHOP T
- APPENDIX 3E SAMPLE COLLECTION BOOK-SHOP G
- APPENDIX 3F SAMPLE COLLECTION BOOK-SHOP D
- APPENDIX 3G SAMPLE COLLECTION BOOK-SHOP A
- APPENDIX 3H SAMPLE COLLECTION BOOK-SHOP J
- APPENDIX 4A ANALYTICAL LABORATORY REPORTS FOR ANALYSIS OF CHARCOAL TUBE SAMPLES
- APPENDIX 4B ANALYTICAL LABORATORY REPORTS FOR ANALYSIS OF PASSIVE BADGE SAMPLES
- APPENDIX 4C ANALYTICAL LABORATORY REPORTS - QUALITY CONTROL DATA FOR ANALYSIS OF CHARCOAL TUBE SAMPLES
- APPENDIX 4D ANALYTICAL LABORATORY REPORTS - QUALITY CONTROL DATA FOR ANALYSIS OF PASSIVE BADGE SAMPLES

APPENDICES (CONT.)

APPENDIX 5A      RAW DATA TABLES: TWA CHARCOAL TUBE AND  
PASSIVE SAMPLES

APPENDIX 5B      RAW DATA TABLES: REAL-TIME MONITORING DATA

APPENDIX 1A

INTERAGENCY AGREEMENT BETWEEN

THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

AND

THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH



98-03  
NIOSH's copy

INTERAGENCY AGREEMENT  
BETWEEN  
THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION  
AND  
THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

MEMORANDUM OF AGREEMENT

THIS MEMORANDUM SETS FORTH THE TERMS OF AGREEMENT BETWEEN THE DEPARTMENT OF HEALTH AND HUMAN SERVICES, PUBLIC HEALTH SERVICE, CENTERS FOR DISEASE CONTROL, NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION.

I. DESCRIPTION OF SERVICE:

The Occupational Safety and Health Administration has funded a study of control technologies for perchloroethylene in the dry cleaning industry to determine the extent of exposure, to gather control and operational information, and to assist in determining technological feasibility of controlling worker exposure to perchloroethylene (Perc).

This study will determine the extent of exposure of employees and control technology in small and medium sized dry cleaning establishments to provide OSHA data to be utilized in determining technological feasibility of controlling worker exposure to perchloroethylene. Plants will be selected and data taken to characterize worker exposure levels and control technology for "fourth generation" dry cleaning machines (closed-loop, dry-to-dry machines, with an integrated, in-line refrigerated condenser and a carbon absorber to recover perchloroethylene vapors during the dry cycle) and "fifth generation" machines, having the same features as a fourth generation machine plus an internal monitor / interlock system to prevent door opening at perc concentrations above a set level. In addition, local exhaust ventilation will be added to a "third generation" dry-to-dry machine with refrigerated condenser to measure its effect on employee exposure.

Exposure and control technology data will be provided to OSHA within 10 months following the effective date of this Agreement. The results of this study will be summarized in a written report and raw data will be appended.

NIOSH will coordinate the study with any parallel OSHA study to assure consistency of data and to preclude geographical overlap.

II. DURATION OF AGREEMENT

Agreement will begin upon signature through September 30, 1998.

### III. ESTIMATED COST BY FISCAL YEAR

Estimated cost for this Agreement: FY 98:

#### Contract

Direct Costs: \$38,095

Overhead: \$1,905

#### Support

Direct Costs: \$50,000

Overhead: \$10,000

Total Costs: \$100,000

### IV. PAYMENT TO BE MADE TO:

National Institute for Occupational Safety and Health by OPAC system.

Billing should be sent to: Mr. Gregory Semkoski, Fiscal Officer, Room N-3104, U.S. Department of Labor (OSHA), 200 Constitution Ave., N.W., Washington, D.C. 20210

### V. REIMBURSING AGENCY LOCATION CODE (TREASURY STATION SYMBOL)

The accounting for this Agreement is: FO62-8-\$-SYBU-26000-2589-IA0.  
Agency Location Code is: 16-01-2012. Document number: W9F80002

### VI. TRAVEL

Travel under this Agreement is subject to allowances authorized in accordance with the Federal Travel Regulations, Joint Federal Travel Regulations, and/or Foreign Service Regulations.

### VII. EQUIPMENT

Any equipment which is procured in order to provide service will be retained by the National Institute for Occupational Safety and Health.

### VIII. PROJECT OFFICER

Mr. Paul Bolon (202-219-5692) for OSHA;  
Mr. G. E. Burroughs for NIOSH (513-841-4275).

This Agreement may be canceled within 60 days notice, whereby both parties mutually agree in the cancellation.

IX. APPROVALS:

APPROVED AND ACCEPTED FOR THE CENTERS FOR DISEASE CONTROL AND PREVENTION:

BY: W. D. Taylor for 11/14/97  
(Signature) (Date)

TITLE: Diane D. Porter, Associate Director for Management

APPROVED AND ACCEPTED FOR THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION BY:

BY: [Signature] 11/21/97  
(Signature) (Date)

TITLE: Acting Director, Directorate of Policy  
Occupational Safety and Health Administration

NOTE: If the Agreement is of a category needing approval of the Public Health Service (based on PHS General Administration Manual Chapter 8-77-10) or the Department (based on HHS General Administration Manual Chapter 8-77-60), this signature section should be adapted accordingly. See the next page for format guidance. Contact the Financial Management Office for category guidance.

NOTE: This agreement is made under the authority of the Economy Act of 1932 as amended (31 U.S.C. 1535 and 1536).

Clearance:  
FMO, Budget Analyst

Denise B. Galvin  
(Signature)

Budget Analyst 11/14/97  
(Title) (Date)



APPENDIX 1B

PROTOCOL FOR THE EVALUATION OF CONTROL TECHNOLOGIES FOR  
PERCHLOROETHYLENE IN DRY CLEANING FACILITIES



**PROTOCOL**  
**EVALUATION OF CONTROL TECHNOLOGIES FOR  
PERCHLOROETHYLENE IN DRY CLEANING FACILITIES**

**TASK ONE - EXPOSURE ASSESSMENT IN 4<sup>TH</sup> AND 5<sup>TH</sup> GENERATION SHOPS**

**PLANT SELECTION**

After a review of data collected in the NIOSH dry cleaning intervention study, consideration of available resources, and consultation with a statistician, a plan was developed to assess exposure of workers at eight (8) dry cleaning shops for two days each. To facilitate this protocol, shops will be selected in groups of 2, with the two shops in each group geographically close to each other to facilitate travel. Other criteria for selection are that the shops have generally only one (but no more than two) perchloroethylene machines, that these machines be of 4<sup>th</sup> or 5<sup>th</sup> generation design (not retrofits), that the shops are full-time operations where garments are being cleaned several hours per day, and that the owners of these shops be willing to participate in the study. Sites will be selected by NIOSH researchers, with OSHA approval.

**ENVIRONMENTAL MONITORING**

**A. Personal TWA measurements**

All exposed job categories in the selected shops will be monitored on both days of the evaluation to determine their eight-hour time weighted average breathing zone exposures to perchloroethylene. Sampling and analysis will be according to method #1003 in the NIOSH Manual of Analytical Methods. Samples will be collected on sorbent tubes using battery powered personal sampling pumps, calibrated on-site to the appropriate flow rates. Analysis will be by an accredited contract laboratory. Sample data will be recorded on a data sheet such as shown in Attachment 1.

A separate second set of personal TWA measurements will be made on selected personnel (primarily operators) using passive "badge" samplers. This set of measurements will consist of two days of sampling done concurrently with the method 1003 sampling, plus three days of sampling done following to the NIOSH visit. The simultaneous sampling will allow for a comparison of methods and the subsequent sampling will allow for additional information regarding the distribution of exposures. The cleaners will be instructed in how to collect their own samples using these devices, and asked to submit the samples along with a log (see Attachment 2) of cleaning activity in a pre-addressed postage paid mailer.

**B. Real-time monitoring for peak exposures measurements**

Machine operators will be monitored during several exposure events using a photoionization detector (PID) monitor to determine breathing zone perchloroethylene concentration on a real time basis. Exposure events are primarily unloading / loading operations, but could also include any repair, maintenance or other operation which could result in increased perc exposure. The PID monitor will be calibrated on-site with a commercially procured perc calibration gas (or a surrogate of known proportional response), and operated according to manufacturers instructions. These instruments include data-logging capabilities, and will be downloaded to laptop computers for data storage. Each exposure event will be monitored for the duration of that event, and for a sufficient time prior and subsequent to establish a background concentration such that 5, 10 and 15 minute average exposures can be calculated. Sample data will be recorded on a data sheet such as shown in Attachment 3.

### C. Other Perc measurements

At the discretion of the industrial hygienist, additional area and/or background samples may be taken using NMAM 1003, PID or other techniques, if during the course of an investigation it is determined that such measurements would add to the usefulness of the study.

### PLANT AND MACHINE INFORMATION

Background information will be collected at each dry cleaning plant regarding the equipment, controls, materials and procedures at that facility. The purpose of this information will be to enhance inter-facility comparisons. Typical data to be collected is indicated on Attachment 4.

### DATA TREATMENT

Subsequent to this series of plant investigations, data for each series of tests will be tabulated. A separate report will be prepared for each of the eight facilities visited, and transmitted to that facility and to OSHA. These and other reports from this study will be considered for publication, and will be publicly available after deletion of personal identifiers and internal NIOSH review. Mean, median, range and variance measurements will be calculated for each set of measurements, and for groups as appropriate (e. g., for 4<sup>th</sup> generation machines, as a function of number or size of loads, etc.). All raw data will be transmitted to OSHA.

## TASK TWO - EFFECTIVENESS OF LOCAL EXHAUST VENTILATION ADDED TO A THIRD GENERATION MACHINE

### PLANT SELECTION

A dry cleaning plant in the greater Cincinnati area will be sought which has an existing third generation machine and whose owner is able and willing to allow the installation of a local exhaust ventilation system on their unit. The building and machine will be evaluated to assure adequacy of the structure to physically support this installation (e. g., adequate roof structure and electrical service). NIOSH shall design and arrange for construction and installation of this LEV system at no cost to the owner of the dry cleaning plant.

### ENVIRONMENTAL MONITORING

The operator and other persons as deemed necessary by the industrial hygienist shall be monitored for a minimum of 3 days prior to the beginning of the LEV installation using the techniques described in section II A and B above to determine TWA and peak exposures to perc. This monitoring will be repeated for a minimum of 3 days after the installation of the LEV is completed and the system is operational.

### PLANT AND MACHINE INFORMATION

Background information will be collected as in section III above, prior to installation, and any changes in the facility will be documented with that installation. Data as indicated in Attachment 3 will be collected again during the post-intervention monitoring.

### DATA TREATMENT

Data treatment will be as in the first task, with a separate report being prepared for this facility documenting changes in exposure with the change in ventilation.

**ATTACHMENT 1  
SAMPLING DATA SHEET  
TWA SAMPLES**

FACILITY \_\_\_\_\_ DATE \_\_\_\_\_

\_\_\_\_\_ INVESTIGATOR \_\_\_\_\_

ADDRESS \_\_\_\_\_ TEMP. \_\_\_\_\_ R. H. \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

<u>NAME</u>	<u>JOB</u>	<u>PUMP NUMBER</u>	<u>FLOW RATE</u>	<u>SAMPLE NUMBER</u>	<u>START TIME</u>	<u>STOP TIME</u>	<u>DURATION</u>	<u>COMMENTS</u>
-------------	------------	------------------------	----------------------	--------------------------	-----------------------	----------------------	-----------------	-----------------






**ATTACHMENT 4**  
**PHYSICAL FACILITY INFORMATION**

FACILITY / CONTACT \_\_\_\_\_

INVESTIGATOR \_\_\_\_\_ DATE \_\_\_\_\_

ADDRESS \_\_\_\_\_

LOAD SIZE

TODAY \_\_\_\_\_

YESTERDAY \_\_\_\_\_

LAST WEEK \_\_\_\_\_

PRIOR DATES \_\_\_\_\_

PHONE \_\_\_\_\_

NO. OF EMPLOYEES \_\_\_\_\_ NO. OF SHIFTS \_\_\_\_\_

PPE IN USE \_\_\_\_\_ UNION SHOP \_\_\_\_\_

**DRY CLEANING EQUIPMENT:**

MANUFACTURER \_\_\_\_\_ MODEL \_\_\_\_\_ DATE OF PURCHASE \_\_\_\_\_

CONTROL DEVICES: \_\_\_\_\_

REPAIR HISTORY: \_\_\_\_\_

**COMMENTS (NOTE VISUAL OBSERVATIONS, LEAKS, OPERATOR TECHNIQUE, ETC.)**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Attachment 4, page 2

Building construction

Sq. Ft.  
Floor  
Walls

Age  
Roof  
Other

Fan

Type  
Inlet diam:  
Exh. diam:

Size  
SP  
SP

Collector

Type  
Inlet diam:  
Exh. diam:

Size  
SP  
SP



APPENDIX 2

SAMPLING AND ANALYTICAL METHOD FOR PERCHLOROETHYLENE IN AIR

(NMAM METHOD 1003, HALOGENATED HYDROCARBONS)



Table 1

MW: Table 1

CAS: Table 1

RTECS: Table 1

METHOD: 1003, Issue 2

EVALUATION: PARTIAL

Issue 1: 15 February 1984

Issue 2: 15 August 1994

OSHA: See TABLE 1

PROPERTIES: See TABLE 2

NIOSH: See TABLE 1

ACGIH: See TABLE 1

<b>COMPOUNDS:</b> benzyl chloride (synonyms in Table 1)	bromoform carbon tetrachloride chlorobenzene	chlorobromomethane chloroform o-dichlorobenzene p-dichlorobenzene	1,1-dichloroethane 1,2-dichloroethylene ethylene dichloride hexachloroethane	1,1,1-trichloroethane tetrachloroethylene 1,1,2-trichloroethane 1,2,3-trichloropropane
---------------------------------------------------------------	----------------------------------------------------	----------------------------------------------------------------------------	---------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------

SAMPLING		MEASUREMENT	
<b>SAMPLER:</b>	SOLID SORBENT TUBE (coconut shell charcoal, 100 mg/50 mg)	<b>TECHNIQUE:</b>	GAS CHROMATOGRAPHY, FID
<b>FLOW RATE:</b>	0.01 to 0.2 L/min	<b>ANALYTE:</b>	compounds above
<b>VOL-MIN:</b>	Table 3	<b>DESORPTION:</b>	1 mL CS <sub>2</sub> , stand 30 min
<b>-MAX:</b>	Table 3	<b>INJECTION VOLUME:</b>	5 µL
<b>SHIPMENT:</b>	routine	<b>TEMPERATURES:</b>	Table 4
<b>SAMPLE STABILITY:</b>	not determined	<b>CARRIER GAS:</b>	N <sub>2</sub> or He, 30 mL/min
<b>BLANKS:</b>	2 to 10 field blanks per set	<b>COLUMN:</b>	Table 4; alternates are SP-2100, Sp-2100 with 0.1% Carbowax 1500 or DB-1 fused silica capillary column
<b>ACCURACY</b>		<b>CALIBRATION:</b>	standard solutions of analyte in CS <sub>2</sub>
<b>RANGE STUDIED:</b>	see EVALUATION OF METHOD [1]	<b>RANGE:</b>	Table 4
<b>BIAS:</b>	see EVALUATION OF METHOD [1]	<b>ESTIMATED LOD:</b>	0.01 mg per sample [2]
<b>OVERALL PRECISION (S<sub>IT</sub>):</b>	see EVALUATION OF METHOD [1]	<b>PRECISION (S<sub>p</sub>):</b>	see EVALUATION OF METHOD
<b>ACCURACY:</b>	see EVALUATION OF METHOD [1]		

**APPLICABILITY:** See Table 3 for working ranges. This method can be used for simultaneous determination of two or more substances suspected to be present by changing gas chromatographic conditions (i.e., temperature program). High humidity during sampling will prevent organic vapors from being trapped efficiently on the sorbent and greatly decreases breakthrough volume.

**INTERFERENCES:** None identified. The chromatographic column or separation conditions may be changed to circumvent interferences.

**OTHER METHODS:** This method combines and replaces P&CAM 127 [3], S101 [4], S110 [5], S113 [6], S114 [7], S115 [8], S122 [9], S123 [10], S126 [11], S133 [12], S134 [13], S135 [14], S281 [15], S314 [16], S328 [17], S335 [18], S351 [19], and Method 1003 (dated 2/15/84).

**REAGENTS:**

1. Carbon disulfide, chromatographic quality.\*
2. Analyte, reagent grade.
3. Calibration stock solutions:
  - a. benzyl chloride, 10 mg/mL in *n*-heptane.
  - b. bromoform, 10 mg/mL in *n*-hexane.
  - c. *o*-dichlorobenzene, 200 mg/mL in acetone.
  - d. *p*-dichlorobenzene, 300 mg/mL in acetone.
  - e. hexachloroethane, 25 mg/mL in toluene.
4. Decane, *n*-undecane, octane or other internal standards (see step 6).
5. Nitrogen or helium, purified.
6. Hydrogen, prepurified.
7. Air, filtered.

\* See SPECIAL PRECAUTIONS.

**EQUIPMENT:**

1. Sampler: glass tube, 7 cm long, 6-mm OD, 4-mm ID, flame-sealed ends with plastic caps, containing two sections of 20/40 mesh activated (600 °C) coconut shell charcoal (front = 100 mg; back = 50 mg) separated by a 2-mm urethane foam plug. A silylated glass wool plug precedes the front section and a 3-mm urethane foam plug follows the back section. Pressure drop across the tube at 1 L/min airflow must be less than 3.4 kPa. Tubes are commercially available (e.g., SKC #226-01).
2. Personal sampling pump, 0.01 to 0.2 L/min, with flexible connecting tubing.
3. Gas chromatograph, FID, integrator and column (see Table 3).
4. Vials, 2-mL, glass, PTFE-lined septum crimp caps.
5. Volumetric flasks, 10-mL.
6. Syringes, 10- $\mu$ L, readable to 0.1  $\mu$ L.
7. Pipet, TD, 1-mL, with pipet bulb.

**SPECIAL PRECAUTIONS:** Carbon disulfide is toxic and a serious fire and explosion hazard (flash point = -30 °C). Work with it only in a hood. Several of the analytes are suspect carcinogens (Table 1). *n*-Heptane, *n*-hexane, and acetone are fire hazards.

**SAMPLING:**

1. Calibrate each personal sampling pump with a representative sampler in line.
2. Break the ends of the sampler immediately before sampling. Attach sampler to personal sampling pump with flexible tubing.
3. Sample at an accurately known flow rate between 0.01 and 0.2 L/min for a total sample size between the limits shown in Table 2.
4. Cap the samplers. Pack securely for shipment.

**SAMPLE PREPARATION:**

5. Place the front and back sorbent sections of the sampler tube in separate vials. Discard the glass wool and foam plugs.
6. Add 1.0 mL CS<sub>2</sub> to each vial. Cap each vial.  
NOTE: A suitable internal standard, such as decane [16], *n*-undecane [6,19], or octane [9,13,17] at 0.1% (v/v) may be added at this step and step 8.
7. Allow to stand 30 min with occasional agitation.

**CALIBRATION AND QUALITY CONTROL:**

8. Calibrate daily with at least six working standards over the appropriate range (Table 3).
  - a. Add known amounts of neat analyte or calibration stock solution to CS<sub>2</sub> in 10-mL volumetric flasks and dilute to the mark.
  - b. Analyze with samples and blanks (steps 11 and 12).
  - c. Prepare calibration graph (peak area vs. mg analyte).

9. Determine desorption efficiency (DE) at least once for each lot of charcoal used for sampling in the range of interest. Prepare three tubes at each of five concentrations plus three media blanks.
  - a. Remove and discard back sorbent section of a media blank sampler.
  - b. Inject a known amount (2 to 20  $\mu\text{L}$ ) of pure analyte, or calibration stock solution (see REAGENTS, 3.), directly onto front sorbent section with a microliter syringe.
  - c. Cap the tube. Allow to stand overnight.
  - d. Desorb (steps 5 through 7) and analyze together with working standards (steps 11 and 12).
  - e. Prepare a graph of DE vs. mg analyte recovered.
10. Analyze three quality control blind spikes and three analyst spikes to insure that the calibration graph and DE graph are in control.

#### MEASUREMENT:

11. Set gas chromatograph according to manufacturer's recommendations and to conditions given on page 1003-1 and in Table 3. Inject sample aliquot either manually using solvent flush technique or with autosampler.  
NOTE: If peak area is above the linear range of the working standards, dilute with  $\text{CS}_2$ , reanalyze and apply the appropriate dilution factor in calculations.
12. Measure peak area.

#### CALCULATIONS:

13. Determine the mass, mg (corrected for DE), of analyte found in the sample front ( $W_f$ ) and back ( $W_b$ ) sorbent sections and in the average media blank front ( $B_f$ ) and back ( $B_b$ ) sorbent sections.  
NOTE: If  $W_b > W_f/10$ , report breakthrough and possible sample loss.
14. Calculate concentration, C, of analyte in the air volume sampled, V (L):

$$C = \frac{(W_f + W_b - B_f - B_b) \cdot 10^3}{V}, \text{ mg/m}^3.$$

#### EVALUATION OF METHOD:

Laboratory testing was performed with spiked samples and generated atmospheres using SKC Lot 105 coconut shell charcoal [1]. Results were:

Compound	Range mg/m <sup>3</sup>	Sample Size	Bias %	Precision		Accuracy ± %	Desorption Efficiency	Ref.
				Overall	Measurement			
Benzyl chloride	2-8	10 L	-8.4	0.096	0.031	25.6	0.90 @ 0.03-0.1 mg	[8]
Bromoform	3-10	10 L	-1.3	0.071	0.043	14.0	0.80 @ 0.025 mg	[7]
Carbon tetrachloride	65-299	15 L	-1.6	0.092	0.037	18.0	0.96 @ 1.3-4.8 mg	[16]
Chlorobenzene	183-736	10 L	0.3	0.056	0.025	11.0	0.91 @ 1.8-7.1 mg	[12]
Chlorobromomethane	640-2655	5 L	3.4	0.061	0.051	14.0	0.94 @ 3.3-13 mg	[6]
Chloroform	100-416	15 L	1.3	0.057	0.047	11.6	0.97 @ 1.8-7.4 mg	[19]
<i>o</i> -Dichlorobenzene	150-629	3 L	-1.9	0.068	0.013	13.7	0.86 @ 0.5-1.9 mg	[14]
<i>p</i> -Dichlorobenzene	183-777	3 L	-4.3	0.052	0.022	12.5	0.91 @ 0.7-2.7 mg	[15]
1,1-Dichloroethane	212-838	10 L	2.6	0.057	0.011	12.4	1.01 @ 1.9-8 mg	[10]
1,2-Dichloroethylene*	475-1915	3 L	-2.9	0.052	0.017	11.3	1.00 @ 2.4-9.5 mg	[5]
Ethylene dichloride	195-819	3 L	-2.0	0.079	0.012	15.7	0.96 @ 0.6-2.5 mg	[9]
Hexachloroethane	5-25	10 L	-6.6	0.121	0.014	25.4	0.98 @ 0.05-0.2 mg	[4]
1,1,1-Trichloroethane	904-3790	3 L	-0.6	0.054	0.018	10.6	0.99 @ 2.9-11 mg	[17]
Tetrachloroethylene	655-2749	3 L	-7.2	0.052	0.013	15.1	0.96 @ 2.1-8 mg	[18]
1,1,2-Trichloroethane	26-111	10 L	-9.0	0.057	0.010	17.5	0.97 @ 0.3-1.2 mg	[13]
1,2,3-Trichloropropane	163-629	10 L	2.1	0.068	0.027	14.2	0.95 @ 1.5-6 mg	[11]

\*isomer used (i.e., cis- or trans-) in evaluation unknown.

## REFERENCES:

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- [2] User check, UBTL, NIOSH Sequences #3990-T, 3990-U and 3990-W (NIOSH, unpublished, November 3, 1983) and 4304-J (NIOSH, unpublished, April 3, 1984).
- [3] NIOSH Manual of Analytical Methods, 2nd ed., V. 1., P&CAM 127, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-157-A (1977).
- [4] *Ibid.*, V. 2., S101, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-157-B (1977).
- [5] *Ibid.*, S110.
- [6] *Ibid.*, S113.
- [7] *Ibid.*, S114.
- [8] *Ibid.*, S115.
- [9] *Ibid.*, S122.
- [10] *Ibid.*, S123.
- [11] *Ibid.*, S126.
- [12] *Ibid.*, S133.
- [13] *Ibid.*, S134.
- [14] *Ibid.*, V. 3, S135, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-157-C (1977).
- [15] *Ibid.*, S281.
- [16] *Ibid.*, S314.
- [17] *Ibid.*, S328.
- [18] *Ibid.*, S335.
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- [20] NIOSH/OSHA Occupational Health Guidelines for Chemical Hazards, U.S. Department of Health and Human Services, Publ. (NIOSH) 81-123 (1981), available as Stock #PB83-154609 from NTIS, Springfield, VA 22161.
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- [27] Criteria for a Recommended Standard...Occupational Exposure to 1,1,1-Trichloroethane, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 76-184 (1976).
- [28] Criteria for a Recommended Standard...Occupational Exposure to Tetrachloroethylene (Perchloroethylene), U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 76-185 (1976).

## METHOD REVISED BY:

G. David Foley and Yvonne T. Gagnon, NIOSH/DPSE; methods originally validated under NIOSH Contract CDC-99-74-45.

TABLE 1. GENERAL INFORMATION.

Compound RTECS	Synonyms	OSHA/NIOSH/ACGIH (ppm)
Benzyl chloride <sup>a</sup> (C <sub>6</sub> H <sub>5</sub> CH <sub>2</sub> Cl); XS8925000	(chloromethyl) benzene; α-chlorotoluene; CAS #100-44-7	1/C 1.0/1
Bromoform (CHBr <sub>3</sub> ); PB5600000	tribromomethane; CAS #75-25-2	0.5 (skin)/0.5 (skin)/0.5 (skin)
Carbon tetrachloride <sup>ab</sup> (CCl <sub>4</sub> ); FG4900000	tetrachloromethane; CAS #56-23-5	10, C 25/STEL 2 (1 h)/5 (skin)
Chlorobenzene (C <sub>6</sub> H <sub>5</sub> Cl); CZ0175000	monochlorobenzene; phenyl chloride; CAS #108-90-7	75/-/10
Chlorobromomethane (CH <sub>2</sub> BrCl); PAS250000	bromochloromethane; Halon 1011; CAS #74-97-5	200/200/200
Chloroform <sup>ab</sup> (CHCl <sub>3</sub> ); FS9100000	trichloromethane; CAS #67-66-3	C 50/STEL 2/10
p-Dichlorobenzene <sup>c</sup> (1,2-C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub> ); CZ4500000	1,2-dichlorobenzene; CAS #95-50-1	50/C 50/25 (skin); STEL 50
p-Dichlorobenzene <sup>ac</sup> (1,4-C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub> ); CZ4550000	1,4-dichlorobenzene; CAS #106-46-7	75/1.7 (LOQ)/75, STEL 110
1,1-Dichloroethane (CH <sub>3</sub> CHCl <sub>2</sub> ); KI0175000	ethylidene chloride; CAS #75-34-3	100/100/100
1,2-Dichloroethylene (ClCH=CHCl); KV9360000	acetylene dichloride; 1,2-dichloroethene; CAS #540-59-0	200/200/200
Ethylene dichloride <sup>ab</sup> (ClCH <sub>2</sub> CH <sub>2</sub> Cl); KI0525000	1,2-dichloroethane; CAS #107-06-2	50, C 100/1, STEL 2/10
Hexachloroethane <sup>ac</sup> (CCl <sub>3</sub> CCl <sub>3</sub> ); KI4025000	perchloroethane; CAS #67-72-1	1 (skin)/1/1 (skin)
1,1,1-trichloroethane (CH <sub>3</sub> CCl <sub>3</sub> ); KJ2975000	methyl chloroform; CAS #71-55-6	350/C 350/350, STEL 450
Tetrachloroethylene <sup>ab</sup> (Cl <sub>2</sub> C=CCl <sub>2</sub> ); KX3850000	perchloroethylene; CAS #127-18-4	100, C 200, P 300/0.4 (LOQ)/ 25, STEL 100
1,1,2-Trichloroethane <sup>ad</sup> (Cl <sub>2</sub> CHCH <sub>2</sub> Cl); KJ3150000	vinyl trichloride; CAS #79-00-5	10 (skin)/10 (skin)/10 (skin)
1,2,3-Trichloropropane <sup>a</sup> (CH <sub>2</sub> ClCHClCH <sub>2</sub> Cl); TZ9275000	allyl trichloride; glycerol trichlorohydrin; CAS #96-18-4	50/10 (skin)/10 (skin)

<sup>a</sup>Suspect carcinogen [20,21,22]; <sup>b</sup>Group I Pesticide; <sup>c</sup>Group II Pesticide; <sup>d</sup>Group III Pesticide

TABLE 2. PHYSICAL PROPERTIES

Compound RTECS	M.W.	mg/m <sup>3</sup> = 1 ppm @ NTP	Synonyms	Properties
Benzyl chloride (C <sub>6</sub> H <sub>5</sub> CH <sub>2</sub> Cl)	126.58	5.17	(chloromethyl) benzene; -chlorotoluene	liquid; BP 179 °C; MP -48 to -43 °C; d 1.100 @ 20 °C; flash pt. 67 °C
Bromoform (CHBr <sub>3</sub> )	252.75	10.33	tribromomethane	liquid, d 2.887; BP 148 °C; nonflammable
Carbon tetrachloride (CCl <sub>4</sub> )	153.84	6.29	tetrachloromethane	liquid; d 1.585; BP 76.7 °C; FP -23.0 °C; VP 91.3 mm @ 20 °C; vapor density (air = 1) 5.3
Chlorobenzene (C <sub>6</sub> H <sub>5</sub> Cl)	112.56	4.60	monochlorobenzene; phenyl chloride	liquid; d 1.105 @ 25 °C; BP 131.6 °C; MP -45 °C; flash pt. 29.4 °C (CC)
Chlorobromomethane (CH <sub>2</sub> BrCl)	129.39	5.29	bromochloromethane; Halon 1011	liquid; d 1.93 @ 20 °C; BP 68 °C; MP -88 °C; nonflammable
Chloroform (CHCl <sub>3</sub> )	119.39	4.88	trichloromethane	liquid, d 1.485 @ 20 °C; BP 61.2 °C; FP -63.5 °C
o-Dichlorobenzene (1,2-C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub> )	147.00	6.01	1,2-dichlorobenzene	liquid; d 1.284; BP 172 to 179 °C; FP -17 °C; flash pt. 65.5 °C
p-Dichlorobenzene (1,4-C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub> )	147.00	6.01	1,4-dichlorobenzene	solid crystals; d 1.458; BP 173.7 °C; MP 53 °C; sublimes; flash pt. 65.5 °C
1,1-Dichloroethane (CH <sub>3</sub> CHCl <sub>2</sub> )	98.95	4.05	ethylidene chloride	liquid, d 1.174 @ 20 °C; BP 57 to 59 °C; FP -98 °C
1,2-Dichloroethylene (ClCH=CHCl)	96.94	3.96	acetylene dichloride; 1,2-dichloroethene	liquid; trans isomer; d 1.257; BP 47 to 49 °C; MP -57 °C; cis isomer; d 1.282; BP 58 to 60 °C; flash pt. 3.9 °C; FP -80 °C
Ethylene dichloride (ClCH <sub>2</sub> CH <sub>2</sub> Cl)	98.96	4.05	1,2-dichloroethane	liquid; d 1.2554 @ 20 °C; BP 83.5 °C; FP -35.5 °C; flash pt. 13 °C; explosive limits in air 6 to 16%
Hexachloroethane (CCl <sub>3</sub> CCl <sub>3</sub> )	236.74	9.66	perchloroethane	solid; d 2.091; MP 185 °C; BP sublimes at 187 °C
1,1,1-trichloroethane (CH <sub>3</sub> CCl <sub>3</sub> )	133.42	5.45	methyl chloroform	liquid; d 1.325; BP 75 °C; FP -30.4 °C; nonflammable
Tetrachloroethylene (Cl <sub>2</sub> C=CCl <sub>2</sub> )	165.83	6.78	perchloroethylene	liquid; d 1.625 @ 20 °C; BP 121 °C; FP -22.4 °C
1,1,2-Trichloroethane (Cl <sub>2</sub> CHCH <sub>2</sub> Cl)	133.41	5.45	vinyl trichloride	liquid; d 1.4432 @ 20 °C; BP 113.7 °C; FP -36.4 °C; VP 19 mm Hg @ 20 °C
1,2,3-Trichloropropane (CH <sub>2</sub> ClCHClCH <sub>2</sub> Cl)	147.43	6.03	allyl trichloride; glycerol trichlorohydrin	liquid; d 1.3888 @ 20 °C; BP 156.2 °C; FP -15 °C; flash pt. 82.2 °C (OC)

TABLE 3. SAMPLING LIMITS.

Compound	Air Sample Volume (L)			Working Range, ppm, at Max Sample Volume
	Min	Max	Target	
Benzyl chloride	6 @ 1 ppm	50	10	0.6 to 5.8
Bromoform	4 @ 0.5 ppm	70	10	0.2 to 4
Carbon tetrachloride	3 @ 10 ppm	150	15	2 to 105
Chlorobenzene	1.5 @ 75 ppm	40	10	10 to 430
Chlorobromomethane	0.5 @ 200 ppm	8	5	18 to 450
Chloroform	1 @ 50 ppm	50	15	2 to 190
<i>o</i> -Dichlorobenzene	1 @ 50 ppm	60	3	16 to 1100
<i>p</i> -Dichlorobenzene	1 @ 75 ppm	10	3	27 to 330
1,1-Dichloroethane	0.5 @ 100 ppm	15	10	4 to 250
1,2-Dichloroethylene	0.2 @ 200 ppm	5	3	16 to 560
Ethylene dichloride	1 @ 50 ppm	50	3	16 to 1320
Hexachloroethane	3 @ 1 ppm	70	10	0.3 to 8.3
1,1,1-Trichloroethane	0.1 @ 350 ppm	8	3	18 to 1450
Tetrachloroethylene	0.2 @ 100 ppm	40	3	9 to 1900
1,1,2-Trichloroethane	2 @ 10 ppm	60	10	1.8 to 64
1,2,3-Trichloropropane	0.6 @ 50 ppm	60	10	3 to 310

TABLE 4. MEASUREMENT PARAMETERS.

Compound	Column*	Temp. (°C)	Range (mg per sample)
		Column/Injector/Detector	
Benzyl chloride	A	160/170/210	0.02 to 0.15
Bromoform	A	130/170/210	0.02 to 0.15
Carbon tetrachloride	B	60/155/200	0.2 to 7
Chlorobenzene	A	105/190/250	0.4 to 10
Chlorobromomethane	A	80/170/210	0.5 to 15
Chloroform	B	75/155/200	0.4 to 11
<i>o</i> -Dichlorobenzene	C	140/225/250	0.1 to 3
<i>p</i> -Dichlorobenzene	A	140/225/275	0.2 to 4
1,1-Dichloroethane	A	50/100/175	0.4 to 12
1,2-Dichloroethylene	A	60/170/210	0.2 to 7
Ethylene dichloride	C	70/225/250	0.1 to 4
Hexachloroethane	D	110/170/210	0.02 to 0.3
1,1,1-Trichloroethane	C	70/225/250	0.6 to 17
Tetrachloroethylene	C	90/225/250	0.4 to 12
1,1,2-Trichloroethane	C	70/250/225	0.05 to 2
1,2,3-Trichloropropane	E	160/180/230	0.3 to 9

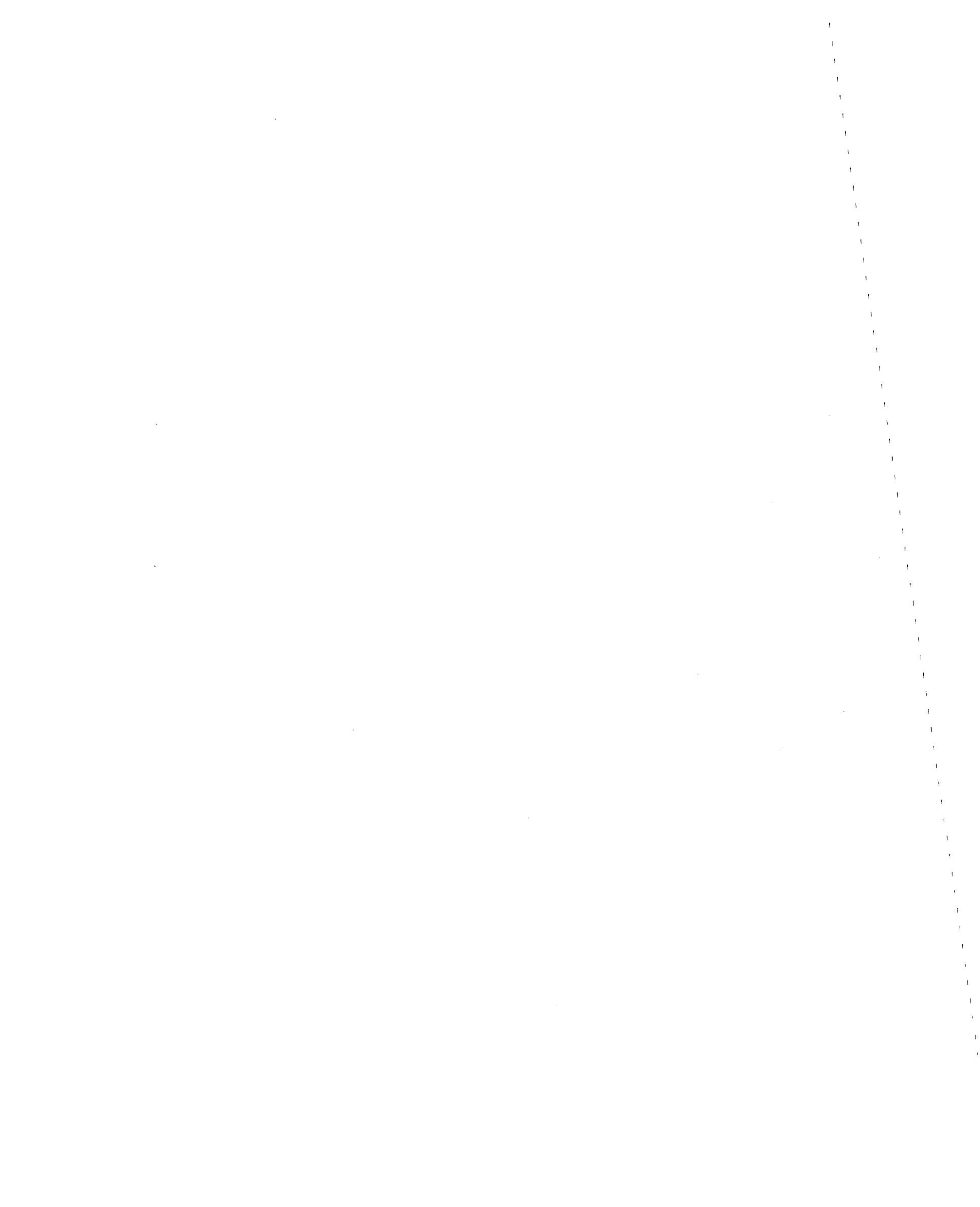
\*A = 3 m x 3-mm OD stainless steel, 10% SP-1000 on 80/100 mesh Chromosorb WHP.

B = 6 m x 3-mm OD, otherwise same as A.

C = 3 m x 3-mm OD stainless steel, 10% OV-101 on 100/120 mesh Chromosorb WHP.

D = 3 m x 6-mm OD glass, 3% SP-2250 on 80/100 mesh Chromosorb WHP.

E = 3 m x 3-mm OD stainless steel, 10% FFAP on 80/100 mesh Chromosorb WHP.



APPENDIX 3A

SAMPLE COLLECTION BOOK

SHOP F



Dell Tech Support CFRA9 = Service Tag  
208-911-69 = Equipment Service Code

NIOSH

**PERCHLOROETHYLENE  
DRY CLEANING STUDY**

FACILITY \_\_\_\_\_

CITY Long Beach, CA

PHONE \_\_\_\_\_

OWNER / OPERATOR \_\_\_\_\_

423

Ed Burroughs  
NIOSH  
4676 Columbia Pkwy.  
Cincinnati, OH 45226  
513-841-4275  
geb1@cdc.gov

# REAL - TIME MONITORING SAMPLING DATA SHEET

E.

INVESTIGATOR RA DATE 2/3/98

INTRUMENT I. D. EDPA326

DATA FILE NAME(S): \_\_\_\_\_

CAL. GAS SOURCE SCOTT

CONCENTRATION 198 PPM

INSTRUMENT RESPONSE 198

ZERO SET WITH OUTSIDE A.R.

COMPUTER I. D. \_\_\_\_\_

DISK I. D. \_\_\_\_\_

TIME	EVENT	PPM	TIME	EVENT	PPM
6:55	IN PRODUCTION AREA IN STACK OF PAPER - UP TO N50	0 - 0.5			
7:30	IN FINISHED CLOTHES - BACK TO FOR DELIVERY	0 -			
7:55 - 8:02	UNLOAD & LOAD - MACHINE 2 PAPER - <del>TRUCK</del> IN BZ OF MARIA UNLOADING TRUCK INSIDE OCEAN; MACHINE 1 NOT - BZ OF MARIA, UP TO ~ 1300 PPM DURING LOADING				
~ 8:50	DEMO RUN FOR STEVE MATTHEWS UNLOAD/LOAD - MACHINE 1,				
9:01 - 9:10	THRU MACHINE 2, ALL REMAINING IN BZ. OF OPERATOR				
9:10 - 9:15	UNLOAD/LOAD MACHINE 2 monitored Jose sitting clothes turned off for short time				
10:18 - 10:22	UNLOAD/LOAD MACHINE 1 ONLY ~ 10:20 BZ JOSE, WHAT SINKS IN <del>TRUCK</del> HANITS				
During lunch	fills were changed at 1 Machine -				
~ 12:45	Machine 2 - UNLOAD/LOAD turned off between				
1:00	Machine 1 - UNLOAD/LOAD				
2:13	MACHINE 1 - UNLOAD/LOAD THRU				
14:58	CAL CHECK : ROOM AIR READS 0 198 CAL GAS READS 196				



*NO DEPENDENT PASSIVE SAMPLER USE*

**PASSIVE SAMPLER LOG**  
**NIOSH PERCHLOROETHYLENE STUDY**

FACILITY \_\_\_\_\_ PHONE \_\_\_\_\_  
 FOR QUESTIONS OR COMMENTS CALL:  
ADDRESS \_\_\_\_\_ Ed Burroughs - 513-841-4275  
 NIOSH  
 4676 Columbia Pkwy.  
 Cincinnati, OH 45226

BADGE #	DATE	JOB TITLE	TIME		WEIGHT OF LOAD (IN POUNDS)						COMMENTS		
			ON	OFF	1	2	3	4	5	6			
LL-1	2/6/98	Pruner	6:30	3:30									
LL-2	2/8	"	7:00	3:00									
LL-3	2/9	"	6:30	4:00									
MH-1	2/5	Operator	6:00	2:30									
MH-2	2/6	"	6:00	2:30									
MH-3	2/9	"	6:00	4:00									
JS-1	2/6	operator/sorters Harvest	8:00	4:30									
JS-2	2/8	"	8:00	4:30									
JS-3	2/9	"	8:00	4:30									

2/9 E-HL task

Downloaded from F112

after circuitry to computer  
had no sense

Access to Hepa terminal - , Photosac -

2020

linked  
~~copy of text~~

of to PIP - a - Acad

**PHYSICAL FACILITY INFORMATION**

**FACILITY / CONTACT**

INVESTIGATOR LE DATE 2-4-76

**ADDRESS**

**LOAD SIZE**

TODAY \_\_\_\_\_

YESTERDAY \_\_\_\_\_

LAST WEEK \_\_\_\_\_

**PHONE**

NO. OF EMPLOYEES 30 NO. OF SHIFTS 2 - week ends included PRIOR DATES \_\_\_\_\_

PPE IN USE None - company - gloves - chlorine pre spots

UNION SHOP AFK-CIC

**DRY CLEANING EQUIPMENT:**

MANUFACTURER Kenazee MODEL 450 DATE OF PURCHASE Byrs Ltd

CONTROL DEVICES: the per detection device which prevents the doors from opening is disabled cause of malfunction - this device was replaced by a new one

REPAIR HISTORY: \_\_\_\_\_

**COMMENTS (NOTE VISUAL OBSERVATIONS, LEAKS, OPERATOR TECHNIQUE, ETC.)**

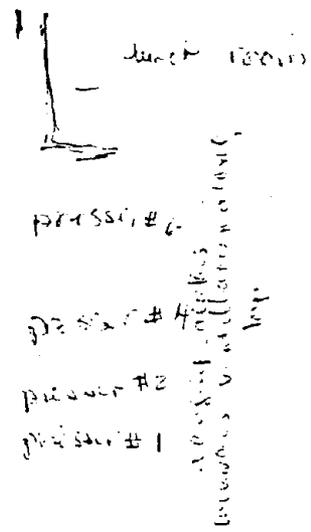
no leaks - photo the PIP lined during door opening - see way

2 - Rengucci Sp.A. C/3 Di Castella (PG) Italy Tel. (075) 455-0077  
 (Green Multi ser b<sup>®</sup> - only one has this color #2) Tel. 661095  
 6 pound machines - like called "Patrici System 650" Rengucci  
 ~ 2 yrs old - 3 1/2

10 min wash cycle } 45-1 hr  
 drying depends on } length  
 part units? } cycle

but not opens after 70000

Piston tray cleaned  
 every 2 hrs  
 \$5/gal to replace of  
 cleaning water  
 500 wash 1/2 hr  
 times - 12 min  
 Cook still same



(T) is meant to be tightly  
 mesh using still  
 cleaning - try about  
 1 hour impossible then  
 get on it

LOADING RECORD

First load @ 600 of Machine  
 and second @ 700  
 and @ 800

Edwards 10 @ 810  
 Machine 2 -  
 unloading 50 ppm  
 unloading 50 ppm  
 loading 70 ppm  
 unloading 130 ppm  
 loading 90 ppm

unloading 50 ppm  
 when the person down on extracting machine

- 4 9:00
- 5 10:00
- 6 11:00 - not recorded
- 12:00 ~~not recorded~~
- 8 1:55 - not recorded

LOPS 200

MACHINE 1: MON 2/2 - 12 LOADS (11 X 60 LB, 1 X 50 LB)  
TUES 2/3 -

MACHINE 2: MON - 12 LOADS (10 X 60 LB, 1 X 50, 1 X 30 LB)  
Tues - 10 loads (9 X 60 LB, 1 X 30 LB)

## Texas Notes

Back door open @ 7:15 a

The multi-sub was cleaned on both machines last night  
for owner to see if it improved exposures today



Boysen T.F. 11  
 500 575-152

**SAMPLING DATA SHEET**  
**TWA SAMPLES**

DATE 2/4/98  
 INVESTIGATOR EB - LE  
 TEMP. 47.9 R.H. 44% @ 6:05  
71.0 41% @ 15:00

FACILITY \_\_\_\_\_  
 ADDRESS \_\_\_\_\_

NAME	JOB	PUMP NUMBER	FLOW RATE	SAMPLE NUMBER	START TIME	STOP TIME	DURATION	COMMENTS
MARIA HERRERA	Operator <del>Presser #1</del>	1917	96 98-99	F11	6:05	3:00		8 540
LEDIA LOYA	Presser #6	1904	104-98	F12	6:07	3:30		8
AREA-Computer		9044	100-97	F13	6:39	3:32		912
MARTHA GONZALES	Presser #1	9052	102-98	F14	6:41	3:33		8.75
MARIA PEREZ	Presser #4	9050	100-95	F15	6:44	3:20		10.91 (first day she worked - not started)
ROSA-PEREZ	Presser #3	9046	91-	F16	6:45	7:34		11.70 - pump holder broke
Area-Computer		9058	99-96	F17	7:39	3:30		
JOSÉ SANTIAGO	Operator - Sorter	9056	100-97	F18	7:54	3:30		10.70 - Same tube and release - no pump
ROSALBA PEREZ	#2	11914	104-91	F16	7:34	5:15		

(9053\* 101 - not used)  
 F16 retest 7:00

**SAMPLING DATA SHEET  
TWA SAMPLES**

FACILITY \_\_\_\_\_ DATE 2/3/98  
 INVESTIGATOR EB, LE  
 TEMP. 70°F R.H. 34%  
70°F 42% (near machinery)  
3:30 AM 6:50 AM 4:00

LOJIC TWEAC 3 863

NAME	JOB	PUMP NUMBER	FLOW RATE	SAMPLE NUMBER	START TIME	STOP TIME	DURATION	COMMENTS
MARIA HENRERA	CRATER	1914	106 106 106	F1	6:10	11:23 2:23	3:13 min	PUMP FAULT @ 3:44.7 min
LUDIA LOYA	PRESSURE # 6	9050	101	F2	6:14	3:05	5:36.7	
ROSA PEREZ	PRESSURE # 2	11905	100	F3	6:46	3:03	3:29.7	PUMP FAULT @ 7:53 min RESET @ 9:38
AREA	COMPUTER STATION	1904	102	F4	7:46	3:07	NO READING	
MARTHA GONZALES	PRESSURE # 1	9044	101	F5	6:42	3:04	5:06.3	
ALEJANDRINA ALCANDER	PRESSURE # 3	9052	102	F6	6:45	3:04	5:01.6	
AILEA	BP COVER ABOVE 1507000 MAP	9046	93	F7	7:49	3:09	4:39.8	
JOSE SARMIENTO	COMPUTER STATION	9053	101	F8	8:12	9:35	<del>3:23</del>	PUMP FAULT @ 24:22 min TWA TIME =
"	"	1917	102 101 100	F9	10:11	3:50	3:10	

APPENDIX 3B

SAMPLE COLLECTION BOOK

SHOP N



NIOSH

**PERCHLOROETHYLENE  
DRY CLEANING STUDY**

**FACILITY** \_\_\_\_\_

**CITY** Long Beach, CA

**PHONE** 562-2

**OWNER / OPERATOR** \_\_\_\_\_

Ed Burroughs  
NIOSH  
4676 Columbia Pkwy.  
Cincinnati, OH 45226  
513-841-4275  
geb1@cdc.gov

# SAMPLING DATA SHEET TWA SAMPLES

FACILITY

DATE 2/4/98

ADDRESS

INVESTIGATOR RS

ADDRESS

TEMP. 55°F R.H. 32% outside 5:00

Area

70 40 1st floor

Low level, CA

70 35 outside 1:45

NAME	JOB	PUMP NUMBER	FLOW RATE	SAMPLE NUMBER	START TIME	STOP TIME	DURATION	COMMENTS
ATARIO	WASHER	9045	99	N1	7:22	2:18	44.7	9:11 1:11 10:22 2:08 8:21/10:56
AREA	WATER COVER, 2' IN DIAMETER, IN RECEPTION	1929	99	N2	7:33	2:22	40.7	8:21 10:56 9:13 12:54 10:28 2:10
AREA	WATER COVER, 2' IN DIAMETER, IN RECEPTION, FLOOR AREA	9054	102	N3	7:40	2:27	40.5	8:22 10:58 9:13 2:12 10:28 2:08
BONIFEDIO "CAITO"	C. P. AREA	9048	101	N4	7:46	2:20	39.0	8:22 12:54 9:11 2:08 10:28 2:08
JAMINE	ASSEMBLY	1902	103	N5	7:52	2:18	DISMANTLY WATER REACT	8:20 1:05 9:14 2:16 10:28 2:08
FRANCISCO	PRESSER	9043	101	N6	7:54	2:20	37.5	8:20 10:56 9:12 12:54 10:28 2:08
MARTIN	PRESSER	9051	103	N7	7:57	2:21	38.5	8:20 12:54 9:12 2:08 10:28 2:08







# REAL - TIME MONITORING SAMPLING DATA SHEET

FACIL: \_\_\_\_\_

INVESTIGATOR EB

DATE 2/4/98

1

INTRUMENT I. D. 601325

DATA FILE NAME(S): \_\_\_\_\_

CAL. GAS SOURCE SCOTT

CONCENTRATION 198 PPM

INSTRUMENT RESPONSE 198

ZERO SET ON OUTSIDE AIR

COMPUTER I. D. \_\_\_\_\_

DISK I. D. \_\_\_\_\_

TIME	EVENT	PPM	TIME	EVENT	PPM
7:28	CALIBRATION		11:52	IN MACHINE AREA	0-1
	IN AREA OF 400 - WORKING	<1.0	11:53	IN LAUNDRY AREA	0
8:00	ARRIVED, FIRST LOAD IN MACHINE		11:54	IN HANDING AREA	0
8:04	WEAR SPOTTING TRUCK	0	11:55	IN PRESSING AREA	0
8:05	UNLOAD SMALL MACHINE		11:56	IN MACHINE AREA - 2:00:15	
8:05-8:07	HANDING SMALL LOAD	0-10		RUNNING + UNLOADING	
8:00-8:10	UNLOAD/LOAD LINDS	0-30	11:59-2:00	UNLOAD LINDS	
8:15-8:16	BE OF OPERATOR, HANDING LINDS LOAD	0-30	2:00-	OPERATORS BE, HANDING LINDS	
9:00	GENERAL AREA IN FRONT OF MACHINES, BEHIND IN OPERATION		2:04	OP BE CLEANING LINT FILTER	
9:02-03	UNLOAD/LOAD LINDS (IN EMPTY ROOM 6-800 PPM)		2:05	HANDING LOAD - OP. BE	
9:04-9:10	IN FRONT OF LINDS		2:06	GEN. AREA	
9:45	DEMO IN FRONT OF MACHINES	0-1	3:02	CAL CR - 0 = 0	198 PPM 193
10:38	BOTH IN OPERATION	0			
10:46-48	UNLOAD/RELOAD LINDS (NEW LOAD ~ 20:13)				60 PPM
10:50-56	BE OF OPERATOR, HANDING LINDS LOAD				
11:02	UNLOAD/LOAD LINDS - 45° OUT, 60° IN				
11:05-1:10	BE OF OPERATOR + PRESSER HANDING LOAD				

# REAL - TIME MONITORING SAMPLING DATA SHEET

FACILITY

N

INVESTIGATOR

EB/CC

DATE

2/5/92

INTRUMENT I. D.

325

DATA FILE NAME(S):

CAL. GAS SOURCE

SCOTT

CONCENTRATION

198 PPM Tolu

INSTRUMENT RESPONSE

198

ZERO SET

using outside air

COMPUTER I. D.

94216

DISK I. D.

PHOTOGRAPH 2021 199A

TIME	EVENT	PPM	TIME	EVENT	PPM
------	-------	-----	------	-------	-----

8:02 CALIBRATION

ROOM MAINTENANCE OPERATIONS

8:17 BREAK IN PLANT OF MACHINES 0-

8:23 UNLOAD LINDAS 60# - (ALSO 30#)

8:25 LEAD - 60#

8:26 OPERATIONS BE WHILE MAINT

MAINT LINDAS LEAD

8:32 UNLOAD OMEGA 30# (40#)

8:33 MAINT OMEGA LEAD

(OPERATIONS BE)

8:36 LEAD UNLOAD - 10# (ALSO 50#)

8:38 LEAD TIME IN PLANT

OR MAINTENANCE

8:38-8:39 STOP WORK

- 9:23 (U) load bundles 60#

(Load - air flow in plant < 50 fpm)

9:23 - sorting clothes (auto)

9:34 - unloaded coriza machine

9:35 - general machine

9:35 - sorting clothes

9:38 general machine all

9:40 - off -

10:37 CAL CHECK - 198 PPM STD 10-115 193

11:01 - UNLOAD LINDAS - 60# - OPERATIONS BE

11:02 - RELOAD - 60#

11:03 - OPERATIONS BE WHILE MAINT LINDAS

11:09 - UNLOAD OMEGA 30# (40#) SMALL 20#

11:12 - off

11:42 - unload bundles

11:43 - off

11:49 - unloaded coriza machine 30# (40#) (ALSO 50#) (ALSO 50#)

11:54 - off

12:04 - lead bundles

12:11 - lead bundles - sort machine

12:15 - stop

12:15 - stop

12:15 - stop

12:15 - stop

12:15 - UNLOAD LINDAS

12:15 - LEAD " 60#

12:16 - 60# first in plant of LINDAS

UNLOAD OMEGA 30# (40#) (ALSO 50#)

151 - Background - in front of LINDAS

152 - Unload bundles - 60#

154 - Background

156 - off - LEAD - unsorted

2:35 - lead - bundles

3:25 unload - bundles

3:29 lead bundles 30# (40#)

3:30 sorting clothes

3:36 - end

PHYSICAL FACILITY INFORMATION

FACILITY / CONTACT \_\_\_\_\_ INVESTIGATOR RB DATE 2/4/97

LOAD SIZE

TODAY \_\_\_\_\_  
YESTERDAY \_\_\_\_\_  
LAST WEEK \_\_\_\_\_

NO. OF EMPLOYEES \* \_\_\_\_\_ NO. OF SHIFTS / \_\_\_\_\_  
PPE IN USE Name \_\_\_\_\_ UNION SHOP \_\_\_\_\_

DRY CLEANING EQUIPMENT:

MANUFACTURER Lindos MODEL 5600 DATE OF PURCHASE July '97 (insurance)

CONTROL DEVICES: Repair kit (condenser & carbon adsorbent)

REPAIR HISTORY: \_\_\_\_\_

COMMENTS (NOTE VISUAL OBSERVATIONS, LEAKS, OPERATOR TECHNIQUE, ETC.)

\* NO. OF EMPLOYEES - Plant - 3 Pressers, 1 operator, 1 Assly, 1 washer, 2 change pressers = 7 total

~20' 3' E' WIDE  
REAR

**Building construction**

Sq. Ft.             
 Floor CONCRETE  
 Walls BRICK

Age             
 Roof METAL  
 Other           

Fan -  
 Type             
 Inlet diam:             
 Exh. diam:           

Size  
 SP             
 SP           

Collector  
 Type             
 Inlet diam:             
 Exh. diam:           

Size  
 SP             
 SP           

DOOR

26' x 10'

PROVISION FOR AIR CLEAN

3 PROVISIONS

PLASTERED PART

DOOR

DOOR  
 14' HIGH  
 3' WIDE

LABORATORY

DOOR  
 14' HIGH  
 3' WIDE

WORK TABLE

WOODS  
 10' x 10'  
 10' x 10'

N-50'

55.5'

PERC PLANT

N 1/8' HIGH @ PERC

W 1/2' HIGH



Drying chemicals - no gasses

Extractor (centrifuge) needed - manually stopped it with handle - too hot

Boats - basins

Operators in this step do not always close machine doors to prevent loading & unloading

Foundry - if needed is recorded on machine

2nd charcoal filter has not been added - not a requirement

Stills cleaned 1x/week - fan activated during that time

Small charcoal - not regenerated

Interlocks on doors not keyed to prevent doors - but can open door by turning off machine & setting interlock button at control then can open door

50 gal/hr/mc  $\frac{1000}{1000000}$  8 sec 600/day x 24 days/mc

1 unit ~~per hour~~ 100 gal/hr  $\frac{100}{1000000}$  1000000

2nd no interlocking system - completely new system - just install it

Labels a maintenance form to maintain machine but still in process - computerize

APPENDIX 3C

SAMPLE COLLECTION BOOK

SHOP L



2/17 & 18, 1998

NIOSH

PERCHLOROETHYLENE  
DRY CLEANING STUDY

FACILITY \_\_\_\_\_

CITY SAN FRANCISCO

PHONE \_\_\_\_\_

OWNER / OPERATOR C

Ed Burroughs  
NIOSH  
4676 Columbia Pkwy.  
Cincinnati, OH 45226  
513-841-4275  
geb1@cdc.gov

**SAMPLING DATA SHEET  
TWA SAMPLES**

FACILITY

DATE 2/17/98  
INVESTIGATOR EP / LE

at CECILIA

NAME	JOB	PUMP NUMBER	ce/min FLOW RATE	C.T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION	COMMENTS
QUANG	OPERATOR	9058	97 92-Pot	L1	L1	8:24	2:28	363	12:20 1:28
CECILIA	control room	9014	99 97-Pot	L2	L2	8:20	12:38	252	
LAIMAN	Accreditations - on second floor	9050	98 96-Pot	L3	L3	8:29	2:18	349	12:20 1:30
LUIS	AREA - B2 control ~ 2' outside area	9045	99 98-Pot	L4	L4	8:30	2:23	297	12:18 1:29
LUIS	AREA - B2 control TO CONT. OF MACHINE	9048	98 90-Pot	L5	L5	9:03	2:26	301	12:19 1:30

BLANK L-RL

**SAMPLING DATA SHEET  
TWA SAMPLES**

FACILITY \_\_\_\_\_ DATE 2/18/98  
INVESTIGATOR LE/EB/KT

NAME	JOB	PUMP NUMBER	FLOW RATE cc/min	C. T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION	COMMENTS
Jeannie	operator	9058	<del>97(pp)</del> 94 post	L6	L6	8:03	10:56	174	
LAI MAN	alterations upstairs	9044	98(pp) -96 post	L7	L7	8:10	14:30	<del>369</del> 370	
CECELIA	front counter	9048	95(pp)	L8	L8	8:14	12:48	2746	
Area -	within machine containment	9045	99(pp) 92 post	L9	L9	8:29	2:140	371	
Area	but stock containment	9050	99(pp) 96 post	L10	L10	8:30	17:35	<del>9050</del> 367	
Quang	operator - came in late -	9058	97 92	L11	L11	11:03	14:45	223	

*IN DE PEARSON - P.F. SIDE - SAMPLES*

**SAMPLING DATA SHEET  
TWA SAMPLES**

FACILITY \_\_\_\_\_ DATE \_\_\_\_\_ INVESTIGATOR \_\_\_\_\_

NAME	JOB	PUMP NUMBER	FLOW RATE	C.T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION	COMMENTS
2/19	OPERATOR			—	J1	8:00	6:00		
2/20	"			—	J2	7:30	5:00		
2/21	"			—	J3	8:00	6:00		
2/19 (MARRCO 1/19)	OPERATOR			—	Q1	8:00	4:45		
2/20	"			—	Q2	8:00	4:45		
2/21	"			—	Q3	8:30	5:00		
					L-BLK	—	—		



# REAL - TIME MONITORING SAMPLING DATA SHEET

I

INVESTIGATOR LME DATE 2/18/98

INTRUMENT I. D. FP 325

DATA FILE NAME(S): \_\_\_\_\_

CAL. GAS SOURCE 198 ppm Scott  
CONCENTRATION \_\_\_\_\_

INSTRUMENT RESPONSE \_\_\_\_\_  
ZERO SET

COMPUTER I. D. \_\_\_\_\_  
DISK I. D. \_\_\_\_\_

Garnie died here

Quarage

TIME	EVENT	PPM	TIME	EVENT	PPM
~ 8:15-20	Calibration				
8:22-8:23	lot load - she did not run good morning cycle	~ 1000 peak ~ 15 # load			
9:21	unload/disl - wants to wait until he comes back				
9:55	loaded - done by Quary	254 load			
10:47	Unload/load	25# load			
11:15	re calibrated - span gas reading w 178 - we recal to 198				
11:35	Unload load	18#			
12:48	U-L - clothes set for machine	7 1000 ppm - 15#			
13:25	U-L	20#			
		15#			
2:08-2:10	unload/load operation				
2:12-2:16	HANGING FRESH LOAD, PEAK ~ 70,000 IN GARMETS				
2:43	Unload <del>load</del> - End of day				
		7 LOADS			

PHYSICAL FACILITY INFORMATION

FACILITY / CONTACT

INVESTIGATOR Ed Le DATE 2/17/98

AD.

LOAD SIZE

TODAY 900# 2000 2000 2000

PHONE

YESTERDAY

LAST WEEK

NO. OF EMPLOYEES 4-5

NO. OF SHIFTS 1

PRIOR DATES

PPE IN USE NONE\*

UNION SHOP

DRY CLEANING EQUIPMENT:

(35 units company)

MANUFACTURER Union

MODEL 353

DATE OF PURCHASE ~ 1/81 960 (MATCHING INFO IN '97)

CONTROL DEVICES:

REPAIR HISTORY:

COMMENTS (NOTE VISUAL OBSERVATIONS, LEAKS, OPERATOR TECHNIQUE, ETC.)

- refrigerated condenser door is unlocked - but no PPE seen -
- fugitive emissions (if so, it's not working) - only required on breathing - on jacket
- carbon absorber
- there is a "good" smell when it starts on day one only - day 2 did not

\* There is a box in back room with a couple of dust masks (not used), diary glasses + gloves, + ear muffs, on shelf with tools

PHYSICAL FACILITY INFORMATION

FACILITY / CONTACT

INVESTIGATOR LE DATE 2/18/91

ADDRESS

LOAD SIZE

TODAY see next page

YESTERDAY \_\_\_\_\_

LAST WEEK \_\_\_\_\_

PRIOR DATES \_\_\_\_\_

PHONE

NO. OF EMPLOYEES 107

NO. OF SHIFTS 1

PPE IN USE None

UNION SHOP \_\_\_\_\_

DRY CLEANING EQUIPMENT:

MANUFACTURER \_\_\_\_\_ MODEL \_\_\_\_\_ DATE OF PURCHASE \_\_\_\_\_

CONTROL DEVICES: \_\_\_\_\_

REPAIR HISTORY: \_\_\_\_\_

COMMENTS (NOTE VISUAL OBSERVATIONS, LEAKS, OPERATOR TECHNIQUE, ETC.)

Family has 1 drop shop in addition to the shop.  
Technician did not wear "good morning cycle" - said machine  
had been set up on prior day - she had high peaks when opened  
door - she's unsure about running machine.

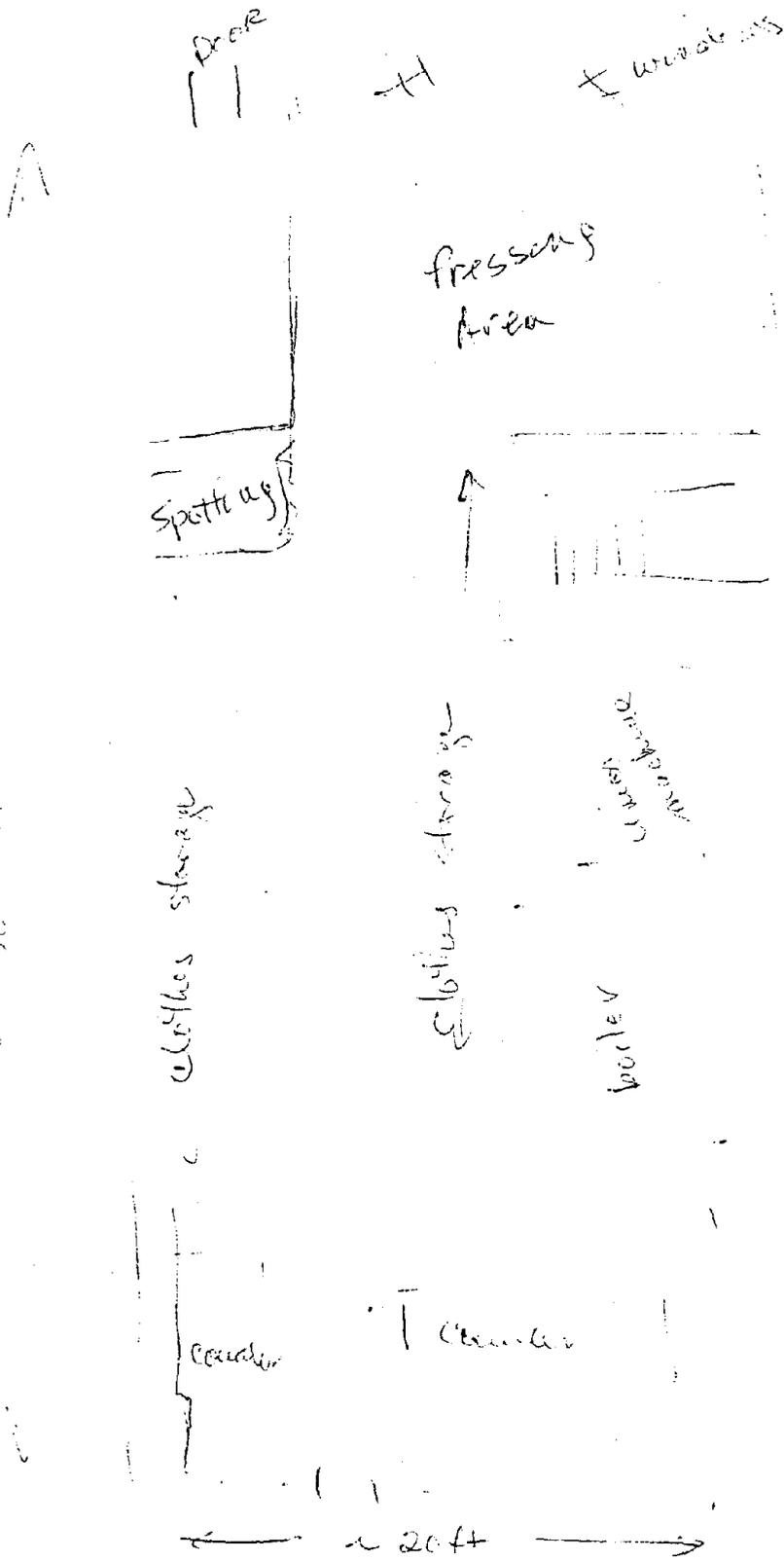
FETS OXIDATION LOG

DATE	LOOPS SIZE						N
2/2	30	30	20	25	30	18	6
2/3	20	25	30	20	15		5
2/4	25	25	30	18	17		5
2/5	20	15	20	16	19	20	6
2/6	15	17	18	19	20		5
2/7	30	30	29	23	20		5
2/9	30	30	25	28	27	30	6
10	25	20	20	10	18		5
11	25	18	10	10			4
12	25	20	15	10	15		2 Hour Recommendation
13	25	15	20	10			5
14	20	20	15	25			4

VENTILATION MEASUREMENTS - SCOTT LUTZ SAID THIS MACHINE HAS AIR FLOW INTO DRUM WHEN HOOD OPENED, WE WERE UNABLE TO DETECT ~~THE~~ ANY AIR FLOW (GREATER THAN 50 FPM) INTO OR OUT OF DRUM, ONLY GOT REAR ~ 50 FPM WHEN GADGETS PASSING DRUSE, OTHERWISE ~ 20 FPM

AIR FLOW THRU MACHINE ROOM - TRAVERSE OF OPENING SHOWS FLOW INTO ROOM @ 230-290 FPM, ~ 260 @ CORNER POINT OF THE 2 FT X 2 FT LOUVERED INLET; FLOW OUT OF ROOM THRU EXHAUST GRILL ~ 15' X 20" WAS 280-550, MEAN ~ 450 FPM; THERE IS ALSO AN OPENING ~ 16" SQ. TO BEILD ROOM

1040 CFM



Alt. astin's done  
 register

APPENDIX 3D

SAMPLE COLLECTION BOOK

SHOP T



NIOSH

PERCHLOROETHYLENE  
DRY CLEANING STUDY

FACILITY \_\_\_\_\_  
CITY San Francisco  
PHONE \_\_\_\_\_  
OWNER / OPERATOR \_\_\_\_\_

Ed Burroughs  
NIOSH  
4676 Columbia Pkwy.  
Cincinnati, OH 45226  
513-841-4275  
geb1@cdc.gov

**SAMPLING DATA SHEET  
TWA SAMPLES**

FACILITY \_\_\_\_\_ DATE 2/18/98 INVESTIGATOR Utaylor / Ed Tennant / JH  
cc:cc (cc's)  
over 400's

NAME	JOB	PUMP NUMBER	L/min FLOW RATE	C.T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION	COMMENTS
	OPERATOR	9053	.1003 / .094	T-1	T-1	8:37	3:12	395	Checked 10:10
KARINA Jean Long	OPERATOR PRESSOR	1902	.1023 / .096	T-2	T-2	8:40 4:14	3:10 PM	359	checked 10:10
Jenny	COUNTER PERSON	9054	.0996 / .094	T-3	T-3	8:40	3:13	391	checked 10:10
A. ROY	OUTSIDE MACHINE ROOM - AREA HT 6' IN FRONT OF ROOM	9051	.1017 / .098	T-4	T-4	8:46	3:14	387	
A. LEA	INSIDE MACHINE ROOM - AREA HT. ON TOP LEFT OF MACHINE	9059	.1014 / .092	T-5	T-5	8:44	3:15	389	





# REAL - TIME MONITORING SAMPLING DATA SHEET

FACILITY \_\_\_\_\_

INVESTIGATOR LT, EB DATE 2/15/98

INTRUMENT I. D. KOFP 326

DATA FILE NAME(S): \_\_\_\_\_

CAL. GAS SOURCE SCOTT

CONCENTRATION 198 PPM

INSTRUMENT RESPONSE 198 PPM

ZERO SET WITH OUTSIDE AIR

COMPUTER I. D. \_\_\_\_\_

DISK I. D. \_\_\_\_\_

TIME	EVENT	PPM	TIME	EVENT	PPM
START TO 9:19	Calibration				
9:28	IN MACHINE ROOM				
9:29	OPEN DOOR, UNLOAD				
9:30	IN EMPTY ROOMS	50			
9:31	LOAD				
9:32	IN MACHINE ROOM - 0 - NEW CYCLE				
10:27-10:30	UNLOAD RELOAD OPERATION - (ONE SAMPLE FOR 105x ANAL TAKEN)				
11:28-11:32	unload, reload ~92ppm in breathing zone → inside canister				
12:23	UNLOAD				
12:24	IN ROOMS				
12:24	LOAD				
12:26	IN MACHINE ROOM				
13:28-13:32	Un load / Load ~113 inside machine				
13:32-13:37	Around shop				
14:32-14:34	Unload				
14:40-14:44	Behind machine, cleaning Lint trap (no ↑ noticed)				
	n=6				

Comments: machine had charcoal filters/distiller according to operator. filters changed every 50 cycles. Lint cleaned everyday. Back of machine extremely clean → no leaks detected.



PHYSICAL FACILITY INFORMATION

FACILITY / CONTACT \_\_\_\_\_ INVESTIGATOR \_\_\_\_\_ DATE \_\_\_\_\_

ADDRESS \_\_\_\_\_ LOAD SIZE \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ TODAY \_\_\_\_\_

PHONE \_\_\_\_\_  
\_\_\_\_\_ YESTERDAY \_\_\_\_\_  
\_\_\_\_\_ LAST WEEK \_\_\_\_\_

NO. OF EMPLOYEES 3 NO. OF SHIFTS \_\_\_\_\_ PRIOR DATES \_\_\_\_\_

PPE IN USE protect wear UNION SHOP \_\_\_\_\_  
gloves - Cotton

DRY CLEANING EQUIPMENT:

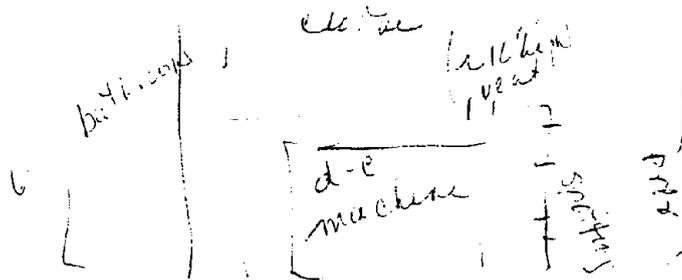
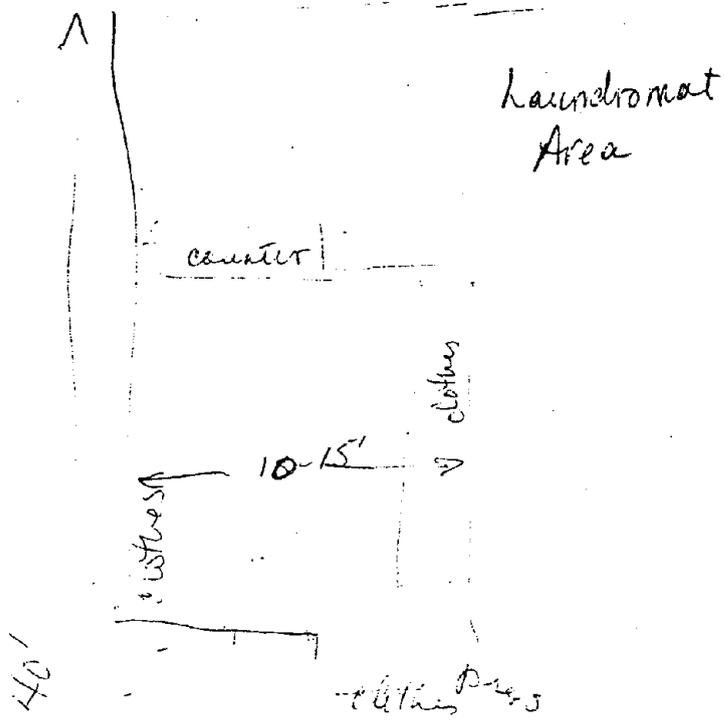
MANUFACTURER Union MODEL L 353 DATE OF PURCHASE < 1yr old

CONTROL DEVICES: 35# capacity

REPAIR HISTORY: \_\_\_\_\_

COMMENTS (NOTE VISUAL OBSERVATIONS, LEAKS, OPERATOR TECHNIQUE, ETC.)

Air Velocity into Machine Room - velocity 50-120 FPM (mean ≈ 75 FPM) at  
micro, with indicator of open area (2 1/2' x 6'0") - ≈ 1300 CFM  
In within a containment room.



# 1054 DATA

CALIBRATION: DILUTE 200 PPM SCOTT CAL GAS 1:1000 → 200 ppb

<u>ANAL #</u>	<u>SAMPLE</u>	<u>RESULTS</u> (mV @ 124mm)
7	SHED AIR	
8	ANAL OF BINGO SAMPLE TAKEN @ 10:30 DURING UNLOADING	14,600
9	SHED AIR	50
10	"	20

pounds / load  
2/19

2/18 = 33 30 32 22 28 08

NE 5

N 2 5

2/17 30 32 32 - 32 - 33

5

2/16 30 - 20 - 30 - 30 - 28

5

2/15 32 32 32 32 22

5

2/14 30 08 36

3

2/13 20 30 32 32 22

5

etc.

$\bar{X} \sim 5$

APPENDIX 3E

SAMPLE COLLECTION BOOK

SHOP G

NIOSH

**PERCHLOROETHYLENE  
DRY CLEANING STUDY**

**FACILITY** \_\_\_\_\_ *Cleaners*

**CITY** \_\_\_\_\_ *San Francisco, CA*

**PHONE** \_\_\_\_\_ *(415)*

**OWNER / OPERA** \_\_\_\_\_

Ed Burroughs  
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4676 Columbia Pkwy.  
Cincinnati, OH 45226  
513-841-4275  
geb1@cdc.gov

**SAMPLING DATA SHEET**  
**TWA SAMPLES**

FACILITY \_\_\_\_\_

DATE 2/19/98

VERS \_\_\_\_\_

INVESTIGATOR L. Taylor

L/min

NAME	MP	FLOW RATE	C. T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION	COMMENTS
Mike	9044	.0991 .0982	G-1	G-1	9:42	12:36	171.42	✓ 11:02
	9050	.0987 .0959	G-2	G-2	9:48	1:55	248.71	✓ 11:02
Carlos	9048	.0942 .0924	G-3	G-3	9:55	1:55		✓ 11:02
	9058	.0971 .0964	G-4	G-4	9:57	12:35pm	158.26	✓ 11:02
	9045	.0984 .0956	G-5	G-5	10:08	1:55	226.01	garage door like open door and open door on either side strong ventilation thru shop.
			G-6					

**SAMPLING DATA SHEET  
TWA SAMPLES**

FACILITY \_\_\_\_\_

DATE 2/20/98

leaners

INVESTIGATOR W Taylor

Name	PUMP NUMBER	$\frac{L}{min}$ FLOW RATE	C. T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION	COMMENTS
Mile	9044	$\frac{.0987 pc}{.0930 pst}$	G-7	G-7	8:20am	12:30pm	257.03	The first load was late because the machine malfunctioned during the water perc separation.
	9050	$\frac{.0912}{.0920}$	G-8	G-8	8:21	12:55	273.05	Apparently the water temp was too low causing the separator press to not work. After the temp was corrected, the normal cycles began.
Car 105	9045	$\frac{.0914}{.0928}$	G-9	G-9	8:27	1:00pm	271.49	
inside barrier room	9058	$\frac{.0977}{.0930}$	G-10	G-10	8:25	12:42	263.34	This delay caused a lack of workload for employees.
outside b.r. general air	9048	$\frac{.0934}{.0900}$	G-11	<del>G-11</del>	8:29	12:40	252.31	Pump fell within machine at same point. (Since it was so high, I couldn't see it.)
			Blank	G-12	8:35			





PHYSICAL FACILITY INFORMATION

FACILITY CONTACT

Mi 1

ADDRESS

my (1 vacz)

S.F. CA

PHONE

415

NO. OF EMPLOYEES

4

NO. OF SHIFTS

1

PPE IN USE None seen

UNION SHOP

NO

INVESTIGATOR Chayler

DATE

9/19 + 9/20

LOAD SIZE

TODAY 4516

YESTERDAY

LAST WEEK due to rainy weather, the amount of clothing has been reduced.  
PRIOR DATES

DRY CLEANING EQUIPMENT:

sounds like Permar's

MANUFACTURER Permac

Model PS46

MODEL

DATE OF PURCHASE 1 year old

CONTROL DEVICES: condensr. distiller, solvent recovery charcoal filter

REPAIR HISTORY: 45 lb machine

COMMENTS (NOTE VISUAL OBSERVATIONS, LEAKS, OPERATOR TECHNIQUE, ETC.)

This machine was a refrigerator, still w/automatic disposed into haz waste container. There is a barrier room with two fan exhausts. According to the operator the fan exhaust is 1700 cfm (while 1500 is required) the room around the machine is large enough to allow easy entrance and exit. This reduces the length of time the operator spends in the room and overall exposure.

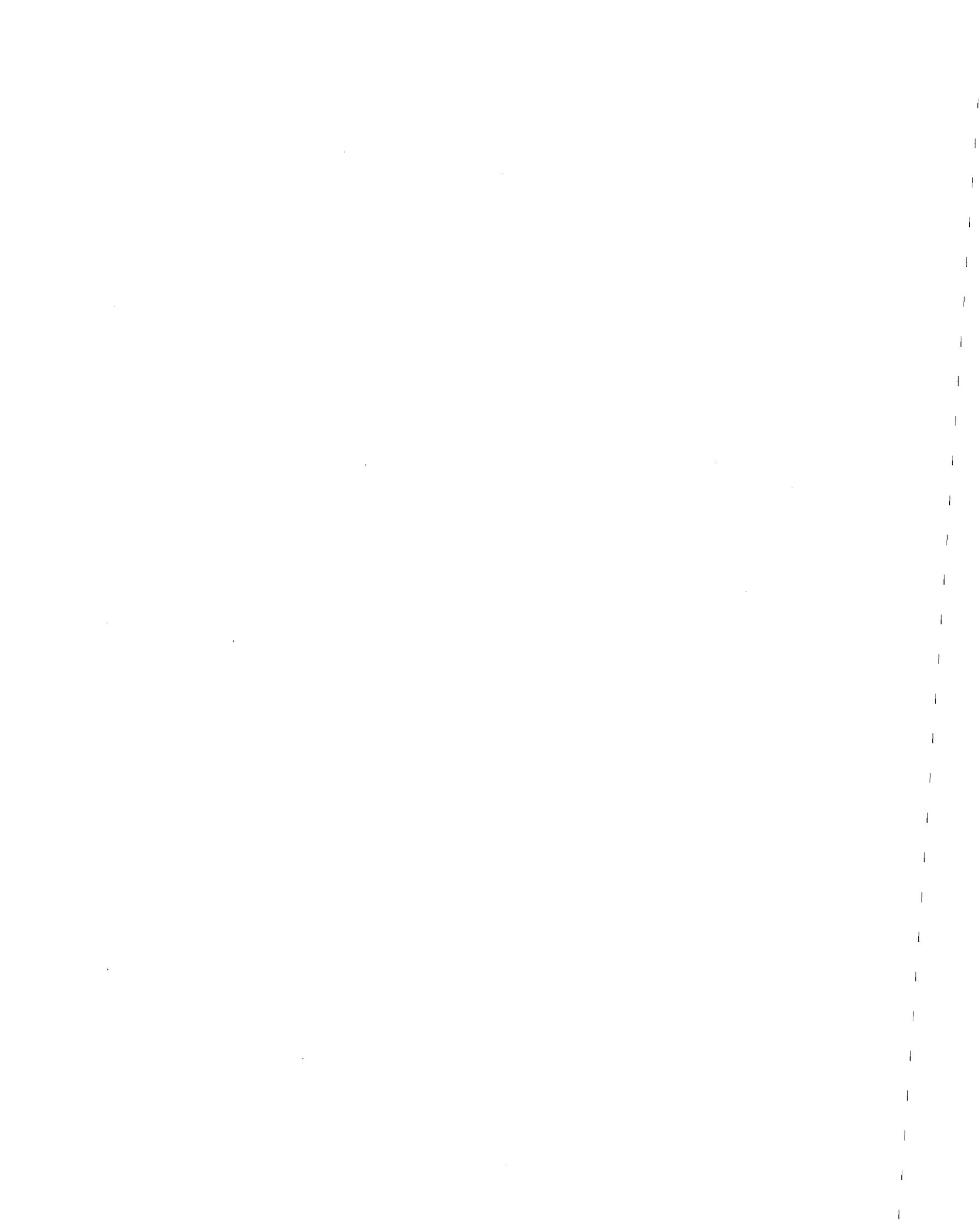
A large garage door is open at all times and so is a small door in the other side of the facility. This creates quite a rapid ventilation air exchange in the shop. (cont)



The machine was purchased over 1 year ago and is a <sup>2172</sup> fifth generation with additional features such as the automatic distiller haz waste transport. The lint traps are changed each morning before the first run. No leaks were detected in the back of machine.

The shop has a cement floor and brick w/ some wooden walls. Although the machine is kept extremely clean, the general housekeeping is fair. Several items make the large space cluttered.

No modification/interlock



APPENDIX 3F

SAMPLE COLLECTION BOOK

SHOP D



**NIOSH**

**PERCHLOROETHYLENE  
DRY CLEANING STUDY**

**FACILITY** \_\_\_\_\_

**CITY** \_\_\_\_\_

**PHONE** \_\_\_\_\_

**OWNER / OPERATOR** \_\_\_\_\_

**Ed Burroughs  
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4676 Columbia Pkwy.  
Cincinnati, OH 45226  
513-841-4275  
geb1@cdc.gov**

P. 60  
71 F  
307 RH

**SAMPLING DATA SHEET**  
**TWA SAMPLES**

FACILITY \_\_\_\_\_

DATE 4/14/98

INVESTIGATOR R. S. L. L. L. L.

205

NAME	JOB	NUMBER	RATE	C. T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION	COMMENTS
Robert W. W. W.	OPERATOR / PRESSOR	9051	.1018 --- .0994	01	01	7:26	4:08 PM		Chgd 9:10 ✓ 10:45 ✓ 11:45
Vick	Assembly (un-pection)	9050	.0973 --- .0936	02	02	7:27	5:21.48 min		✓ 9:40 ✓ 10:45 ✓ 11:45
Area top of Machine	on top of MACHINE	9059	.1004 --- .0963	03	03	7:30	4:20 5:30.0		✓ 9:40 ✓ 10:45
Tom Area - top of Machine	MANAGER / CARPENTER	9054	.1004 --- .0980	04	04	7:43	4:09 PM 5:06.89 min		✓ 9:42 10:45 ✓ 11:45
Crunker Area Sample	BE ON CONTROL	1917	.0956 --- .0947	05	05	8:07	4:20 4:46 min		✓ 9:42 ✓ 10:45 ✓ 11:45
<del>Crunker</del> Domeslar N. L. L. L.	Pressor	1902	.1014 --- .0966	06	06	8:43	4:13 4:50		✓ 9:42 ✓ 10:45 ✓ 11:45
A. L. A	BASEMENT, CENTER OF HANGING CLOTHES	9053	.1017 ? 0	07	07	09:00	-F. 406.6 mins		✓ 10:45 - Faulted ✓ 11:45

D8 (Badge)

Blank

**SAMPLING DATA SHEET**  
**TWA SAMPLES**

FA \_\_\_\_\_

DATE 4/15/98

INVESTIGATOR Ureyler / Ever / Dave

NAME	JOB	PUMP NUMBER	FLOW RATE	C. T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION	COMMENTS
Tommy	Maintenance (Counter Operator) Asst	1917	.0975 ----- .0934	D-9	D-9	7:12 am	4:10	540.18	10:57 OK 12:00 OK 15:06 OK
Robert Warren	Operator / Press. (Spotter)	9059	.1011 ----- .0960	D-10	D-10	7:23	4:00 pm	515.91	OK 10:48 12:56 OK 15:03 OK
Victor	Pressure Assembly / Inspector	9050	.0962 ----- .0934	D-11	D-11	7:15 am	4:09	534.84	10:47 OK 12:52 OK 15:07 OK
Area Sample (Cont. of Machine)		9054	.0985 ----- .0983	D-12	D-12	7:16 am	4:15	536.90	10:48 OK 12:54 OK
Area Sample (upstairs apt.)		9051	.1013 ----- .1011	D-13	D-13	7:25	4:00	504.03	13:28 OK 15:04 OK
Blank				D-14	D-14				
Charles Demesvar	pressur	9053	0.1010 ----- 0.0965	D-15	D-15	9:57	4:04	368.06	10:47 OK - this sampling line 12:53 OK - had several sections 15:03 OK - of tubing (pressure drop the end had tubing to protect the worker

\* When I changed DC order sample sites in office - there was NO TUBE @ D-15, but there was an unlabeled tube, so I assumed they were the same.

Rec in office  
3/15/58  
KZ

# INDEPENDENT PRESSURE SAMPLERS

## SAMPLING DATA SHEET

### TWA SAMPLES

FACILITY 6 DATE 07 INVESTIGATOR \_\_\_\_\_

NAME	JOB	NUMBER	FLOW RATE	<del>BAR</del> NUMBER	<del>BAR</del> NUMBER	START TIME	STOP TIME	DURATION	COMMENTS
	MANUFACTURER/ ASST. OPERATOR			Tommy T1	4/23/58	4/23 11:00 AM	4/29 7:40 AM		
	"			Tommy T2	4/23-24	<del>4/23 11:00 AM</del>	<del>7:40 AM</del>		
	"			Tommy T3	4/27-28	4/27 10:30 AM	4/28 8:00 AM		
	OPERATOR/ PRESSOR			Robert R1	4/23	11:00 AM	7:00 PM		
	"			Robert R2	4/24	10:45 AM	7:00 PM		
	"			Robert R3	4/27	10:00 AM	6:00 PM		NOT SURE STOP TIME WITH 6 PM, ALSO LOOKED LIKE 5 AND 8
				T-1B	BLANK	?			ONLY MARK ON SAMPLE WAS "T-1" IN MY WRITING

TOM HAD MARKED ROBOTS WITH NAMES, I ADDED LETTERS/NUMBER DESIGNATIONS

# REAL - TIME MONITORING SAMPLING DATA SHEET

FACILI \_\_\_\_\_

INVESTIGATOR AB

DATE 4/14/95

INTRUMENT I. D. EDFP 326

DATA FILE NAME(S): DC DEPOT DAY 1

CAL. GAS SOURCE SCOTT

CONCENTRATION 198 PPM

INSTRUMENT RESPONSE 198

ZERO SET OUTSIDE AIR

COMPUTER I. D. 60

DISK I. D. DRYCELLAR DATA NY

TIME	EVENT	PPM	TIME	EVENT	PPM
7:30	TUNN SHOP	- 0 -	⑤ 5:38	UNLOAD	UP TO ~100-150
			15:40	CLEAN BUTTON TRAP	UP TO ~10
	BASEMENT	- 0 -		CAC READS 182 PPM	
			16:12	CITOCK	
	FLOOR OF BASEMENT		⑤ 16:35	UNLOAD / -	35 PPM
	AT SPOT LOOKS LIKE OIL SPILL	1-2 PPM PEAK 5-6 PPM		RELOAD	100 "
① 8:38	1st load				7 loads
	AROUND & AROUND				
8:23 - 8:28	MACHINE	- 0 -			
8:32 - 8:34	REST LOAD				
9:21	UNLOAD				
② 9:23	RELOAD				
10:10	UNLOAD				
③ 10:11	RELOAD				
11:01	UNLOAD				
④ 11:02	RELOAD				
11:04	Cleaning filters				
11:08	clean button trap & hindrucks				
					cleaned every third load
11:50	Measuring Outside ventilation (ND)				
	Small exhaust fan				
12:55	Measuring Outside, exhaust (ND)				
	large exhaust fan				
12:20	Measuring Outside exhaust (ND)				
	while door is open				
⑤ 14:47	Load/unload cycle - (5th load)				

took some measurements -  
in clothing - ~~not~~ < 40 ppm.  
fresh from machine



PHYSICAL FACILITY INFORMATION

FACILITY / CONTACT

INVESTIGATOR RJZ DATE 4/14/87

ADDR  
\_\_\_\_\_  
\_\_\_\_\_

LOAD SIZE

TODAY 7 LOANS, 1 ALL 35 #

YESTERDAY ALL DAY'S RUNS 35 # on

LAST WEEK LOANS, USUALLY 25 LOANS/DAY

(HAS NO RECORD ON LOAN/SERV/DAY)

PRIOR DATES \_\_\_\_\_

NO. OF EMPLOYEES ~ 5 NO. OF SHIFTS 1 (7:00)

PPE IN USE None (Respirator (Hanging)) UNION SHOP No  
At least gloves worn when servicing

DRY CLEANING EQUIPMENT:

MANUFACTURER REARSTAR MODEL RS 373 DATE OF PURCHASE ~ 1 1/2 YEARS AGO

CONTROL DEVICES: Refrigeration Compressor, Carbon Absorption, Day-to-Day Closed System, NO FUGITIVE  
EMISSION LOW. 2000

REPAIR HISTORY: No REPAIR SINCE INSTALLATION  
CIRC. TANK CARBON  
MARK WITHIN ROOM  
IS OPEN

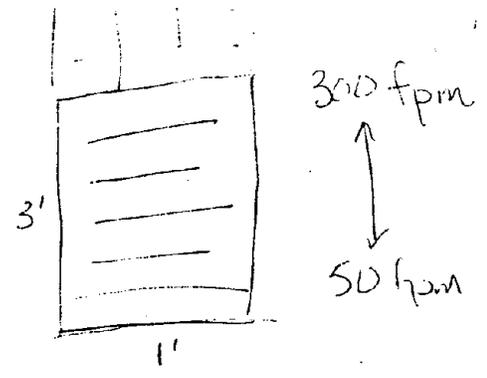
COMMENTS (NOTE VISUAL OBSERVATIONS, LEAKS, OPERATOR TECHNIQUE, ETC.)

SOMETIMES DOES NOT RUN & ENDS BACK TO BACK, WILL RUN GOOD WORKING CYCLE IF  
DRUM EMPTY FOR PERIOD OF TIME, SHORT DLY CYCLE (1-2 MIN) IF DRUM EMPTY SHORT TIME,  
(REGENERATION)  
DESCRIBED 7 CARBON FILTERS YESTERDAY, DOES THIS AFTER ~ 35 LOANS (EVERY 1-2 WORKS)

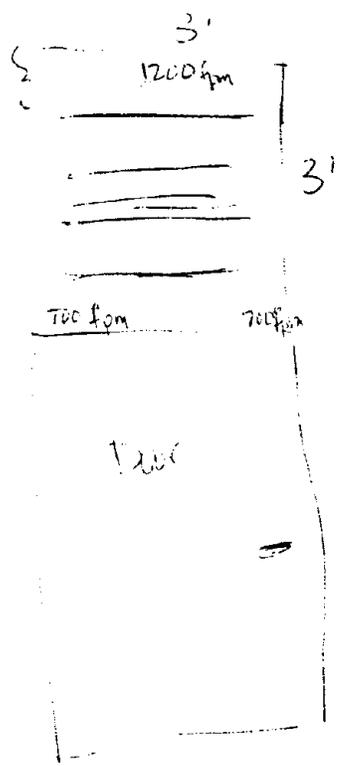
# Ventilation Measurements

①

inside small exhaust (after fan)  
 several louvers are bent, some  
 lint buildup  
 (on far left of building)



②

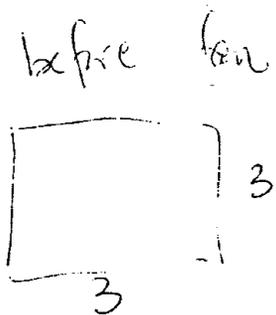


larger exhaust ~~area~~ output

700-1200 fpm

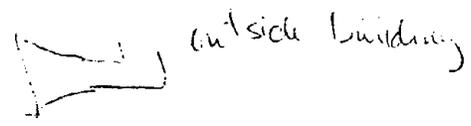
$9 \times 3 = 9 \text{ ft}^2$   
 $1000 \text{ fpm} \times 9 \text{ ft}^2 = 9000 \text{ cfm}$

①



evenly distributed  
 approx 200 fpm

General Ventilation  
 (connection to dryer)



APPENDIX 3G

SAMPLE COLLECTION BOOK

SHOP A



NIOSH

**PERCHLOROETHYLENE  
DRY CLEANING STUDY**

4/15 & 16, 1998

**FACILITY** \_\_\_\_\_  
**CITY** \_\_\_\_\_  
**PHONE** \_\_\_\_\_  
**OWNER / OPERATOR** \_\_\_\_\_ / ✓

**Ed Burroughs**  
**NIOSH**  
**4676 Columbia Pkwy.**  
**Cincinnati, OH 45226**  
**513-841-4275**  
**geb1@cdc.gov**

**SAMPLING DATA SHEET  
TWA SAMPLES**

FACILITY \_\_\_\_\_

DATE 4/15/98

INVESTIGATOR LT

NAME	JOB	PUMP NUMBER	FLOW RATE	C. T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION	COMMENTS
Mario	Operator	1904	.1018 — .0978	A-1	A-1	8:22	3:15	407.43	2:40
Alex	132 LOUVER MIDWAY BETWEEN MACHINE + SPOTTING TABLE	420834	.0983 — .0964	A-6	A-6	8:54	3:08	375.9	9:05 2:40
Atfredo	Pressor #1	9058	.0977 — .0935	A2*	A2	8:24	3:08	403.4	2:40
Phil	Wet laundry (uniforms) NO PERC	9048	.0914 — .0864	A3*	A3	8:27	5:10	403.2	9:00 2:45
Susan	Pressor #2	9045	.0969 — .0907	A4	A4	8:32	3:08	393.0	2:40
Area Sample (Counter)	HOTEL LOUVER BEHIND COUNTER (BEHIND COUNTER)	9044	.0965 — .0950	A5	A5	8:33	3:01 3:06 (Vapor)	386.8	9:02 2:45
Blank					A7				

\* When I opened samples in office A2 + A-BLANK WERE TAKEN TOGETHER WITH THEIR CASES  
IT LOOKED LIKE ONE C.T. WENT WITH THE A2 CASE + THE OTHER WENT WITH THE A-BLANK  
CASE, BUT I'M NOT SURE. I'M NOT SURE WHAT I SHOULD DO WITH THESE CASES.

**SAMPLING DATA SHEET  
TWA SAMPLES**

FACILITY \_\_\_\_\_

DATE 4/16/98

INVESTIGATOR LT, EB

NAME	JOB	PUMP NUMBER	FLOW RATE	C.T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION	COMMENTS
Marco	OPERATOR	420834	$\frac{995}{973}$	A8	A8	8:15	2:17	365.05	11:45 ✓
Alfredo	Pressor (#1 Press)	9045	$\frac{952}{909}$	A9	A9	8:17	2:15	355.93	9:49 11:45 ✓
SHARON	Pressor (#2 Press)	9048	$\frac{893}{830}$	A10	A10	8:19	2:10	347.92	9:48 11:45 ✓
PAUL	WET WASHDOWN	9058	$\frac{965}{928}$	A11	A11	8:21	2:23	360.12	9:49 11:45 ✓
ARCA	AZ LEVEL MIDWAY between MACHINE & SPRINKLING IRIG	9044	$\frac{980}{949}$	A12	A12	8:25	2:28	361.17	9:48 11:45 ✓
BANK				A13	A-13				

# INDEPENDENT PASSIVE SAMPLES

RECOVERED IN MARCO  
4/28/98

## SAMPLING DATA SHEET TWA SAMPLES

FACILITY \_\_\_\_\_ DATE \_\_\_\_\_ INVESTIGATOR \_\_\_\_\_

NAME	JOB	PUMP NUMBER	FLOW RATE	C.T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION	COMMENTS
MARCO	OPERATOR				AA-1	5:00	3:20		4/17/98
"	"				AA-2	8:50	4:00		4/18
"	"				AA-3	9:00	2:00		4/20
ALFREDO	Presser #1				M-1	9:00	2:00		4/20
"	"				M-2	8:30	4:00		4/18
"	"				M-3	8:00	3:20		DATE NOT LISTED
MARK					AB-1	5:20	2:00		4/18 WHY START/STOP TIMES & DATE?

**REAL - TIME MONITORING**

**SAMPLING DATA SHEET**

C. Burroughs  
L. Ebers  
INVESTIGATOR L. Taylor DATE 4/15

ENS \_\_\_\_\_

ID: 0103  
 EID FP 325  
 CAL. GAS SOURCE Secty IV Analyzed for  
 CONCENTRATION 198  
 INSTRUMENT RESPONSE 198  
 ZERO SET 4/15  
 #220B41AB Lot: 20825

DATA FILE NAME(S): \_\_\_\_\_  
 \_\_\_\_\_  
 COMPUTER I. D. \_\_\_\_\_  
 DISK I. D. \_\_\_\_\_

TIME	EVENT	PPM	TIME	EVENT	PPM
8:50 am	Calibration	198	14:47	cal ck -	Rooms 227
Note: trouble calibrating so data before is irrelevant. The last set at 8:50 is the correct calibration data.			14:49	- Reck	
clock reset - was reading ~41?? For 8:50 cal -			15:08	Down coats/jackets over 100 manual judgment. on one coat since one coat was still slightly high,	
8:08	CYCLE ON/OFF	2-3 PPM	the levels of the clothes were high. One jacket was reloaded into the machine.		
9:10	UNLOAD LOAD	20-40, MAX ~100 ~ same			
9:11	CLEAN LINT & BUTTON TRAPS	MAX ~ 80			
9:13	HANGING LOAD THAT CAME OUT @ 9:10 (IN MARBO'S B2)	0			
10:17	Unload only				
~10:25	load only				
~10:33	hanging clothes		N=5		
11:20	AREA IN FRONT OF MACHINE				
11:25	BEHIND MACHINE				
11:26-28	UNLOAD/RELOAD	10-20 UP TO 40 odd, 200+			
~12:30	Unload/Reload	up to 60			
13:39	"	UP TO 90			
13:40	"	400+			

**REAL - TIME MONITORING  
SAMPLING DATA SHEET**

FACI \_\_\_\_\_

INVESTIGATOR LT, ETB DATE 4/16/98

(PID ~~DATE~~ IS 95/05/16)

INTRUMENT I. D. - 325

DATA FILE NAME(S): \_\_\_\_\_

CAL. GAS SOURCE SCOTT  
 CONCENTRATION 198 PPM  
 INSTRUMENT RESPONSE 199  
 ZERO SET USING OUTSIDE AIR

COMPUTER I. D. \_\_\_\_\_  
 DISK I. D. \_\_\_\_\_

TIME	EVENT	PPM	TIME	EVENT	PPM
------	-------	-----	------	-------	-----

8:35	CALIBRATION		10:21	recalibration of instrument (it had lost 10ppm)	
9:16	MACHINE AREA	0			
9:19	@ DOOR - MARCO SAID HE WANTS TO CLEAN GASKET	2-4ppm			
9:22	UNLOAD		11:20 am	unloaded jeans. The jeans did off gas and this was also measured. The operator wanted to hang clothes until he was ready for full load.	
9:23	ROOM	max ~40			
9:25	MARKING BOARD	~0			
9:28					

10:10	Unloaded inside drum ~ 100ppm Load Car Jeans				
-------	----------------------------------------------	--	--	--	--

**NOTE:**

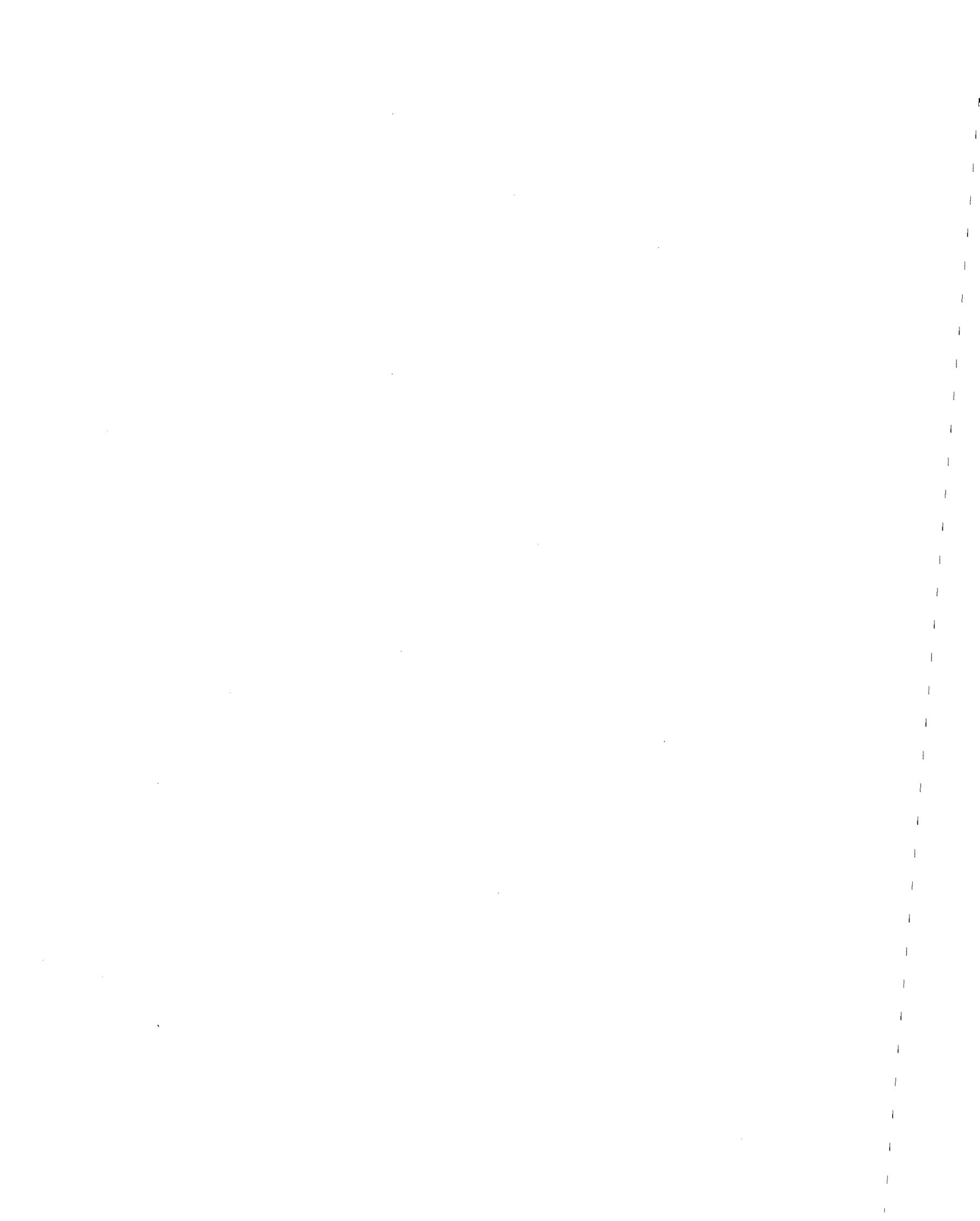
DATE was changed from May 95 to April 16, 1998. inside drum ~ 100

10:13 perimeter of drum  
 top ↑ bottom ↓ 

made circular motions around the drum. The top of the drum of machine was high  because of a vent (where lint would collect?) \* hot air seemed to escape from gasket. (different but was from velometer.

10:19 After door was cleaned to remove lint, no detectable perc was observed.





APPENDIX 3H

SAMPLE COLLECTION BOOK

SHOP J



NIOSH

**PERCHLOROETHYLENE  
DRY CLEANING STUDY**

**FACILITY** \_\_\_\_\_

**CITY** New York City \_\_\_\_\_

**PHONE** \_\_\_\_\_

**OWNER / OPERATOR** \_\_\_\_\_

**Ed Burroughs**  
**NIOSH**  
**4676 Columbia Pkwy.**  
**Cincinnati, OH 45226**  
**513-841-4275**  
**geb1@cdc.gov**

**SAMPLING DATA SHEET**  
**TWA SAMPLES**

FACILITY

DATE 4/16/98

INVESTIGATOR \_\_\_\_\_

NAME	JOB	PUMP NUMBER	FLOW RATE	C.T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION	COMMENTS
John	operator	1917	$\frac{.0956}{.0942}$	J-1	J-1	7:16	15:14	478	12:54 OK
Bus	Presser #2 Press	9050	$\frac{.0948}{.0912}$	J-2	J-2	7:43	15:16	450	12:51 OK
Paul	Assistant Operator	9054	$\frac{.0998}{.0915}$	J-3	J-3	8:11	15:17	426	12:54 OK
Tony	Presser #3	9051	$\frac{.1006}{.0916}$	J-4	J-4	7:59	15:19	440	12:54 OK
Jose	Presser #1	9059	$\frac{.0989}{.0950}$	J-5	J-5	8:01	15:15	432	12:54 OK
Blank				J-6	J-6				



1 N DEPT END POINT PASSIVE SAMPLERS -  
 86/82 4/20/98  
 4/21  
 4/22

**SAMPLING DATA SHEET**  
**TWA SAMPLES**

DATE - NOT LISTED, Presumed to be 4/20/98  
 INVESTIGATOR \_\_\_\_\_

FACILITY \_\_\_\_\_

NAME	JOB	PUMP NUMBER	FLOW RATE	C. T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION	COMMENTS
					O-1	NOT LISTED			
					O-2	8:00	4:00		
					O-3	8:00	3:50		
					P-1	NOT LISTED			
					P-2	8:00	4:00		
					P-3	8:00	3:50		
					OA-1	NOT LISTED			
					OA-2	8:00	4:00		
					OA-3	8:00	3:50		

BCK BK TWK

**REAL - TIME MONITORING  
SAMPLING DATA SHEET**

FA \_\_\_\_\_

INVESTIGATOR \_\_\_\_\_

DATE 4/16/98

INTRUMENT I. D. CVFP 326

DATA FILE NAME(S): \_\_\_\_\_

CAL. GAS SOURCE \_\_\_\_\_  
 CONCENTRATION 198  
 INSTRUMENT RESPONSE \_\_\_\_\_  
 ZERO SET \_\_\_\_\_

COMPUTER I. D. \_\_\_\_\_  
 DISK I. D. \_\_\_\_\_

TIME	EVENT	PPM	TIME	EVENT	PPM
8:11-8:12	unloading #1	35	15:12	unloading	35
8:12-8:14	loading	54	15:13	loading	30
8:31-8:32	unloading	80			
8:32-8:33	loading #2	200			
9:12-9:13	unloading #1	80			
9:13-9:14	loading #1	215			
9:28-9:30	cleaning tent trap and button trap #2	50			
10:08-10:09	cleaning tent and button traps #1	20			
10:23-10:24	unloading #2	50			
10:24-10:25	loading #2	40			
10:25-10:34	hanging cloths	10			
11:10-11:11	unloading #1	45			
	loading #1	70			
11:18-11:19	unloading #2	40			
11:17-11:20	loading #2	20			
11:21-11:31	hanging cloths	25			
13:08-13:09	cleaning tent & button traps #2	200			
13:45	cleaning tent trap #1	25			
13:46	cleaning button traps	168			
14:06	unloading #2	98			
14:07	loading #2	50			
14:37	loading	118			
14:38	unloading #1	105			
13:51	unloading	70			
13:52	unloading #2	35			
14:07	unloading #1	35			
14:08	loading #1	38			
14:53	unloading	53			
14:54	load #2	35			



PHYSICAL FACILITY INFORMATION

FACILITY/CONTACT

INVESTIGATOR BD

DATE

4/16/87

ADDRESS

LOAD SIZE

TODAY ~ 12 KOTOS FOR DAY shift

YESTERDAY

MACHINERY ~ 654 / 248

LAST WEEK

PRIOR DATES

NO. OF EMPLOYEES ~ 25

NO. OF SHIFTS @ ~ 12 HRS

PPE IN USE None observed

UNION SHOP No

DRY CLEANING EQUIPMENT:

MANUFACTURER REALSTAR

700A CANNERY

MODEL RS 640

DATE OF PURCHASE ~ 6 mo ago

CONTROL DEVICES: DRY TUMBLER, CLOSER KNOB, REPAIR COMP, CARBON ADSORBER

REPAIR HISTORY: part DIRT GASKETS, THERMOSTAT on one machine

COMMENTS (NOTE VISUAL OBSERVATIONS, LEAKS, OPERATOR TECHNIQUE, ETC.)

The two machines were well taken care of and kept clean. The manager (Schub) has been experimenting with a charged system of detergent cleaner. An anionic detergent is poured into the machine prior to commencement of the cycle. The perc has been mixed with a cationic detergent. The first detergent removes most of the dirt and the perc is sent to the distiller. The second cycle (with the cationic agent) is recycled. The manager has had significant success with this system. Filter recycling time is significantly reduced which reduces the waste costs. In a typical month the store pays \$300 in waste disposal. Prior to the process change, expenses were approximately \$1100.

PHYSICAL FACILITY INFORMATION

FACILITY / CONTACT \_\_\_\_\_ INVESTIGATOR \_\_\_\_\_ DATE \_\_\_\_\_

ADDRESS \_\_\_\_\_ LOAD SIZE \_\_\_\_\_

TODAY \_\_\_\_\_

YESTERDAY \_\_\_\_\_

LAST WEEK \_\_\_\_\_

PRIOR DATES \_\_\_\_\_

NO. OF EMPLOYEES \_\_\_\_\_ NO. OF SHIFTS \_\_\_\_\_

PPE IN USE \_\_\_\_\_ UNION SHOP \_\_\_\_\_

DRY CLEANING EQUIPMENT:

MANUFACTURER \_\_\_\_\_ MODEL \_\_\_\_\_ DATE OF PURCHASE \_\_\_\_\_

CONTROL DEVICES: \_\_\_\_\_

REPAIR HISTORY: \_\_\_\_\_

COMMENTS (NOTE VISUAL OBSERVATIONS, LEAKS, OPERATOR TECHNIQUE, ETC.)

Ventilation: General Dilution Ventilation only. There are no exhaust fans or local exhaust hoods. Several comfort fans are located throughout the facility. When temp rise, the outside doors are opened to allow increased circulation.

APPENDIX 4A

ANALYTICAL LABORATORY REPORTS  
FOR ANALYSIS OF CHARCOAL TUBE SAMPLES





March 11, 1998

RE: Seq. 8903-CA  
Gas Chromatography

ANALYTICAL REPORT

SUBMITTED TO: Ed Burroughs  
SUBMITTED BY: Young Hee Yoon  
REFERENCE DATA:  
Analysis of: Perchloroethylene

Identification No.: ECTB 97-403  
Sample Type: Charcoal Tube  
Sample(s): 78      Analyses: 78

DataChem Laboratory No.: 98N01777 through 98N01854

The charcoal tube samples were analyzed by gas chromatography according to NMAM 4th edition method 1003 with modifications identified with an asterisk (\*).

Desorption Process: 30 minutes in 1.0 milliliter of carbon disulfide containing 0.5 µL/mL hexane as an internal standard.  
Gas Chromatograph: Hewlett-Packard Model 5890IIA equipped with a flame ionization detector.  
Column:\* 30m x 0.32mm fused silica capillary coated internally with 0.5 µm of DB-wax.  
Oven Condition:\* 40°C for 8 minutes and then up to 100°C for 2 minutes at a rate of 20°C per minute

Media standards were used for quantitation. \*

The LOD and LOQ are tabulated below:

<u>Analyte</u>	<u>LOD (mg/sample)</u>	<u>LOQ (mg/sample)</u>
Perchloroethylene	0.002	0.008

CINCINNATI LABORATORY  
4588 Glendale-Milford Road  
Cincinnati, Ohio 45242-3570  
513-733-5330, FAX 513-733-5347

NOVATO OFFICE  
11 Santa Ynez Court  
Novato, California 94945  
415-897-9471, FAX 415-893-9469

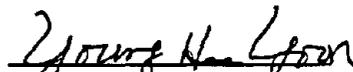
CORPORATE OFFICE  
SALT LAKE CITY LABORATORY  
960 West LeVoy Drive  
Salt Lake City, Utah 84123-2547  
801-266-7700, FAX 801-268-9992

BALTIMORE OFFICE  
10 Juliet Lane #203  
Baltimore, Maryland 21236-1220  
410-529-5675, FAX 410-529-5355

RICHLAND OFFICE  
313 Wellstan Way  
Richland, Washington 99352-4116  
509-943-5556, FAX 509-943-5654

The reported values have not been field blank corrected.

The results are tabulated on the following page(s).

  
Young Hee Yoon

  
Don Wickman  
Section Manager  
Industrial Hygiene  
Organic Chemistry



**ANALYTICAL REPORT**

NIOSH  
Form ARF-AL  
Page 1 of 5  
Part 1 of 1  
03119813453441

Date 3/11/98  
Laboratory Group Name 98N-0039-01  
Agency Identification Number 8903-CA  
Project Name ECTB-97-403

NIOSH  
Attention: Burroughs, Ed  
4676 Columbia Parkway  
Cincinnati, OH 45226

FAX \_\_\_\_\_  
Telephone (513) 841-4275

**Sampling Collection and Shipment**

Sampling Site Dry Cling Shps-LA-SF Date of Collection \_\_\_\_\_  
Date Samples Received at Laboratory March 04, 1998

**Analysis**

Method of Analysis NMAM 1003  
Date(s) of Analysis March 07, 1998 - March 08, 1998

**Analytical Results**

Field Sample Number	Laboratory Number	Sample Type	Perchloro ethylene mg/sample						
F1	98N01777	CT	1.7						
F2	98N01778	CT	0.41						
F3	98N01779	CT	0.26						
F4	98N01780	CT	0.27						
F5	98N01781	CT	0.25						
F6	98N01782	CT	0.36						
F7	98N01783	CT	0.57						
F8	98N01784	CT	0.71						
F11	98N01785	CT	1.1						
F12	98N01786	CT	0.40						
F13	98N01787	CT	0.32						
F14	98N01788	CT	0.46						
F15	98N01789	CT	0.30						

† See comment on last page.  
ND Parameter not detected above LOD.  
NR Parameter not requested.

\*\* See comment on last page.  
( ) Parameter between LOD and 100.

Young Han Yoon  
Analyst: Young Han Yoon  
Lawrence E. Miller  
Reviewer: Lawrence E. Miller  
Don Wickman  
Laboratory Supervisor: Don Wickman



**ANALYTICAL REPORT**

Form ARF-BL

Page 2 of 5

Part 1 of 1

03109814271208

Date 3/11/98

Laboratory Group Name 98N-0039-01

**Analytical Results**

Field Sample Number	Laboratory Number	Sample Type	Perchloro ethylene mg/sample																
F16	98N01790	CT	0.34																
F17	98N01791	CT	0.27																
F18	98N01792	CT	0.32																
F-BLANK	98N01793	CT	ND																
F-BLANK	98N01794	CT	ND																
N1	98N01795	CT	0.65																
N2	98N01796	CT	0.74																
N3	98N01797	CT	0.0098																
N4	98N01798	CT	3.3																
N5	98N01799	CT	0.33																
N6	98N01800	CT	0.47																
N7	98N01801	CT	0.42																
N11	98N01802	CT	0.021																
N12	98N01803	CT	2.9																
N13	98N01804	CT	1.8																
N14	98N01805	CT	0.97																
N15	98N01806	CT	0.63																
N16	98N01807	CT	0.55																
N17	98N01808	CT	0.52																
N-BL-1-FB	98N01809	CT	ND																
N-BL-2-FB	98N01810	CT	ND																
L1	98N01811	CT	0.16																
L2	98N01812	CT	(0.006)																
L3	98N01813	CT	0.022																
L4	98N01814	CT	0.027																
L5	98N01815	CT	0.10																
L6	98N01816	CT	0.24																
L7	98N01817	CT	0.014																
L8	98N01818	CT	0.038																
L9	98N01819	CT	0.16																

† See comment on last page. ND Parameter not detected.above LOD.      \*\* See comment on last page. ( ) Parameter between LOD and LOQ.



**ANALYTICAL REPORT**

Form ARF-BL

Page 3 of 5

Part 1 of 1

03109814271208

Date 3/11/98

Laboratory Group Name 98N-0039-01

**Analytical Results**

Field Sample Number	Laboratory Number	Sample Type	Perchloroethylene mg/sample							
L10	98N01820	CT	0.044							
L11	98N01821	CT	0.15							
L-BL-1-FB	98N01822	CT	ND							
L-FB(2/18)FB	98N01823	CT	ND							
T1	98N01824	CT	0.13							
T2	98N01825	CT	0.050							
T3	98N01826	CT	ND							
T4	98N01827	CT	0.046							
T5	98N01828	CT	0.16							
T6	98N01829	CT	0.10							
T7	98N01830	CT	(0.003)							
T8	98N01831	CT	0.060							
T9	98N01832	CT	0.046							
T10	98N01833	CT	0.13							
T-BL-1-FB	98N01834	CT	ND							
T-BLANK-FB	98N01835	CT	ND							
G1	98N01836	CT	0.069							
G2	98N01837	CT	0.059							
G3	98N01838	CT	0.071							
G4	98N01839	CT	0.020							
G5	98N01840	CT	0.025							
G6	98N01841	CT	ND							
G7	98N01842	CT	0.030							
G8	98N01843	CT	0.032							
G9	98N01844	CT	0.070							
G10	98N01845	CT	0.034							
G11	98N01846	CT	0.0088							
G-BL-FB	98N01847	CT	ND							
HP1	98N01848	CT	0.81							
HP2	98N01849	CT	0.88							

† See comment on last page.  
 ND Parameter not detected.above LOD.

\*\* See comment on last page.  
 ( ) Parameter between LOD and LOQ.





ANALYTICAL REPORT

Form ARF-C

Page 5 of 5  
03119811381265

Date 3/11/98  
Laboratory Group Name 98N-0039-01

**General Set Comments**

NMAM 4th edition method 1003 was modified as follows:  
Use of capillary column.  
Oven conditions and carrier gas flow rate were modified to achieve separation of the compounds.  
Use of media standards.



May 08, 1998

RE: Seq. 8903-CC  
Gas Chromatography

ANALYTICAL REPORT

SUBMITTED TO: Ed Burroughs  
SUBMITTED BY: Young Hee Yoon  
REFERENCE DATA:

Analysis of: Perchloroethylene  
Identification No.: ECTB-97-403  
Sample Type: Charcoal Tube  
Sample(s): 41 Analyses: 41

DataChem Laboratory No.: 98N03372 through 98N03413 except 98N03392

The charcoal tube samples were analyzed by gas chromatography according to NMAM 4th edition method 1003 with modifications identified with an asterisk (\*).

Desorption Process: 30 minutes in 1.0 milliliter of carbon disulfide containing 0.8  $\mu$ L/mL n-hexane as an internal standard.  
Gas Chromatograph: Hewlett-Packard Model 5890A equipped with a flame ionization detector.  
Column:\* 30m x 0.32mm fused silica capillary coated internally with 1.0  $\mu$ m of DB-5ms.  
Oven Conditions:\* 40°C for 8.5 minutes and then up to 70°C for 2 minutes at a rate of 5°C per minute.

Media standards were used for quantitation. \*

CINCINNATI LABORATORY  
4355 Glendale-Milford Road  
Cincinnati, Ohio 45242-3700  
513-733-5550 FAX 513-733-5547

NOVATO OFFICE  
11 Santa Yerma Court  
Novato, California 94945  
415-897-9471 FAX 415-897-9469

CORPORATE OFFICE  
SALT LAKE CITY LABORATORY  
960 West LeVoy Drive  
Salt Lake City, Utah 84123-2547  
801-266-7700 FAX 801-266-9992

BALTIMORE OFFICE  
10 Juliet Lane # 203  
Baltimore, Maryland 21236-1220  
410-529-5675 FAX 410-529-5355

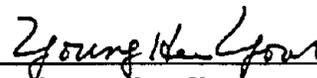
RICHLAND OFFICE  
313 Wellspan Way  
Richland, Washington 99352-4116  
509-943-5555 FAX 509-943-5654

The LOD and LOQ are tabulated below:

<u>Analyte</u>	<u>LOD (mc/sample)</u>	<u>LOQ (mc/sample)</u>
Perchloroethylene	0.002	0.007

The reported values have not been field blank corrected.

The results are tabulated on the following page(s).

  
Young Hee Yoon

  
Don Wickman  
Section Manager  
Industrial Hygiene  
Organic Chemistry



ANALYTICAL REPORT

NIOSH  
 Form ARF-AL  
 Page 1 of 3  
 Part 1 of 1  
 05079811274349

Date 5/8/98  
 Laboratory Group Name 98N-0080-01  
 Agency Identification Number 8903-CC  
 Project Name ECTB-97-403

NIOSH  
 Attention: Burroughs, Ed  
 4676 Columbia Parkway  
 Cincinnati, OH 45226

FAX  
 Telephone (513) 841-4275

Sampling Collection and Shipment

Sampling Site Dry Cling Shops, NY Date of Collection April 15, 1998  
 Date Samples Received at Laboratory April 27, 1998

Analysis

Method of Analysis NMAM 1003  
 Date(s) of Analysis May 06, 1998 - May 07, 1998

Analytical Results

Field Sample Number	Laboratory Number	Sample Type	Perchloroethylene mg/sample						
A1	98N03372	CT	0.63						
A2	98N03373	CT	0.10						
A3	98N03374	CT	0.030						
A4	98N03375	CT	0.14						
A5	98N03376	CT	0.039						
A6	98N03377	CT	0.31						
A8	98N03378	CT	0.37						
A9	98N03379	CT	0.11						
A10	98N03380	CT	0.085						
A11	98N03381	CT	0.042						
A12	98N03382	CT	0.24						
A13	98N03383	CT	ND						
A-BLANK-FE	98N03384	CT	ND						

† See comment on last page.  
 ND Parameter not detected above LOD.  
 NR Parameter not requested.

\*\* See comment on last page.  
 ( ) Parameter between LOD and LOQ.

Young Hee Loon  
 Analyst: Young Hee Loon  
John M. Reynolds  
 Reviewer: John M. Reynolds  
Don Wickman  
 Laboratory Supervisor: Don Wickman



**ANALYTICAL REPORT**

Form ARF-BL

Page 2 of 3

Part 1 of 1

05079811274349

Date 5/8/98

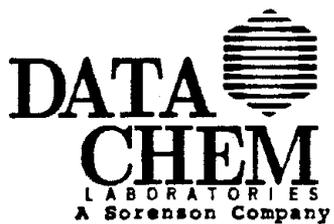
Laboratory Group Name 98N-0080-01

**Analytical Results**

Field Sample Number	Laboratory Number	Sample Type	Perchloro ethylene mg/sample							
D1	98N03385	CT	0.26							
D2	98N03386	CT	0.13							
D3	98N03387	CT	0.52							
D4	98N03388	CT	0.25							
D5	98N03389	CT	0.054							
D6	98N03390	CT	0.21							
D7	98N03391	CT	0.098							
D9	98N03393	CT	0.52							
D10	98N03394	CT	0.22							
D11	98N03395	CT	0.19							
D12	98N03396	CT	0.95							
D13	98N03397	CT	0.024							
D14	98N03398	CT	ND							
D15	98N03399	CT	0.18							
D-BL1-FB	98N03400	CT	ND							
J1	98N03401	CT	0.60							
J2	98N03402	CT	0.26							
J3	98N03403	CT	1.5							
J4	98N03404	CT	0.32							
J5	98N03405	CT	0.15							
J6	98N03406	CT	ND							
J7-FB	98N03407	CT	ND							
J8	98N03408	CT	0.70							
J9	98N03409	CT	0.30							
J10	98N03410	CT	0.15							
J11	98N03411	CT	0.18							
J12	98N03412	CT	0.94							
J13	98N03413	CT	0.78							
Limit of Detection			0.002							
Limit of Quantitation			0.007							

† See comment on last page.  
 ND Parameter not detected.above LOD.

\*\* See comment on last page.  
 ( ) Parameter between LOD and LOQ.



**ANALYTICAL REPORT**

Form ARF-C

Page 3 of 3  
05079811274349

Date 5/8/98  
Laboratory Group Name 98N-0080-01

**General Set Comments**

NMAM 4th edition method 1003 was modified as follows:

Use of capillary column.

Oven conditions and carrier gas flow rate were modified to achieve separation of the compounds.

Use of media standards.

APPENDIX 4B

ANALYTICAL LABORATORY REPORTS  
FOR ANALYSIS OF PASSIVE BADGE SAMPLES





March 13, 1998

RE: Seq. 8903-CB  
Gas Chromatography

ANALYTICAL REPORT

SUBMITTED TO: Ed Burroughs

SUBMITTED BY: Young Hee Yoon

REFERENCE DATA:

Analysis of: Perchloroethylene

Identification No.: ECTB 97-403

Sample Type: SKC Passive Monitor(575 Series)

Sample(s): 101 Analyses: 101

DataChem Laboratory No.: 98N01856 through 98N01956

The SKC passive monitor samples were analyzed by gas chromatography. No analytical method is available for the analysis of the requested analyte on the SKC passive monitor. DCL utilized a combination of conditions from the manufacturer's instructions (for the desorption process) and NMAM 4th edition method 1003 (for gas chromatographic analysis) with modifications identified with an asterisk (\*).

Desorption Process: Shook for one hour in 2.0 milliliters of carbon disulfide containing 0.5 µL/mL hexane as an internal standard.

Gas Chromatograph: Hewlett-Packard Model 5890IIA equipped with a flame ionization detector.

Column:\* 30m x 0.32mm fused silica capillary coated internally with 1.0 µm of DB-5ms.

Oven Condition:\* 40°C for 5 minutes and then up to 60°C for 6 minutes at a rate of 10°C per minute

Liquid standards were used for quantitation. \*

Field blank samples 98N01886 and 98N01903 contained measurable amounts of perchloroethylene.

CINCINNATI LABORATORY  
4388 Glendale-Milford Road  
Cincinnati, Ohio 45242-3714  
513-733-5336 FAX 513-733-5347

NOVATO OFFICE  
11 Santa Yorma Court  
Novato, California 94945  
415-897-9471 FAX 415-893-9469

CORPORATE OFFICE  
SALT LAKE CITY LABORATORY  
960 West LeVey Drive  
Salt Lake City, Utah 84125-2547  
801-266-7700, FAX 801-266-9992

BALTIMORE OFFICE  
10 Juliet Lane #203  
Baltimore, Maryland 21236-1220  
410-529-5675, FAX 410-529-5355

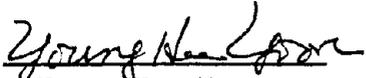
RICHLAND OFFICE  
313 Welisian Way  
Richland, Washington 99352-4116  
509-943-5855, FAX 509-943-5654

The LOD and LOQ are tabulated below:

<u>Analyte</u>	<u>LOD (mg/sample)</u>	<u>LOQ (mg/sample)</u>
Perchloroethylene	0.004	0.01

The reported values have not been field blank corrected.

The results are tabulated on the following page(s).

  
Young Hee Yoon

  
Don Wickman  
Section Manager  
Industrial Hygiene  
Organic Chemistry



ANALYTICAL REPORT

NIOSH  
 Form ARF-AL  
 Page 1 of 5  
 Part 1 of 1  
 03119815303888

Date 3/13/98  
 Laboratory Group Name 98N-0040-01  
 Agency Identification Number 8903-CB  
 Project Name ECTB-97-403

NIOSH  
 Attention: Burroughs, Ed  
 4676 Columbia Parkway  
 Cincinnati, OH 45226

FAX \_\_\_\_\_  
 Telephone (513) 841-4275

Sampling Collection and Shipment

Sampling Site Dry Cling Shops-CA Date of Collection \_\_\_\_\_

Date Samples Received at Laboratory March 05, 1998

Analysis

Method of Analysis NMAM 1003

Date(s) of Analysis March 07, 1998 - March 09, 1998

Analytical Results

Field Sample Number	Laboratory Number	Sample Type	Perchloro ethylene mg/sample						
F1	98N01856	MONITR	0.24						
F2	98N01857	MONITR	0.062						
F3	98N01858	MONITR	0.047						
F4	98N01859	MONITR	0.041						
F5	98N01860	MONITR	0.038						
F6	98N01861	MONITR	0.057						
F7	98N01862	MONITR	0.088						
F8	98N01863	MONITR	0.13						
F11	98N01864	MONITR	0.14						
F12	98N01865	MONITR	0.051						
F13	98N01866	MONITR	0.040						
F14	98N01867	MONITR	0.061						
F15	98N01868	MONITR	0.044						

† See comment on last page.  
 ND Parameter not detected above LOD.  
 NR Parameter not requested.

\*\* See comment on last page.  
 ( ) Parameter between LOD and LOQ.

Young Hee Yoon  
 Analyst: Young Hee Yoon

Lawrence E. Miller  
 Reviewer: Lawrence E. Miller

Don Wickman  
 Laboratory Supervisor: Don Wickman

960 West LeVoy Drive / Salt Lake City, Utah 84123-2547  
 Phone (801) 266-7700 Web Page: www.datachem.com  
 FAX (801) 268-9992 E-mail: lab@datachem.com



**ANALYTICAL REPORT**

Form ARF-BL  
 Page 2 of 5  
 Part 1 of 1  
 03119815303888

Date 3/18/98  
 Laboratory Group Name 98N-0040-01

**Analytical Results**

Field Sample Number	Laboratory Number	Sample Type	Perchloro ethylene mg/sample										
F16	98N01869	MONITR	0.044										
F17	98N01870	MONITR	0.035										
F18	98N01871	MONITR	0.042										
2/3F-FB	98N01872	MONITR	ND										
2/4F-FB	98N01873	MONITR	ND										
LL1	98N01874	MONITR	0.087										
LL2	98N01875	MONITR	0.076										
LL3	98N01876	MONITR	0.12										
MH1	98N01877	MONITR	0.22										
MH2	98N01878	MONITR	0.16										
MH3	98N01879	MONITR	0.30										
JS1	98N01880	MONITR	0.25										
JS2	98N01881	MONITR	0.15										
JS3	98N01882	MONITR	0.18										
2/9F-FB	98N01883	MONITR	ND										
HP1	98N01884	MONITR	0.096										
HP2	98N01885	MONITR	0.11										
HPBL-B	98N01886	MONITR	0.029										
N1	98N01887	MONITR	0.086										
N2	98N01888	MONITR	0.10										
N3	98N01889	MONITR	ND										
N4	98N01890	MONITR	0.44										
N5	98N01891	MONITR	0.044										
N6	98N01892	MONITR	0.066										
N7	98N01893	MONITR	0.066										
N11	98N01894	MONITR	ND										
N12	98N01895	MONITR	0.37										
N13	98N01896	MONITR	0.25										
N14	98N01897	MONITR	0.13										
N15	98N01898	MONITR	0.088										

† See comment on last page. ND Parameter not detected.above LOD.  
 \*\* See comment on last page. ( ) Parameter between LOD and LOQ.



**ANALYTICAL REPORT**

Form ARF-BL

Page 3 of 5

Part 1 of 1

03119815303888

Date 3/13/98  
 Laboratory Group Name 98N-0040-01

**Analytical Results**

Field Sample Number	Laboratory Number	Sample Type	Perchloroethylene mg/sample							
N16	98N01099	MONITR	0.079							
N17	98N01900	MONITR	0.078							
2/4BL-FB	98N01901	MONITR	ND							
2/5BL-FB	98N01902	MONITR	ND							
2/11BL-FB	98N01903	MONITR	0.18							
C1	98N01904	MONITR	0.21							
C2	98N01905	MONITR	0.10							
C3	98N01906	MONITR	0.050							
F1N	98N01907	MONITR	0.081							
F2N	98N01908	MONITR	0.21							
F3N	98N01909	MONITR	0.27							
L1	98N01910	MONITR	0.025							
L2	98N01911	MONITR	ND							
L3	98N01912	MONITR	ND							
L4	98N01913	MONITR	ND							
L5	98N01914	MONITR	0.014							
L6	98N01915	MONITR	0.031							
L7	98N01916	MONITR	ND							
L8	98N01917	MONITR	(0.006)							
L9	98N01918	MONITR	0.020							
L10	98N01919	MONITR	(0.005)							
L11	98N01920	MONITR	0.019							
2/17LBL-FB	98N01921	MONITR	ND							
2/18LBR-FB	98N01922	MONITR	ND							
T1	98N01923	MONITR	0.020							
T2	98N01924	MONITR	(0.006)							
T3	98N01925	MONITR	ND							
T4	98N01926	MONITR	(0.006)							
T5	98N01927	MONITR	0.025							
T6	98N01928	MONITR	0.013							

† See comment on last page.  
 ND Parameter not detected.above LOD.

\*\* See comment on last page.  
 ( ) Parameter between LOD and LOQ.



**ANALYTICAL REPORT**

Form ARF-BL

Page 4 of 5

Part 1 of 1

03119815303888

Date 3/13/98  
 Laboratory Group Name 98N-0040-01

**Analytical Results**

Field Sample Number	Laboratory Number	Sample Type	Perchloro ethylene mg/sample							
T7	98N01929	MONITR	(0.006)							
T8	98N01930	MONITR	0.020							
T9	98N01931	MONITR	0.010							
T10	98N01932	MONITR	0.021							
G1	98N01933	MONITR	0.014							
G2	98N01934	MONITR	(0.007)							
G3	98N01935	MONITR	(0.009)							
G4	98N01936	MONITR	ND							
G5	98N01937	MONITR	ND							
G7	98N01938	MONITR	ND							
G8	98N01939	MONITR	(0.005)							
G9	98N01940	MONITR	(0.01)							
G10	98N01941	MONITR	ND							
G11	98N01942	MONITR	ND							
G12-FB	98N01943	MONITR	ND							
J1	98N01944	MONITR	0.015							
J2	98N01945	MONITR	0.066							
J3	98N01946	MONITR	0.067							
Q1	98N01947	MONITR	0.030							
Q2	98N01948	MONITR	0.036							
Q3	98N01949	MONITR	0.020							
L-BLK-FB	98N01950	MONITR	ND							
MIKE1	98N01951	MONITR	0.051							
MIKE2	98N01952	MONITR	0.030							
MIKE3	98N01953	MONITR	0.013							
MING1	98N01954	MONITR	(0.008)							
MING2	98N01955	MONITR	ND							
MING3	98N01956	MONITR	(0.008)							
Limit of Detection			0.004							
Limit of Quantitation			0.01							

† See comment on last page.      \*\* See comment on last page.  
 ND Parameter not detected.above LOD.      ( ) Parameter between LOD and LOQ.



**ANALYTICAL REPORT**

Form ARF-C

Page 5 of 5  
03129809581806

Date 3/13/98  
Laboratory Group Name 98N-0040-01

**General Set Comments**

No analytical method is available for the analysis of the requested analyte on the SKC passive monitor. DCL utilized a combination of conditions from the manufacturer's instructions (for the desorption process) and NMAM 4th edition method 1003 (for gas chromatographic analysis) with modifications as follows: Use of capillary column.

Oven conditions and carrier gas flow rate were modified to achieve separation of the compounds.

Field blank samples 98N01886 and 98N01903 contained measurable amounts of perchloroethylene.



May 15, 1998

RE: Seq. 8903-CD  
Gas Chromatography

ANALYTICAL REPORT

SUBMITTED TO: Ed Burroughs  
SUBMITTED BY: Young Hee Yoon  
REFERENCE DATA:

Analysis of: Perchloroethylene

Identification No.: ECTB 97-403

Sample Type: SKC Passive Monitor (575 Series)

Sample(s): 64 Analyses: 64

DataChem Laboratory No.: 98N03949 through 98N04012

The SKC passive monitor samples were analyzed by gas chromatography. No analytical method is available for the analysis of the requested analyte on the SKC passive monitor. DCL utilized a combination of conditions from the manufacturer's instructions (for the desorption process) and NMAM 4th edition method 1003 (for gas chromatographic analysis) with modifications identified with an asterisk (\*).

Description Process: Shook for one hour in 2.0 milliliters of carbon disulfide containing 0.8  $\mu$ L/mL hexane as an internal standard.

Gas Chromatograph: Hewlett-Packard Model 5890IIA equipped with a flame ionization detector.

Column:\* 30m x 0.32mm fused silica capillary coated internally with 1.0  $\mu$ m of DB-5ms.

Oven Condition:\* 40°C for 5 minutes and then up to 70°C for 1 minute at a rate of 5°C per minute

Liquid standards were used for quantitation. \*

Field blank sample 98N03995 contained a measurable amount of perchloroethylene.

CINCINNATI LABORATORY  
4888 Glendale-Milford Road  
Cincinnati, Ohio 45242-3776  
513-753-5356, FAX 513-753-5347

NOVATO OFFICE  
11 Santa Ynez Court  
Novato, California 94945  
415-897-9471 FAX 415-893-9469

CORPORATE OFFICE  
SALT LAKE CITY LABORATORY  
960 West LeVoy Drive  
Salt Lake City, Utah 84123-2547  
801-266-7700, FAX 801-266-9952

BALTIMORE OFFICE  
10 Juliet Lane # 203  
Baltimore, Maryland 21236-1220  
410-529-5675, FAX 410-529-5355

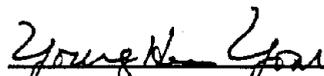
RICHLAND OFFICE  
313 Wellspan Way  
Richland, Washington 99352-4116  
509-943-5554, FAX 509-943-5654

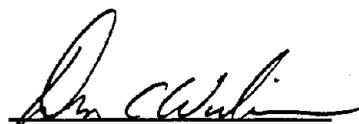
The LOD and LOQ are tabulated below:

<u>Analyte</u>	<u>LOD (mg/sample)</u>	<u>LOQ (mg/sample)</u>
Perchloroethylene	0.004	0.01

The reported values have not been field blank corrected.

The results are tabulated on the following page(s).

  
Young Hee Yoon

  
Don Wickman  
Section Manager  
Industrial Hygiene  
Organic Chemistry



ANALYTICAL REPORT

NIOSH  
 Form ARF-AL  
 Page 1 of 4  
 Part 1 of 1  
 05149817053431

Date 5/15/98  
 Laboratory Group Name 98N-0088-01  
 Agency Identification Number 8903-CD  
 Project Name ECTB-97-403

NIOSH  
 Attention: Burroughs, Ed  
 4676 Columbia Parkway  
 Cincinnati, OH 45226

FAX \_\_\_\_\_  
 Telephone (513) 841-4275

Sampling Collection and Shipment

Sampling Site Dry Clngng Shops, NY Date of Collection April 15, 1998  
 Date Samples Received at Laboratory May 06, 1998  
 Hold Date May 06, 1998 Release Date May 07, 1998

Analysis

Method of Analysis NMAM 1003  
 Date(s) of Analysis May 11, 1998 - May 12, 1998

Analytical Results

Field Sample Number	Laboratory Number	Sample Type	Perchloroethylene mg/sample							
A1	98N03949	BADGE	0.087							
A2	98N03950	BADGE	0.015							
A3	98N03951	BADGE	(0.006)							
A4	98N03952	BADGE	0.022							
A5	98N03953	BADGE	(0.006)							
A6	98N03954	BADGE	0.043							
A7-FB	98N03955	BADGE	ND							
A8	98N03956	BADGE	0.060							
A9	98N03957	BADGE	0.017							
A10	98N03958	BADGE	0.016							
A11	98N03959	BADGE	(0.007)							
A12	98N03960	BADGE	0.035							
A13-FB	98N03961	BADGE	ND							

† See comment on last page.  
 ND Parameter not detected above LOD.  
 NR Parameter not requested.

\*\* See comment on last page.  
 ( ) Parameter between LOD and LOQ.

Young Hee Yoon  
 Analyst: Young-Hee Yoon

F. Rejcek  
 Reviewer:

Don Wickman  
 Laboratory Supervisor: Don Wickman



**ANALYTICAL REPORT**

Form ARF-BL  
 Page 2 of 4  
 Part 1 of 1  
 05149817053431

Date 5/15/98  
 Laboratory Group Name 98N-0088-01

**Analytical Results**

Field Sample Number	Laboratory Number	Sample Type	Perchloro ethylene mg/sample							
J1	98N03962	BADGE	0.10							
J2	98N03963	BADGE	0.043							
J3	98N03964	BADGE	0.21							
J4	98N03965	BADGE	0.049							
J5	98N03966	BADGE	0.027							
JB-FB	98N03967	BADGE	ND							
J8	98N03968	BADGE	0.10							
J9	98N03969	BADGE	0.046							
J10	98N03970	BADGE	0.024							
J11	98N03971	BADGE	0.028							
J12	98N03972	BADGE	0.15							
J13	98N03973	BADGE	0.13							
D1	98N03974	BADGE	0.037							
D2	98N03975	BADGE	0.019							
D3	98N03976	BADGE	0.054							
D4	98N03977	BADGE	0.032							
D5	98N03978	BADGE	(0.008)							
D6	98N03979	BADGE	0.031							
D7	98N03980	BADGE	0.012							
D8-FB	98N03981	BADGE	ND							
D9	98N03982	BADGE	0.070							
D10	98N03983	BADGE	0.032							
D11	98N03984	BADGE	0.026							
D12	98N03985	BADGE	0.14							
D13	98N03986	BADGE	ND							
D14-FB	98N03987	BADGE	ND							
D15	98N03988	BADGE	0.027							
AA1	98N03989	BADGE	0.091							
AA2	98N03990	BADGE	0.019							
AA3	98N03991	BADGE	0.070							

† See comment on last page.  
 ND Parameter not detected.above LOD.

\*\* See comment on last page.  
 ( ) Parameter between LOD and LOQ.





**ANALYTICAL REPORT**

Form ARF-C

Page 4 of 4  
05159809463564

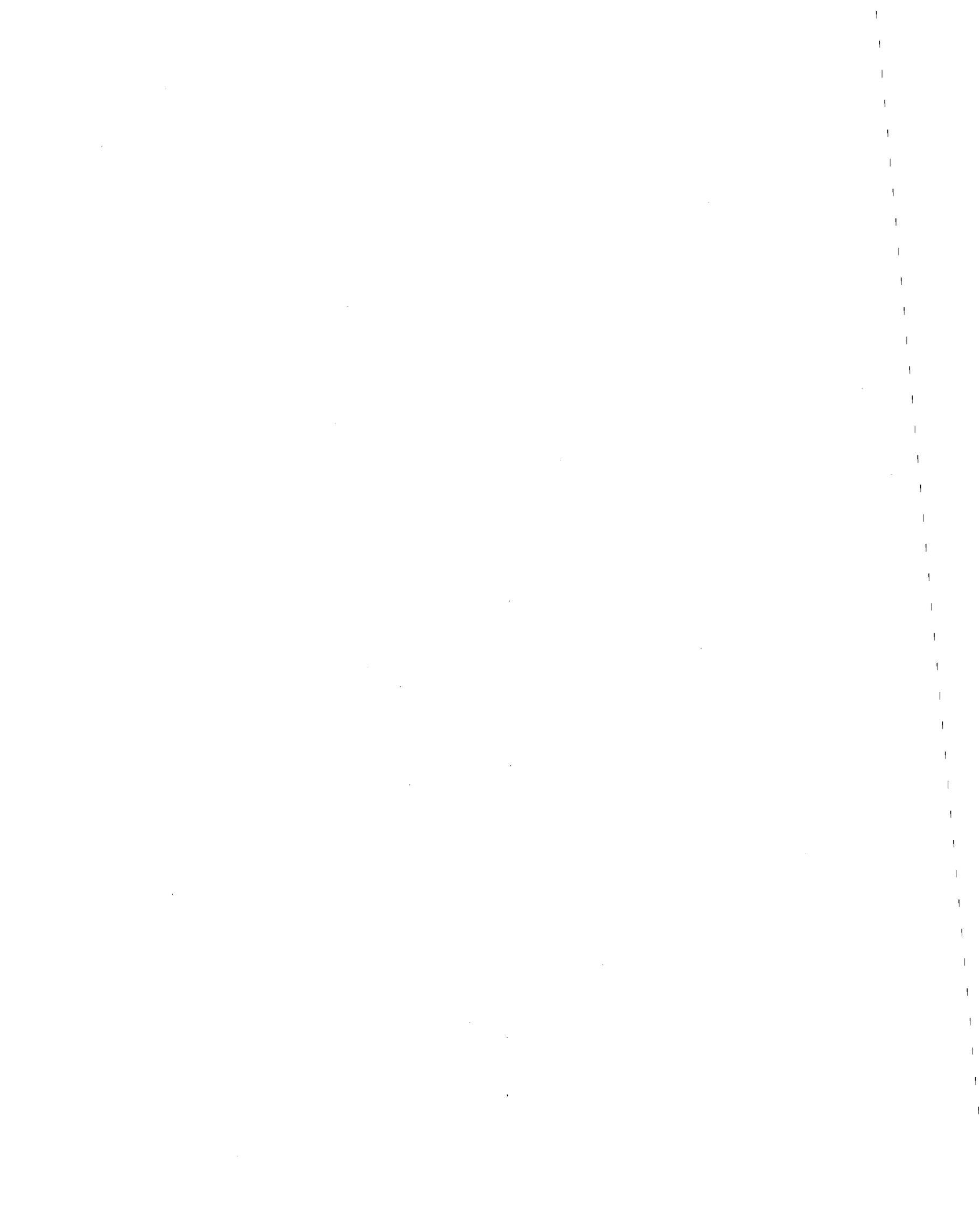
Date 5/15/98  
Laboratory Group Name 98N-0088-01

**General Set Comments**

No analytical method is available for the analysis of the requested analyte on the SKC passive monitor. DCL utilized a combination of conditions from the manufacturer's instructions (for the desorption process) and NMAM 4th edition method 1003 (for gas chromatographic analysis) with modifications as follows:  
Use of capillary column.

Oven conditions and carrier gas flow rate were modified to achieve separation of the compounds.

Field blank sample 98N03995 contained a measurable amount of perchloroethylene.



APPENDIX 4C

ANALYTICAL LABORATORY REPORTS

QUALITY CONTROL DATA FOR ANALYSIS OF CHARCOAL TUBE SAMPLES



DataChem Laboratories

Quality Control Data Sheet

Batch ID: 1998-449

Analyte.....: Perchloroethylene  
 Analyst Name...: YOON  
 Analyst Number: 5010  
 Method.....: NMAH 1003  
 Results in....: mg/sample  
 Set ID(s).....: 98N-0039-01

Seq. No. 8903-CA

CT

Matrix.....: GC/HP5890II  
 Instrument: 10-MAR-1998 14:26  
 Date.....: TCEENE  
 QC File.....:

Sample Name	Repl	Value	Mean	Target	Range	Range/Mean	-Status-	
							Acc	Pie
98N01777A	2	1.6686	1.6598		0.0176	0.0106		
98N01778A	2	1.6510	0.4127		0.0008	0.0018		
98N01779A	2	0.4131	0.2593		0.0002	0.0009		
98N01811A	2	0.4123	0.1618		0.0002	0.0011		
98N01812A	2	0.2594	0.0058		0.0002	0.0396		
98N01813A	2	0.2592	0.0219		0.0001	0.0042		
98N01814A	2	0.1617	0.0271		0.0003	0.0124		
98N01815A	2	0.1619	0.1032		0.0001	0.0012		
98N01816A	2	0.0060	0.2357		0.0000	0.0000		
98N01817A	2	0.0057	0.0138		0.0004	0.0301		
98N01852A	2	0.0220	0.1035		0.0001	0.0011		
98N01853A	2	0.0271	0.0424		0.0002	0.0040		
98N01854A	2	0.0268	Below Range					
QC63194	2	0.1031	Below Range	0.2410	0.0006	0.0025	I	I
QC63195	2	0.1033	0.2479	0.2410	0.0000	0.0001	I	I
QC63196	2	0.2357	0.2480	0.2410	0.0001	0.0006	I	I
QC63197	2	0.0140	0.2473	0.2410	0.0000	0.0001	I	I
QC63198	2	0.0136	0.2484	0.2410	0.0004	0.0015	I	I
QC63199	2	0.1035	0.1651	0.1610	0.0002	0.0011	I	I
		0.0425	0.1650					
		0.0423						
		0.0000						
		0.0000						
		0.2486						
		0.2492						
		0.2479						
		0.2479						
		0.2479						
		0.2481						
		0.2473						
		0.2473						
		0.2482						
		0.2486						
		0.1652						
		0.1650						

JAY  
3/17/98

JAY  
3/17/98

RE

Checked by:

Limit of detection: 0.002

Page: 1

DataChem Laboratories

Quality Control Data Sheet

Batch ID: 1998-449

Analyte.....: Perchloroethylene  
 Analyst Name...: YOON  
 Analyst Number: 5010  
 Method.....: NMAM 1003  
 Results in.....: mg/sample  
 Set ID(s).....: 98N-0039-01

C7

Matrix.....:  
 Instrument: GC/HP5890II  
 Date.....: 10-MAR-1998 14:26  
 QC File.....: TCEENE

Seg. no. 8903-CA

Sample Name	Repl	Value	Mean	Target	Range	Range/Mean	-Status-	
							Acc	Pie
QC63200	2	0.1641 0.1647	0.1644	0.1610	0.0006	0.0040	I	I
QC63201	2	0.1653 0.1648	0.1650	0.1610	0.0005	0.0030	I	I
QC63203	2	0.1610 0.1611	0.1610	0.1610	0.0001	0.0006	I	I
QC63204	2	0.0823 0.0827	0.0825	0.0803	0.0004	0.0047	I	I
QC63207	2	0.0822 0.0818	0.0820	0.0803	0.0004	0.0052	I	I
QC63208	2	0.0826 0.0823	0.0824	0.0803	0.0003	0.0034	I	I

*JAY*  
 3/17/98

*John*  
 3/17/98

*John*

seg. W.8903-CA

LOD/LOQ SUMMARY PAGE.

Batch ID : 1998-449  
Analyte : Perchloroethylene  
Media : CT  
Industrial Hygienist : Ed Burroughs  
Analyst's badge number : 5010  
Analysis Instrument : GC/HP5890II  
Date of Analysis : 5-MAR-1998  
Date of Computation : 10-MAR-1998  
equation type : Quadratic - a+b\*x+c\*x\*\*2  
Coefficients a : 0.0000  
b : 0.5767  
c : 0.0029

Standard Error : 0.0004  
Limit of Detection : 0.0023 mg/sample  
Limit of Quantitation : 0.0076 mg/sample  
Calculation Method : Burkart's method

Report Units : mg/sample  
Data set indexes : First: 0 - Last: 5  
Threshold :

target	response	predicted	Standard Error
target[ 0 ] : 0.0008	response[ 0 ] :	predicted[ 0 ] :	0.0005
target[ 1 ] : 0.0008	response[ 1 ] :	predicted[ 1 ] :	0.0005
target[ 2 ] : 0.0016	response[ 2 ] :	predicted[ 2 ] :	0.0009
target[ 3 ] : 0.0016	response[ 3 ] :	predicted[ 3 ] :	0.0009
target[ 4 ] : 0.0032	response[ 4 ] :	predicted[ 4 ] :	0.0019
target[ 5 ] : 0.0032	response[ 5 ] :	predicted[ 5 ] :	0.0019
target[ 6 ] : 0.0048	response[ 6 ] :	predicted[ 6 ] :	0.0028
target[ 7 ] : 0.0048	response[ 7 ] :	predicted[ 7 ] :	0.0028
target[ 8 ] : 0.0161	response[ 8 ] :	predicted[ 8 ] :	0.0093
target[ 9 ] : 0.0161	response[ 9 ] :	predicted[ 9 ] :	0.0093
target[10] : 0.0482	response[10] :	predicted[10] :	0.0278
target[11] : 0.0482	response[11] :	predicted[11] :	0.0278
target[12] : 0.3213	response[12] :	predicted[12] :	0.1856
target[13] : 0.3213	response[13] :	predicted[13] :	0.1856
target[14] : 0.9639	response[14] :	predicted[14] :	0.5586
target[15] : 0.9639	response[15] :	predicted[15] :	0.5586
target[16] : 8.0320	response[16] :	predicted[16] :	4.8179
target[17] : 8.0320	response[17] :	predicted[17] :	4.8179

\* data points used to compute the standard error.

Seq. No. 8903-CC

DataChem Laboratories  
Quality Control Data Sheet

Batch ID: 1998-889

Analyte.....: Perchloroethylene  
Analyst Name...: YOON  
Analyst Number: 5010  
Method.....: NMAM 1003  
Results in.....: mg/sample  
Set ID(s).....: 98N-0080-01

Matrix.....: **CT**  
Instrument: GC/HPS890II  
Date.....: 7-MAY-1998 14:24  
QC File.....: TCEENE

Sample Name	Repl	Value	Mean	Target	Range	Range/Mean	-Status- Acc Pre
98N03372A	2	0.6338	0.6334	0.0007	0.0007	0.0011	
98N03373A	2	0.6330	0.1006	0.0003	0.0003	0.0026	
98N03374A	2	0.1004	0.1007	0.0001	0.0001	0.0045	
98N03375A	2	0.0299	0.0298	0.0012	0.0012	0.0088	
98N03376A	2	0.1422	0.1415	0.0005	0.0005	0.0132	
98N03377A	2	0.1409	0.0386	0.0030	0.0030	0.0097	
98N03378A	2	0.0388	0.3112	0.0004	0.0004	0.0011	
98N03379A	2	0.3112	0.3082	0.0003	0.0003	0.0032	
QC63189	2	0.3720	0.3722	0.0004	0.0004	0.0011	I
QC63190	2	0.1055	0.1057	0.0004	0.0004	0.0011	I
QC63192	2	0.1058	0.3218	0.0002	0.0002	0.0005	I
QC63193	2	0.3220	0.3236	0.0018	0.0018	0.0056	I
QC63202	2	0.3235	0.3212	0.0023	0.0023	0.0071	I
QC63206	2	0.3237	0.3203	0.1610	0.0003	0.0017	I
		0.3203	0.1582	0.0803	0.0005	0.0065	I
		0.3192	0.1581				
		0.3215	0.0812				
		0.1583					
		0.1581					
		0.0809					
		0.0814					

*Handwritten signatures and dates:*  
5/14/98  
5/18/98  
5/7/98

Seq. no. 8903-CC

LOD/LOQ SUMMARY PAGE.

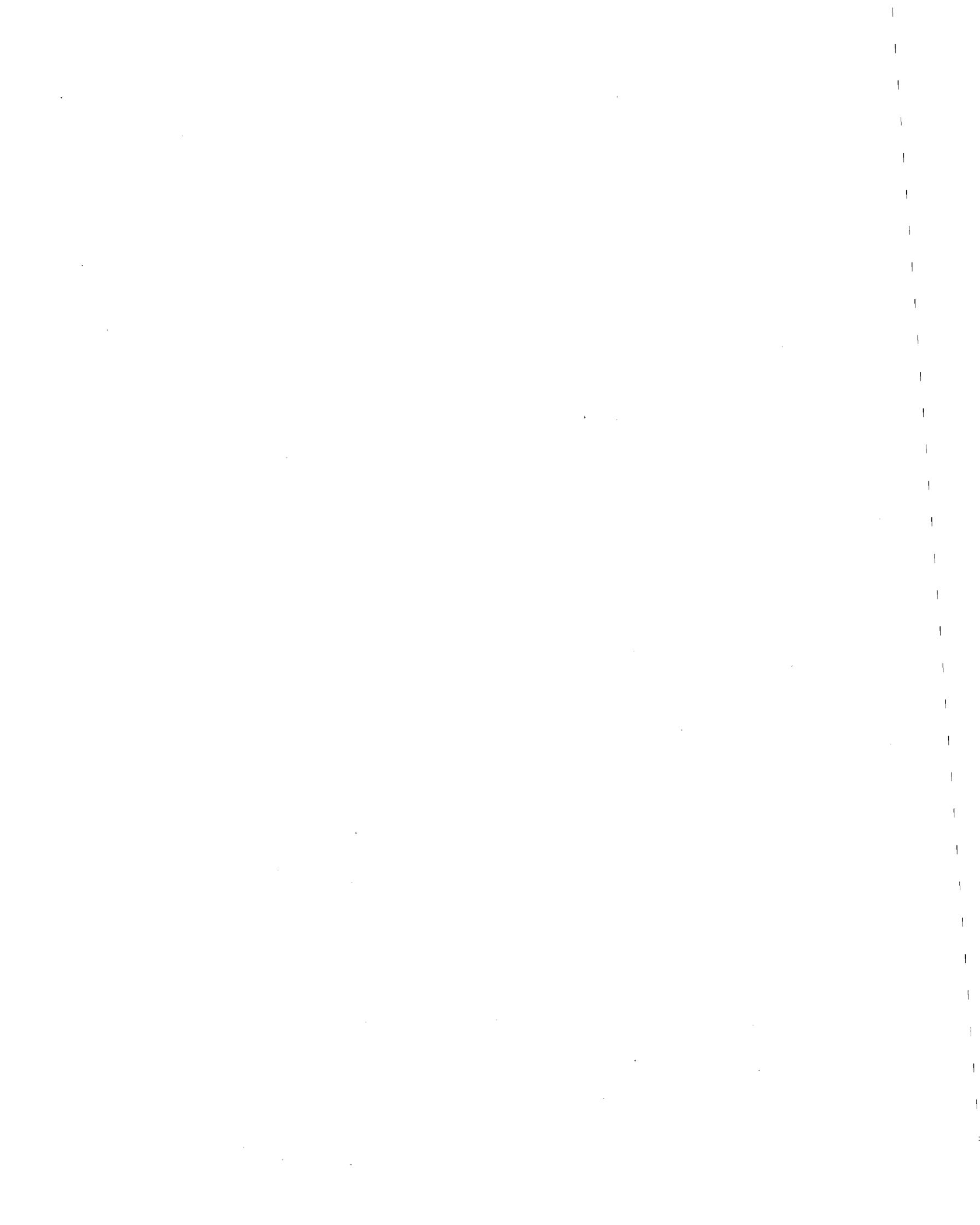
Batch ID : 1998-889  
 Analyte : Perchloroethylene  
 Media : CT  
 Industrial Hygienist : Ed Burroughs  
 Analyst's badge number : 5010  
 Analysis Instrument : GC/HP5890II  
 Date of Analysis : 5-MAY-1998  
 Date of Computation : 7-MAY-1998  
 equation type : Quadratic -  $a+b*x+c*x**2$   
 Coefficients a : 0.0000  
 b : 0.6403  
 c : -0.0003

Standard Error : 0.0005  
 Limit of Detection : 0.0022 mg/sample  
 Limit of Quantitation : 0.0072 mg/sample  
 Calculation Method : Burkart's method

Report Units : mg/sample  
 Data set indexes : First: 0 - Last: 5  
 Threshold :

target	response	predicted	Standard Error
target[ 0 ] : 0.0008	response[ 0 ] :	predicted[ 0 ] :	0.0005
target[ 1 ] : 0.0008	response[ 1 ] :	predicted[ 1 ] :	0.0005
target[ 2 ] : 0.0016	response[ 2 ] :	predicted[ 2 ] :	0.0010
target[ 3 ] : 0.0016	response[ 3 ] :	predicted[ 3 ] :	0.0010
target[ 4 ] : 0.0032	response[ 4 ] :	predicted[ 4 ] :	0.0020
target[ 5 ] : 0.0032	response[ 5 ] :	predicted[ 5 ] :	0.0020
target[ 6 ] : 0.0048	response[ 6 ] :	predicted[ 6 ] :	0.0031
target[ 7 ] : 0.0048	response[ 7 ] :	predicted[ 7 ] :	0.0031
target[ 8 ] : 0.0159	response[ 8 ] :	predicted[ 8 ] :	0.0102
target[ 9 ] : 0.0159	response[ 9 ] :	predicted[ 9 ] :	0.0102
target[10] : 0.0477	response[10] :	predicted[10] :	0.0305
target[11] : 0.0477	response[11] :	predicted[11] :	0.0305
target[12] : 0.3181	response[12] :	predicted[12] :	0.2036
target[13] : 0.3181	response[13] :	predicted[13] :	0.2036
target[14] : 0.9542	response[14] :	predicted[14] :	0.6107
target[15] : 0.9542	response[15] :	predicted[15] :	0.6107
target[16] : 7.9520	response[16] :	predicted[16] :	5.0720
target[17] : 7.9520	response[17] :	predicted[17] :	5.0720
target[18] : 15.9034	response[18] :	predicted[18] :	10.1024
target[19] : 15.9034	response[19] :	predicted[19] :	10.1024
target[20] : 23.8550	response[20] :	predicted[20] :	15.0951
target[21] : 23.8550	response[21] :	predicted[21] :	15.0951

\* data points used to compute the standard error.



APPENDIX 4D

ANALYTICAL LABORATORY REPORTS

QUALITY CONTROL DATA FOR ANALYSIS OF PASSIVE BADGE SAMPLES



DataChem Laboratories

Quality Control Data Sheet

Batch ID: 1998-450

Analyte.....: Perchloroethylene  
 Analyst Name...: YOON  
 Analyst Number: 5010  
 Method.....: NMAN 1003  
 Results in.....: mg/sample  
 Set ID(s).....: 98N-0040-01

Seq. No. 8903-CB

Matrix.....: SKC POU M  
 Instrument: GC/HP5890II  
 Date.....: 12-MAR-1998 09:29  
 QC File....: TCEPVM

Sample Name	Repl	Value	Mean	Target	Range	Range/Mean	-Status-	
							ACC	Pis
98N01856	2	0.2355	0.2363		0.0016	0.0068		
98N01857	2	0.2371	0.0622		0.0001	0.0012		
98N01858	2	0.0621	0.0469		0.0002	0.0042		
98N01859	2	0.0470	0.0406		0.0004	0.0099		
98N01892	2	0.0404	0.0658		0.0005	0.0077		
98N01893	2	0.0660	0.0655		0.0002	0.0028		
98N01894	2	0.0657	0.0655					
98N01895	2	0.0000	Out of Range		0.0001	0.0002		
98N01896	2	0.0000	Out of Range		0.0027	0.0109		
98N01897	2	0.3681	0.3681		0.0000	0.0002		
98N01898	2	0.3682	0.2507		0.0005	0.0052		
98N01953	2	0.2521	0.1315		0.0003	0.0190		
98N01954	2	0.1315	0.1314		0.0001	0.0072		
98N01955	2	0.0886	0.0884					
98N01956	2	0.0136	0.0134					
98N01956	2	0.0133	0.0078					
98N01955	2	0.0079	0.0079					
98N01956	2	0.0000	Out of Range		0.0011	0.1390		
QC63238	2	0.0000	Out of Range	0.0803	0.0015	0.0180	N	A
QC63239	2	0.0088	0.0833	0.0803	0.0002	0.0024	N	A
QC63240	2	0.0077	0.0834	0.0803	0.0005	0.0065	N	A
QC63241	2	0.0826	0.0837	0.1610	0.0000	0.0000	N	A
QC63241	2	0.0841	0.1641					
QC63241	2	0.0833	0.1641					
QC63240	2	0.0835	0.1641					
QC63241	2	0.0835	0.1641					

*JAY*  
3/18/98

QC samples are  
PCE spiked into CS.

No control limits established,  
Recoveries are acceptable.

*RCM*

Checked by:

Page: 1 Limit of detection: 0.004

*JAY*  
3/13/98

Seq. No. 8903-CB

DataChem Laboratories  
 Quality Control Data Sheet  
 Batch ID: 1998-450

Analyte.....: Perchloroethylene  
 Analyst Name...: YOON  
 Analyst Number: 5010  
 Method.....: NMAM 1003  
 Results in.....: mg/Sample  
 Set ID(s).....: 98N-0040-01

Matrix.....: SKC POU M  
 Instrument: GC/HP5890II  
 Date.....: 12-MAR-1998 09:29  
 QC File.....: TCEPVM

Sample Name	Repl	Value	Mean	Target	Range	Range/Mean	-Status-	
							Acc	Pre
QC63242	2	0.1655 0.1660	0.1658	0.1610	0.0005	0.0028	N	A
QC63243	2	0.1664 0.1670	0.1667	0.1610	0.0006	0.0036	N	A
QC63244	2	0.2428 0.2467	0.2448	0.2410	0.0039	0.0158	N	A
QC63245	2	0.2431 0.2474	0.2452	0.2410	0.0043	0.0174	N	A
QC63246	2	0.2494 0.2482	0.2488	0.2410	0.0012	0.0049	N	A
QC63247	2	0.3300 0.3324	0.3312	0.3210	0.0024	0.0072	N	A
QC63248	2	0.3299 0.3228	0.3263	0.3210	0.0071	0.0216	N	A
QC63249	2	0.3280 0.3277	0.3278	0.3210	0.0002	0.0007	N	A

*JAY*  
3/18/98

QC samples are PCE spiked into CS<sub>2</sub>.  
 No control limits established.  
 Recoveries are acceptable.

*JAY*  
3/13/98

*JAY*



## INDUSTRIAL HYGIENE QUALITY CONTROL DATA SHEET

**Analyte:** Perchloroethylene                      **Matrix:** SKC Passive Monitor, lot 656  
**Analyst:** YHY                                              **Instrument:** GC  
**Method:** *nmam 1003 & manufacturer's*      **Date Analyzed:** *March 10, 1998*  
*Instructions*

Results in: mg/Sample

Sample Number	Analysis 1	Analysis 2	Average	Target	% Recovery	Range	Range/Target
QC63254	0.153	0.152	0.153	0.161	45.0	0.001	0.0062
QC63255	0.156	0.156	0.156	0.161	46.9	0	0
QC63256	0.232	0.231	0.232	0.241	96.3	0.001	0.0041

LOD = 0.004

Checked By:

*No control limits established,  
Recoveries are acceptable,*

3/18/98

3/13/98

Seq no. 8903-CB

LOD/LOQ SUMMARY PAGE.

Batch ID : 1998-450  
 Analyte : Perchloroethylene  
 Media : CT  
 Industrial Hygienist : Ed Burroughs  
 Analyst's badge number : 5010  
 Analysis Instrument : GC/HP5890II  
 Date of Analysis : 7-MAR-1998  
 Date of Computation : 11-MAR-1998  
 equation type : Quadratic - a+b\*x+c\*x\*\*2  
 Coefficients a : 0.0000  
 b : 0.6036  
 c : -0.0003

Standard Error : 0.0008  
 Limit of Detection : 0.0040 mg/sample  
 Limit of Quantitation : 0.0134 mg/sample  
 Calculation Method : Burkart's method

Report Units : mg/sample  
 Data set indexes : First: 0 - Last: 5  
 Threshold :

target[ 0 ] :	response[ 0 ] :	0.0000	predicted[ 0 ] :	0.0010
* target[ 1 ] :	response[ 1 ] :	0.0000	predicted[ 1 ] :	0.0010
* target[ 2 ] :	response[ 2 ] :	0.0018	predicted[ 2 ] :	0.0019
* target[ 3 ] :	response[ 3 ] :	0.0021	predicted[ 3 ] :	0.0019
* target[ 4 ] :	response[ 4 ] :	0.0031	predicted[ 4 ] :	0.0029
* target[ 5 ] :	response[ 5 ] :	0.0031	predicted[ 5 ] :	0.0029
target[ 6 ] :	response[ 6 ] :	0.0101	predicted[ 6 ] :	0.0097
target[ 7 ] :	response[ 7 ] :	0.0105	predicted[ 7 ] :	0.0097
target[ 8 ] :	response[ 8 ] :	0.0380	predicted[ 8 ] :	0.0388
target[ 9 ] :	response[ 9 ] :	0.0393	predicted[ 9 ] :	0.0388
target[10] :	response[10] :	0.1968	predicted[10] :	0.1939
target[11] :	response[11] :	0.1979	predicted[11] :	0.1939
target[12] :	response[12] :	0.9920	predicted[12] :	0.9686
target[13] :	response[13] :	0.9947	predicted[13] :	0.9686
target[14] :	response[14] :	4.7827	predicted[14] :	4.8291
target[15] :	response[15] :	4.7938	predicted[15] :	4.8291
target[16] :	response[16] :	9.6357	predicted[16] :	9.6180
target[17] :	response[17] :	9.6358	predicted[17] :	9.6180

\* data points used to compute the standard error.

DataChem Laboratories

Quality Control Data Sheet

Batch ID: 1998-950

Analyte.....: Perchloroethylene  
 Analyst Name...: YOON  
 Analyst Number: 5010  
 Method.....: NMAM 1003  
 Results in....: mg/sample  
 Set ID(s).....: 98N-0088-01

Seq. no. 8903-CD

Matrix.....: SKC POUm  
 Instrument: GC/HP5890II  
 Date.....: 14-MAY-1998 15:20  
 QC File.....:

Sample Name	Repl	Value	Mean	Target	Range	Range/Mean	Range/Pre	-Status-
98N03949	2	0.0881	0.0874		0.0013	0.0150		
98N03950	2	0.0868	0.0153		0.0003	0.0219		
98N03951	2	0.0151	0.0056		0.0002	0.0432		
98N03952	2	0.0055	0.0217		0.0000	0.0002		
98N03953	2	0.0217	0.0058		0.0002	0.0370		
98N03954	2	0.0059	0.0432		0.0003	0.0077		
98N03955	2	0.0434	Out of Range					
98N03956	2	0.0005	Out of Range		0.0002	0.0041		
98N03957	2	0.0598	0.0600		0.0005	0.0268		
98N03958	2	0.0601	0.0170		0.0001	0.0068		
		0.0172						
		0.0168						
		0.0156						
		0.0157						

*JMP*  
5/19/98

*[Signature]*  
5/15/98

*[Signature]*



## QUALITY CONTROL SAMPLE BATCH REPORT

Batch Run Date: 5/11/98-5/12/98

Analytical Method: NMAM 1003

Batch ID: 1998-950

Sample Type: Carbon Disulfide

Analyst: YHY

Set ID: 98N-0088-01  
8903-CD  
*Seq. 90.*

QC Sample ID	Sample Description	Analyte	Units	Result	Target	Recovery (%)	Relative % Difference
QB63719	Blank	Perchloroethylene	mg/Sample	ND	NA	NA	NA
QC63719	LCS	Perchloroethylene	mg/Sample	0.0983	0.0964	101.97	NA
QD63719	LCSD	Perchloroethylene	mg/Sample	0.0975	0.0964	101.14	0.82
QB63720	Blank	Perchloroethylene	mg/Sample	ND	NA	NA	NA
QC63720	LCS	Perchloroethylene	mg/Sample	0.198	0.193	102.59	NA
QD63720	LCSD	Perchloroethylene	mg/Sample	0.197	0.193	102.07	0.51
QB63721	Blank	Perchloroethylene	mg/Sample	ND	NA	NA	NA
QC63721	LCS	Perchloroethylene	mg/Sample	0.296	0.289	102.42	NA
QD63721	LCSD	Perchloroethylene	mg/Sample	0.293	0.289	101.38	1.02

QC Data Reviewed & Approved

*Don C. White*  
*Manager ZO section*  
[Name, Title]

*5/15/98*

Date

LCS - Laboratory Control Sample  
LCSD - Laboratory Control Sample Duplicate  
NA - Not Applicable

Relative % Difference:

$$\frac{2 | \text{LCS} - \text{LCSD} |}{(\text{LCS} + \text{LCSD})} \times 100$$

*JHY*  
*5/19/98*  
*JHY*  
*5/15/98*

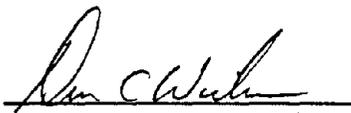


## QUALITY CONTROL SAMPLE BATCH REPORT

Batch Run Date:	05/11/98-05/12/98	Analytical Method:	NMAM 1003
Batch ID:	1998-950	Sample Type:	SKC Passive Sample, Lot 656
Analyst:	YHY	Set ID:	98N-0088-01 8903-CD
		<i>Seg. No.</i>	

QC Sample ID	Sample Description	Analyte	Units	Result	Target	Recovery (%)	Relative % Difference
QB63718	Blank	Perchloroethylene	mg/Sample	ND	NA	NA	NA
QC63718	LCS	Perchloroethylene	mg/Sample	0.187	0.193	96.89	NA
QD63718	LCSD	Perchloroethylene	mg/Sample	0.189	0.193	97.93	1.06

QC Data Reviewed & Approved

  
 \_\_\_\_\_  
 Manager / Osceola  
 [Name, Title]

  
 \_\_\_\_\_  
 Date

LCS - Laboratory Control Sample  
 LCSD - Laboratory Control Sample Duplicate  
 NA - Not Applicable

Relative % Difference:

$$\frac{2 |LCS - LCSD|}{(LCS + LCSD)} \times 100$$

  
 5/19/98  
  
  
 5/15/98



## APPENDIX 5A

### RAW DATA TABLES

#### TWA PERC MEASUREMENTS FOR CHARCOAL AND PASSIVE SAMPLERS

The following 8 tables are a compilation of the information from the sampling data sheets (Appendices 3A through 3H) and the laboratory reports for the charcoal tube and passive samplers (Appendices 4A and 4B). These data were then used to calculate the Perc concentrations for the charcoal tube and passive samplers as indicated in these tables.



**TWA PERC MEASUREMENTS  
FOR CHARCOAL TUBE AND PASSIVE SAMPLERS**

SHOP E

DATE	JOB TITLE	MEAN SAMPLE FLOW RATE ml / min	C. T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION (MINUTES)	C. T. VOLUME (liters)	C. T. MG PERC (MG/TUBE)	BADGE MG PERC (MG/BADGE)	C. T. CONC. (PPM)	BADGE CONC. (PPM)
02/03/98	OPERATOR	106	F 1	F 1	6:10	14:23	439	46.53	1.7	0.24	5.381	6.191
	PRESSER #6	101	F 2	F 2	6:14	15:05	532	53.73	0.41	0.062	1.124	1.320
	PRESSER #2	100	F 3	F 3	6:40	15:03	503	50.30	0.26	0.047	0.761	1.058
	AREA / COMPUTER	102	F 4	F 4	7:46	15:07	441	44.98	0.27	0.041	0.884	1.053
	PRESSER #1	101	F 5	F 5	6:42	15:04	502	50.70	0.25	0.038	0.726	0.857
	PRESSER #4	102	F 6	F 6	6:45	15:04	499	50.90	0.36	0.057	1.042	1.294
	AREA / BZ LEVEL ABOVE											
	GARMET TRAP	93	F 7	F 7	7:49	15:09	440	40.92	0.57	0.088	2.052	2.265
	GARMET HANGER	101	F 8	F 8	8:12	15:50	422	42.62	0.71	0.13	2.454	3.489
02/04/98	OPERATOR	96	F 11	F 11	6:05	15:00	535	51.36	1.1	0.14	3.155	2.963
	PRESSER #6	101	F 12	F 12	6:07	15:20	553	55.85	0.4	0.051	1.055	1.044
	AREA / COMPUTER	99	F 13	F 13	6:39	15:32	533	52.77	0.32	0.04	0.893	0.850
	PRESSER #1	100	F 14	F 14	6:41	15:23	522	52.20	0.46	0.061	1.298	1.323
	PRESSER #4	98	F 15	F 15	6:44	15:20	516	50.57	0.3	0.044	0.874	0.966
	PRESSER #2	101	F 16	F 16	6:45	15:15	510	51.51	0.34	0.044	0.972	0.977
	AREA / BEHIND MACH	98	F 17	F 17	7:39	15:30	471	46.16	0.27	0.035	0.862	0.842
	OPERATOR / SORTER	99	F 18	F 18	7:59	15:32	453	44.85	0.32	0.042	1.051	1.050

**FOLLOWING ARE THE PASSIVE BADGE SAMPLES LEFT ON SITE:**

DATE	JOB TITLE	BADGE I.D.	START TIME	STOP TIME	DURATION (MINUTES)	BADGE MG PERC	BADGE CONC.
02/06/98	Presser	LL-1	6:30	15:30	540	0.087	1.824
02/08/98	Presser	LL-2	7:00	15:00	480	0.076	1.793
02/09/98	Presser	LL-3	6:30	16:00	570	0.12	2.384
02/05/98	Operator	MH-1	6:00	14:30	510	0.22	4.885
02/06/98	Operator	MH-2	6:00	14:30	510	0.16	3.553
02/09/98	Operator	MH-3	6:00	16:00	600	0.3	5.662
02/06/98	Operator/sorter/hanger	JS-1	8:00	16:30	510	0.25	5.551
02/08/98	Operator/sorter/hanger	JS-2	8:00	16:30	510	0.15	3.331
02/09/98	Operator/sorter/hanger	JS-3	8:00	16:30	510	0.18	3.997
	Field blank						ND

**TWA PERC MEASUREMENTS  
FOR CHARCOAL TUBE AND PASSIVE SAMPLERS**

SHOP N

DATE	JOB TITLE	MEAN SAMPLE FLOW RATE ml / min	C. T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION (MINUTES)	C. T. VOLUME (liters)	C. T. MG PERC (MG/TUBE)	BADGE MG PERC (MG/BADGE)	C. T. CONC. (PPM)	BADGE CONC. (PPM)
2/4/98	WASHER	99	N 1	N 1	7:22	14:18	416	41.18	0.65	0.086	2.325	2.341
	AREA / IN FRONT OF MACHINES	102	N 2	N 2	7:33	14:22	409	41.72	0.74	0.1	2.613	2.769
	AREA / COUNTER OPERATOR	102	N 3	N 3	7:40	14:25	405	41.31	0.0098	<0.004	0.035	<0.112
	ASSEMBLER PRESSER	101	N 4	N 4	7:46	14:20	394	39.79	3.3	0.44	12.215	12.647
	PRESSER	103	N 5	N 5	7:52	14:18	386	39.76	0.33	0.044	1.223	1.291
	PRESSER	101	N 6	N 6	7:54	14:20	386	38.99	0.47	0.066	1.776	1.936
	PRESSER	103	N 7	N 7	7:57	14:21	384	39.55	0.42	0.066	1.564	1.946
2/5/98	AREA / COUNTER OPOERATOR	102	N 11	N 11	7:43	16:19	516	52.63	0.021	<0.004	0.059	<0.088
	AREA / NEAR MACHINES	98	N 13	N 13	7:50	16:17	507	49.69	1.8	0.25	5.336	5.584
	WASHER	101	N 14	N 14	7:52	16:16	504	50.90	0.97	0.13	2.807	2.921
	PRESSER	99	N 15	N 15	7:54	16:17	503	49.80	0.63	0.088	1.864	1.981
	ASSEMBLER PRESSER	96	N 16	N 16	8:00	16:15	495	47.52	0.55	0.079	1.705	1.807
	PRESSER	98	N 17	N 17	8:01	16:18	497	48.71	0.52	0.078	1.573	1.777
FOLLOWING ARE THE PASSIVE BADGE SAMPLES LEFT ON SITE:												
	Operator				7:30	15:30	480			0.21		4.954
02/10/98	Operator				7:30	15:30	480			0.1		2.359
02/11/98	Operator				7:30	15:30	480			0.05		1.180
02/11/98	Presser				7:30	15:30	480			0.081		1.911
02/11/98	Presser				7:30	15:30	480			0.21		4.954
02/10/98	Presser				7:30	15:30	480			0.27		6.370
02/10/98	Field Blank				7:30	15:30						

**TWA PERC MEASUREMENTS  
FOR CHARCOAL TUBE AND PASSIVE SAMPLERS**

SHOP I

DATE	JOB TITLE	MEAN SAMPLE FLOW RATE ml / min	C. T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	URATION MINUTES	C. T. VOLUME (liters)	C. T. MG PERC (MG/TUBE)	BADGE MG PERC G/BADG	C. T. CONC. (PPM)	BADGE CONC. (PPM)
2/17/98	OPERATOR	95	L 1	L 1	8:24	14:28	364	34.58	0.16	0.025	0.682	0.778
	COUNTER PERSON	98	L 2	L 2	8:26	12:38	252	24.70	0.006	<0.004	0.036	<0.180
	ALTERATIONS PERSON	97	L 3	L 3	8:29	14:18	349	33.85	0.022	<0.004	0.096	<0.130
	AREA / BZ LEVEL OUTSIDE		L 4	L 4	9:26	14:23	297	29.40	0.027	<0.004	0.135	<0.153
	BARRIER ROOM		L 5	L 5	9:23	14:26	303	28.48	0.1	0.014	0.517	0.523
2/18/98	OPERATOR	96	L 6	L 6	8:03	10:59	176	16.90	0.24	0.031	2.092	1.995
	ALTERATIONS PERSON	97	L 7	L 7	8:10	14:20	370	35.89	0.014	<0.004	0.057	<0.122
	COUNTER PERSON	95	L 8	L 8	8:14	12:48	274	26.03	0.038	(0.006)	0.215	(0.248)
	AREA / BZ LEVEL INSIDE		L 9	L 9	8:29	14:40	371	35.62	0.16	0.020	0.662	0.610
	BARRIER ROOM		L 10	L 10	8:30	14:35	365	35.77	0.044	(0.005)	0.181	(0.155)
	AREA / BZ LEVEL OUTSIDE		L 11	L 11	11:03	14:45	222	20.65	0.15	0.019	1.070	0.969
	BARRIER ROOM											
	OPERATOR											

**FOLLOWING ARE THE PASSIVE BADGE SAMPLES LEFT ON SITE:**

02/19/98	Manager	J 1	8:00	6:00	600	0.015	0.283
02/20/98	Manager	J 2	7:30	5:00	570	0.066	1.311
02/21/98	Manager	J 3	8:00	6:00	600	0.067	1.265
2/19/98	Operator	Q 1	8:00	4:45	525	0.030	0.647
2/20/98	Operator	Q 2	8:00	4:45	525	0.036	0.777
2/21/98	Operator	Q 3	8:30	5:00	510	0.020	0.444
	Field Blank	L-BLK				ND	

**TWA PERC MEASUREMENTS  
FOR CHARCOAL TUBE AND PASSIVE SAMPLERS**

SHOP I

DATE	JOB TITLE	MEAN SAMPL FLOW RATE ml / min	C. T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION (MINUTES)	C. T. VOLUME (liters)	C. T. MG PERC (MG/TUBE)	BADGE MG PERC (MG/BADGE)	C. T. CONC. (PPM)	BADGE CONC. (PPM)
2/18/98	OPERATOR	99	T 1	T 1	8:37	15:12	395	39.11	0.13	0.020	0.490	0.573
	PRESSER	110	T 2	T 2	9:14	15:10	356	39.16	0.05	(0.006)	0.188	(0.191)
	COUNTER PERSON	95	T 3	T 3	8:40	15:13	393	37.34	0.002	<0.004	<0.008	<0.115
	AREA / OUTSIDE											
	BARRIER ROOM	108	T 4	T 4	8:46	15:14	388	41.90	0.046	(0.006)	0.162	(0.175)
	AREA / INSIDE											
	BARRIER ROOM	103	T 5	T 5	8:44	15:15	391	40.27	0.16	0.025	0.585	0.724
2/19/98	OPERATOR	108	T 6	T 6	8:25	15:30	425	45.90	0.1	0.013	0.321	0.346
	COUNTER PERSON	100	T 7	T 7	8:29	13:17	288	28.80	0.003	(0.006)	0.015	(0.236)
	PRESSER	104	T 8	T 8	8:30	15:28	418	43.47	0.06	0.020	0.203	0.542
	AREA / OUTSIDE											
	BARRIER ROOM	104	T 9	T 9	8:31	15:34	423	43.99	0.046	0.010	0.154	0.268
	AREA / INSIDE											
	BARRIER ROOM	110	T 10	T 10	8:32	15:36	424	46.64	0.13	0.021	0.411	0.561

**FOLLOWING ARE THE PASSIVE BADGE SAMPLES LEFT ON SITE:**

2/23/98	Operator	Ming-1	8:00	4:00	480	(0.008)	(0.189)
2/20/98	Operator	Ming-2	8:08	3:20	432	<0.004	<0.1
2/24/98	Operator	Ming-3	8:00	3:10	430	(0.008)	(0.211)

**TWA PERC MEASUREMENTS  
FOR CHARCOAL TUBE AND PASSIVE SAMPLERS**

SHOP G

DATE	JOB TITLE	MEAN SAMPLE FLOW RATE ml / min	C. T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION (MINUTES)	C. T. VOLUME (liters)	C. T. MG PERC (MG/TUBE)	BADGE MG PERC (MG/BADGE)	C. T. CONC. (PPM)	BADGE CONC. (PPM)
2/19/98	OPERATOR	99	G 1	G 1	9:42	12:36	174	17.23	0.069	0.014	0.590	0.911
	PRESSER	98	G 2	G 2	9:48	13:55	247	24.21	0.059	(0.007)	0.359	(0.321)
	PRESSER	93	G 3	G 3	9:55	13:55	240	22.32	0.071	(0.009)	0.469	(0.425)
	AREA / INSIDE											
	BARRIER ROOM	97	G 4	G 4	9:57	12:35	158	15.33	0.02	<0.004	0.192	<0.287
	AREA / OUTSIDE											
	BARRIER ROOM	97	G 5	G 5	10:08	13:55	227	22.02	0.025	<0.004	0.167	<0.200
2/20/98	OPERATOR	96	G 7	G 7	8:20	12:36	256	24.58	0.03	<0.004	0.180	<0.177
	PRESSER	96	G 8	G 8	8:21	12:55	274	26.30	0.032	(0.005)	0.179	(0.207)
	PRESSER	95	G 9	G 9	8:27	13:00	273	25.94	0.07	(0.010)	0.398	(0.415)
	AREA / INSIDE											
	BARRIER ROOM	96	G 10	G 10	8:25	12:42	257	24.67	0.034	<0.004	0.203	<0.176
	AREA / OUTSIDE											
	BARRIER ROOM	92	G 11	G 11	8:29	12:40	251	23.09	0.0088	<0.004	0.056	<0.180

**FOLLOWING ARE THE PASSIVE BADGE SAMPLES LEFT ON SITE:**

2/23/98	Operator	Mike-1	8:30	14:20	350	0.051	1.650
2/24/98	Operator	Mike-2	8:30	14:30	360	0.030	0.944
2/25/98	Operator	Mike-3	8:30	14:20	350	0.013	0.421

**TWA PERC MEASUREMENTS  
FOR CHARCOAL TUBE AND PASSIVE SAMPLERS**

SHOP D

DATE	JOB TITLE	MEAN SAMPLE FLOW RATE ml / min	C. T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION (MINUTES)	C. T. VOLUME (liters)	C. T. MG PERC (MG/TUBE)	BADGE MG PERC (MG/BADGE)	C. T. CONC. (PPM)	BADGE CONC. (PPM)
04/14/98	Operator/presser Assembler	100	D1	D1	7:26	4:08	522	52.2	0.26	0.04	0.73	0.80
			D2	D2	7:27		535	50.8	0.13	0.02	0.38	0.40
	Area - on top of machine	98	D3	D3	7:30	4:20	530	51.9	0.52	0.05	1.47	1.15
			D4	D4	7:43	4:09	507	50.2	0.25	0.03	0.73	0.71
	Area - BZ on counter	95	D5	D5	8:07	4:20	496	47.1	0.05	(0.01)	0.17	(0.18)
			D6	D6	8:43	4:13	450	44.6	0.21	0.03	0.69	0.78
	Presser	99	D7	D7	9:00	fault	407	41.1	0.10	0.01	0.35	0.33
			D8	D8						<0.004		#VALUE!
04/15/98	Manager/operator	95	D9	D9	7:12	4:10	540	51.3	0.52	0.07	1.49	1.47
			D10	D10	7:23	4:00	516	51.1	0.22	0.03	0.63	0.70
	Operator/presser	99	D11	D11	7:15	4:09	535	50.8	0.19	0.03	0.55	0.55
			D12	D12	7:16	4:15	537	52.6	0.95	0.14	2.66	2.95
	Area - on top of machine	98	D13	D13	7:25	4:06	504	50.9	0.02	<0.004	0.07	<0.09
			D14	D14					<0.002	<0.004		#VALUE!
	Area - upstairs residential hallway	101	D15	D15	9:57	4:04	368	36.4	0.18	0.03	0.73	0.83
			D-FL1-FB	D-FL1-FB					<0.002			#DIV/0!

**FOLLOWING ARE THE PASSIVE BADGE SAMPLES LEFT ON SITE:**

DATE	JOB TITLE	BADGE I.D	START TIME	STOP TIME	DURATION (MINUTES)	BADGE MG PERC
04/23/24	Manager/operator	T1	11:00	7:40am	1240	0.08
04/24/98	Manager/operator	T2	10:30	7:00pm	510	0.06
04/27/28	Manager/operator	T3	10:00	7:00am	1260	0.11
04/23/98	Operator/presser	R1	11:00	7:00	480	0.14
04/24/98	Operator/presser	R2	10:45	7:00	495	0.14
04/27/98	Operator/presser	R3	10:00	6:00	480	0.21
	Blank	T1-B				<0.004

**TWA PERC MEASUREMENTS  
FOR CHARCOAL TUBE AND PASSIVE SAMPLERS**

SHOP A

DATE	JOB TITLE	MEAN SAMPLE FLOW RATE ml / min	C. T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION (MINUTES)	C. T. VOLUME (liters)	C. T. MG PERC (MG/TUBE)	BADGE MG PERC (MG/BADGE)	C. T. CONC. (PPM)	BADGE CONC. (PPM)
April 15, 1998	Operator Area-BZ midway between machine & spotting table	100.00	A1	A1	0.35	0.14	407.00	40.70	0.630	0.087	2.280	2.421
	Presser #1	97.00	A6	A6	0.37	0.13	376.00	36.47	0.310	0.043	1.252	1.295
	Laundry operator	96.00	A2	A2	0.35	0.13	403.00	38.69	0.100	0.015	0.381	0.422
	Presser #2	89.00	A3	A3	0.35	0.14	403.00	35.87	0.030	(0.006)	0.123	(0.169)
	Head level behind counter	94.00	A4	A4	0.36	0.13	393.00	36.94	0.140	0.022	0.558	0.634
	Blank	97.00	A5	A5	0.36	0.13	387.00	37.54	0.039	(0.006)	0.153	(0.176)
			A7							<0.004	#VALUE!	#VALUE!
April 16, 1998	Operator	98.00	A8	A8	0.34	0.10	365.00	35.77	0.370	0.060	1.524	1.862
	Presser #1	93.00	A9	A9	0.35	0.09	356.00	33.11	0.110	0.017	0.489	0.541
	Presser #2	86.00	A10	A10	0.35	0.09	348.00	29.93	0.085	0.016	0.418	0.521
	Wet laundry operator	94.00	A11	A11	0.35	0.10	360.00	33.84	0.042	(0.007)	0.163	(0.220)
	Area-BZ midway between machine & spotting table	97.00	A12	A12	0.35	0.10	361.00	35.02	0.240	0.035	1.010	1.098
	Blank		A13	A13					<0.002	<0.004	#VALUE!	#VALUE!

**FOLLOWING ARE THE PASSIVE BADGE SAMPLES LEFT ON SITE:**

DATE	JOB TITLE	BADGE I.	START TIME	STOP TIME	DURATION (MINUTES)	BADGE MG PERC	BADGE CONC. (PPM)
April 17, 1998	operator	AA1	0.33	0.14	440.00	0.091	2.342
April 21, 1998	operator	AA2	0.37	0.17	430.00	0.019	0.500
April 20, 1998	operator	AA3	0.38	0.08	300.00	0.070	2.642
April 20, 1998	Presser #1	M1	0.38	0.08	300.00	0.017	0.642
April 18, 1998	Presser #1	M2	0.35	0.17	450.00	0.032	0.805
not listed	Presser #1	M3	0.33	0.14	440.00	0.029	0.746
4/18??	Blank	AB1	8:20??	2:00??	400.00	0.230	6.512

**TWA PERC MEASUREMENTS  
FOR CHARCOAL TUBE AND PASSIVE SAMPLERS**

**SHOP J**

DATE	JOB TITLE	MEAN SAMPLE FLOW RATE ml / min	C. T. NUMBER	BADGE NUMBER	START TIME	STOP TIME	DURATION (MINUTES)	C. T. VOLUME (liters)	MG PERC (MG/TUBE)	BADGE MG PERC	C. T. CONC. (PPM)	BADGE CONC. (PPM)
April 16, 1998	Operator Presser #2 Assistant operator Presser #3 Presser #1 Blank	95 93 98 99 97	J1	J1	7:16	3:14	478	45.4	0.6	0.1	1.946	2.369
			J2	J2	7:43	3:16	450	41.9	0.26	0.043	0.915	1.082
			J3	J3	8:11	3:17	426	41.7	1.5	0.21	5.292	5.582
			J4	J4	7:59	3:19	440	43.6	0.32	0.049	1.082	1.261
			J5	J5	8:01	3:15	432	41.9	0.15	0.027	0.527	0.708
			J6	J B				0.0	<0.002	<0.002	#VALUE!	#VALUE!
April 17, 1998	Operator Presser #2 Presser #1 Presser #3 Assistant operator Area - on top of machine Blank	95 97 97 91 98 98	J8	J8	7:21	3:19	478	45.4	0.7	0.1	2.271	2.369
			J9	J9	7:30	3:17	467	45.3	0.3	0.046	0.976	1.115
			J10	J10	7:43	3:16	451	43.7	0.15	0.024	0.505	0.603
			J11	J11	7:58	3:18	441	40.1	0.18	0.028	0.661	0.719
			J12	J12	8:10	3:20	429	42.0	0.94	0.15	3.293	3.960
			J13	J7	7:32	3:21	467	45.8	0.78	0.13	2.510	3.152
								<0.002	#VALUE!			

**FOLLOWING ARE THE PASSIVE BADGE SAMPLES LEFT ON SITE:**

DATE	JOB TITLE	BADGE I.	START TIME	DURATION (MINUTES)	BADGE MG PERC	#VALUE!
April 20, 1998	Operator	O1	Not listed		0.2	#VALUE!
April 21, 1998	Presser	O2	8:00	480	0.21	#DIV/0!
April 22, 1998	Assistant operator	O3	8:00	470	0.23	4.954
April 20, 1998	Operator	P1	Not listed		0.042	#DIV/0!
April 21, 1998	Presser	P2	8:00	480	0.043	1.014
April 22, 1998	Assistant operator	P3	8:00	470	0.094	2.265
April 20, 1998	Operator	OA1	Not listed		0.24	#DIV/0!
April 21, 1998	Presser	OA2	8:00	480	0.26	6.134
April 22, 1998	Assistant operator	OA3	8:00	470	0.28	6.746
	Blank	BLK			<0.002	#VALUE!

## APPENDIX 5B

### RAW DATA TABLES

#### REAL-TIME MONITORING DATA

The data downloaded from the PID monitor is presented in the following tables arranged by shop. The PID monitor presents 6 columns of data which include:

- Date - the year / month / day the data was collected
- Time - the hour : minute : second in 15 second increments on a 24 hour basis when the data was collected
- Status - the function of the monitor including OK (standard data collection mode), CAL (indicating the instrument response was being adjusted to a span gas of known concentration), and ALPK ( indicating that the measurement exceeded an arbitrary ALarm PeaK established in the instrument).
- Min - the MINimum concentration in ppm measured during the 15 second period monitored
- Avg - the mean (or arithmetic AVeraGe) concentration in ppm for the 15 second period monitored
- Max - the MAXimum concentration in ppm measured during the 15 second period monitored



**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP F - FIRST DAY OF SAMPLING**

2020 Report					
Date	Time	Status	Min	Avg	Max
98/02/03	6:55:57	OK	0.9	0.9	1
98/02/03	6:56:12	OK	0.7	0.8	1.1
98/02/03	6:56:27	OK	0.5	0.6	0.7
98/02/03	6:56:42	OK	0.4	0.4	0.5
98/02/03	6:56:57	OK	0.2	0.3	0.4
98/02/03	6:57:12	OK	0.2	0.2	0.2
98/02/03	6:57:27	OK	0	0.1	0.2
98/02/03	6:57:42	OK	0	0	0
98/02/03	6:57:57	OK	0	0	0
98/02/03	6:58:12	OK	0	0	0
98/02/03	6:58:27	OK	0	0	0
98/02/03	6:58:42	OK	0	0	0
98/02/03	6:58:57	OK	0	0	0
98/02/03	6:59:12	OK	0	0	0
98/02/03	6:59:27	OK	0	0	0
98/02/03	6:59:42	OK	0	0	0
98/02/03	6:59:57	OK	0	0	0
98/02/03	7:00:12	OK	0	0	0
98/02/03	7:00:27	Cal	0	1.7	6.7
98/02/03	7:00:42	Cal	0	0.6	1.2
98/02/03	7:00:57	OK	1.1	1.1	1.4
98/02/03	7:01:12	OK	1	1	1.1
98/02/03	7:01:27	OK	0.8	1	1.2
98/02/03	7:01:42	OK	0.9	1	1.1
98/02/03	7:01:57	Cal	0.8	10.1	140
98/02/03	7:02:12	Cal	140	173	177
98/02/03	7:02:27	Cal	2.6	125	200
98/02/03	7:02:42	OK	1.8	2	2.6
98/02/03	7:02:57	OK	0.7	1.4	1.9
98/02/03	7:03:12	OK	0.1	0.2	0.7
98/02/03	7:03:27	OK	0	0	0.1
98/02/03	7:03:42	OK	0	0	0.1
98/02/03	7:03:57	OK	0	0	0
98/02/03	7:04:12	OK	0	0	0
98/02/03	7:04:27	OK	0	0	0.1
98/02/03	7:04:42	OK	0	0	0
98/02/03	7:04:57	OK	0	0	0.1
98/02/03	7:05:12	OK	0.1	0.1	0.2
98/02/03	7:05:27	OK	0	0	0.2
98/02/03	7:05:42	OK	0	0	0.3
98/02/03	7:05:57	OK	0	0.3	1.2
98/02/03	7:06:12	OK	0	0.1	0.6
98/02/03	7:06:27	OK	0	0.3	1
98/02/03	7:06:42	OK	0	0	0.2
98/02/03	7:06:57	OK	0	0	0

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP F - FIRST DAY OF SAMPLING**

98/02/03	7:07:12	OK	0	0	0
98/02/03	7:07:27	OK	0	0.5	2.6
98/02/03	7:07:42	OK	0	20.9	48.3
98/02/03	7:07:57	OK	0.2	2.8	36.8
98/02/03	7:08:12	OK	0	0.1	0.4
98/02/03	7:08:27	OK	0	0	0
98/02/03	7:08:42	OK	0	0	0
98/02/03	7:08:57	OK	0	0	0
98/02/03	7:09:12	OK	0	0	0
98/02/03	7:09:27	OK	0	0	0

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/03	7:09:42	OK	0	0	0
98/02/03	7:09:57	OK	0	0	0
98/02/03	7:10:12	OK	0	0	0
98/02/03	7:10:27	OK	0	0.1	0.5
98/02/03	7:10:42	OK	0	0	0.1
98/02/03	7:10:57	OK	0	0	0.1
98/02/03	7:11:12	OK	0	0	0
98/02/03	7:11:27	OK	0	0	0
98/02/03	7:11:42	OK	0	0	0
98/02/03	7:11:57	OK	0	0	0
98/02/03	7:12:12	OK	0	0	0
98/02/03	7:12:27	OK	0	0	0
98/02/03	7:12:42	OK	0	0	0
98/02/03	7:12:57	OK	0	0	0
98/02/03	7:13:12	OK	0	0	0
98/02/03	7:13:27	OK	0	0	0
98/02/03	7:13:42	OK	0	0	0
98/02/03	7:13:57	OK	0	0	0
98/02/03	7:14:12	OK	0	0	0
98/02/03	7:14:27	OK	0	0	0
98/02/03	7:14:42	OK	0	0	0
98/02/03	7:31:48	OK	0	0	0.6
98/02/03	7:32:03	OK	0	0	0
98/02/03	7:32:18	OK	0	0	0
98/02/03	7:32:33	OK	0	0	0
98/02/03	7:32:48	OK	0	0	0
98/02/03	7:33:03	OK	0	0	0
98/02/03	7:33:18	OK	0	0	0
98/02/03	7:33:33	OK	0	0	0
98/02/03	7:33:48	OK	0	0	0
98/02/03	7:55:24	OK	0	0.2	1.3
98/02/03	7:55:39	OK	0	0	0
98/02/03	7:55:54	OK	0	22	49.2

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP F - FIRST DAY OF SAMPLING**

98/02/03	7:56:09 OK	4.9	34.5	74.6
98/02/03	7:56:24 OK	2	151	446
98/02/03	7:56:39 OK	446	583	700
98/02/03	7:56:54 OK	3	49.2	561
98/02/03	7:57:09 OK	4.3	58.9	146
98/02/03	7:57:24 OK	0.1	7.7	93.6
98/02/03	7:57:39 OK	0	0	0.1
98/02/03	7:57:54 OK	0	0	0
98/02/03	7:58:09 OK	0	0	0
98/02/03	7:58:24 OK	0	121	290
98/02/03	7:58:39 OK	112	277	675
98/02/03	7:58:54 OK	119	323	520
98/02/03	7:59:09 OK	1.4	79.3	377
98/02/03	7:59:24 OK	0.2	0.5	1.4
98/02/03	7:59:39 OK	0.1	175	416
98/02/03	7:59:54 OK	1.4	1.9	5.8
98/02/03	8:00:09 OK	0.7	27.5	152
98/02/03	8:00:24 ALPK	126	458	914
98/02/03	8:00:39 ALPK	20.3	340	1300
98/02/03	8:00:54 OK	2.4	11.4	32.6
98/02/03	8:01:09 OK	2.1	5	11.2
98/02/03	8:01:24 OK	0.2	1.7	6.5

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/03	8:01:39 OK		0	0.2	0.6
98/02/03	8:01:54 OK		0	0.2	0.9
98/02/03	8:02:09 OK		0	0.1	0.7
98/02/03	8:02:24 OK		0	0	0
98/02/03	8:02:39 OK		0	0	0
98/02/03	8:02:54 OK		0	0	0
98/02/03	8:10:06 OK		0	0	0
98/02/03	8:49:21 OK		0	0.6	2.2
98/02/03	8:49:36 OK		0	0	1.2
98/02/03	8:49:51 OK		0	30.9	111
98/02/03	8:50:06 OK		56.1	77.9	111
98/02/03	8:50:21 OK		1.4	20.3	109
98/02/03	8:50:36 OK		0.2	0.6	1.4
98/02/03	8:50:51 OK		0	0	0.2
98/02/03	8:51:06 OK		0	0	0.2
98/02/03	8:51:21 OK		0	0	0
98/02/03	8:51:36 OK		0	0.5	1.6
98/02/03	8:51:51 OK		0	0.1	0.4
98/02/03	8:52:06 OK		0	0.1	0.4
98/02/03	8:52:21 OK		0	0	0
98/02/03	8:52:36 OK		0	0	0

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP F - FIRST DAY OF SAMPLING**

98/02/03	8:52:51	OK	0	0	0
98/02/03	8:53:06	OK	0	0	0
98/02/03	8:53:21	OK	0	0	0
98/02/03	9:01:34	OK	0	0	0.4
98/02/03	9:01:49	OK	0	1.9	21.5
98/02/03	9:02:04	OK	1.4	16.5	50.5
98/02/03	9:02:19	OK	1.7	13.3	35.3
98/02/03	9:02:34	OK	3.2	15.2	40.4
98/02/03	9:02:49	OK	0	0.8	3.3
98/02/03	9:03:04	OK	0	0.1	0.5
98/02/03	9:03:19	OK	0	28.6	149
98/02/03	9:03:34	OK	60	184	333
98/02/03	9:03:49	OK	4.3	70.6	333
98/02/03	9:04:04	OK	0.7	32.2	153
98/02/03	9:04:19	OK	5.9	62.8	182
98/02/03	9:04:34	OK	0.5	5.8	32.3
98/02/03	9:04:49	OK	0.1	0.3	1.1
98/02/03	9:05:04	OK	0	0.1	0.3
98/02/03	9:05:19	OK	0	0	0
98/02/03	9:05:34	OK	0	0	0
98/02/03	9:05:49	OK	0	0	0
98/02/03	9:06:04	OK	0	0	0
98/02/03	9:06:19	OK	0	0	0.1
98/02/03	9:06:34	OK	0	0	0
98/02/03	9:06:49	OK	0	0	0
98/02/03	9:07:04	OK	0	0	0
98/02/03	9:07:19	OK	0	69.7	343
98/02/03	9:07:34	ALPK	71	285	871
98/02/03	9:07:49	ALPK	33	307	807
98/02/03	9:08:04	OK	1.5	10.2	34.6
98/02/03	9:08:19	OK	1.5	175	435
98/02/03	9:08:34	OK	105	377	674
98/02/03	9:08:49	OK	2.3	37.9	256
98/02/03	9:09:04	OK	0.9	1.3	2.3

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/03	9:09:19	OK	0.1	0.5	0.9
98/02/03	9:09:34	OK	0	0.1	0.5
98/02/03	9:09:49	OK	0	0	0.1
98/02/03	9:10:04	OK	0	0	0
98/02/03	9:10:19	OK	0	0	0
98/02/03	10:05:36	OK	0	0.5	2.1
98/02/03	10:05:51	OK	0	9.8	38.3
98/02/03	10:06:06	OK	3	22	71.4
98/02/03	10:06:21	OK	0	3.7	35.3

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP F - FIRST DAY OF SAMPLING**

98/02/03	10:06:36	OK	1.1	32	67.5
98/02/03	10:06:51	OK	0	33.3	73.7
98/02/03	10:07:06	OK	0	0	0
98/02/03	10:07:21	OK	0	0	0
98/02/03	10:07:36	OK	0	0	0
98/02/03	10:07:51	OK	0	0	0
98/02/03	10:08:06	OK	0	0	0
98/02/03	10:08:21	OK	0	0	0
98/02/03	10:08:36	OK	0	0	0
98/02/03	10:08:51	OK	0	0	0
98/02/03	10:09:06	OK	0	0.1	0.8
98/02/03	10:09:21	OK	0	0.3	1.1
98/02/03	10:09:36	OK	0	0.4	3
98/02/03	10:09:51	OK	0	0.8	2.1
98/02/03	10:10:06	OK	0	3.6	17.3
98/02/03	10:10:21	OK	0	0	0
98/02/03	10:10:36	OK	0	0	0
98/02/03	10:10:51	OK	0	0	0
98/02/03	10:11:06	OK	0	8.2	30
98/02/03	10:11:21	OK	0	6.7	33.1
98/02/03	10:11:36	OK	0	0	0
98/02/03	10:11:51	OK	0	0	0
98/02/03	10:12:06	OK	0	0	0
98/02/03	10:18:03	OK	0	11.4	78.7
98/02/03	10:18:18	OK	1.3	35.5	80.5
98/02/03	10:18:33	OK	2.6	92.9	334
98/02/03	10:18:48	OK	0	23	156
98/02/03	10:19:03	OK	122	308	680
98/02/03	10:19:18	OK	7.2	103	502
98/02/03	10:19:33	OK	0	0.7	7.2
98/02/03	10:19:48	OK	0	0	0
98/02/03	10:20:03	OK	0	0	0
98/02/03	10:20:18	OK	0	0	0
98/02/03	10:20:33	OK	0	0	0
98/02/03	10:20:48	OK	0	0.4	4
98/02/03	10:21:03	OK	0	1.3	12.5
98/02/03	10:21:18	OK	0	0.7	12.5
98/02/03	10:21:33	OK	0	12.8	26.1
98/02/03	10:21:48	OK	4.4	37.2	155
98/02/03	10:22:03	OK	0	0	4.6
98/02/03	10:22:18	OK	0	0	0
98/02/03	10:22:33	OK	0	0	0
98/02/03	10:22:48	OK	0	0	0
98/02/03	12:36:49	OK	0	0.7	1.9
98/02/03	12:37:04	OK	0	0	0
98/02/03	12:37:19	OK	0	16.2	39.2

2020 Report

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP F - FIRST DAY OF SAMPLING

Date	Time	Status	Min	Avg	Max	
98/02/03	12:37:34	OK		1.4	18.7	66.7
98/02/03	12:37:49	OK		8.5	59.4	176
98/02/03	12:38:04	OK		18.5	41.3	86.1
98/02/03	12:38:19	OK		0.5	32.2	84.1
98/02/03	12:59:21	OK		0	22.3	71.7
98/02/03	12:59:36	OK		30.1	60.2	109
98/02/03	12:59:51	OK		3.5	61.3	147
98/02/03	13:00:06	OK		1.3	71.2	179
98/02/03	13:00:21	OK		42.6	142	286
98/02/03	13:30:50	OK		0	0.3	1.5
98/02/03	13:38:02	OK		0	0.3	1.5
98/02/03	13:46:11	OK		0	0.1	1.2
98/02/03	13:46:25	OK		0	0	0
98/02/03	14:13:33	OK		0	0.1	1
98/02/03	14:13:48	OK		0	12.9	68.9
98/02/03	14:14:03	OK		16.9	41.7	84
98/02/03	14:14:18	OK		27.3	83.2	179
98/02/03	14:14:33	OK		36.3	130	343
98/02/03	14:14:48	OK		0.2	19.2	154
98/02/03	14:15:03	OK		0	0	0.3
98/02/03	14:15:18	OK		0	0	0
98/02/03	14:15:33	Off		0	0	0
98/02/03	14:15:48	OK		0	0	0
98/02/03	14:16:03	OK		0	0	0
98/02/03	14:16:18	OK		0	0	0
98/02/03	14:16:33	OK		0	0	0
98/02/03	14:16:48	OK		0	0	0
98/02/03	14:17:03	OK		0	0	0
98/02/03	14:17:18	OK		0	0	0
98/02/03	14:17:33	OK		0	0	0
98/02/03	14:17:48	OK		0	0	0
98/02/03	14:51:59	OK		0	105	175
98/02/03	14:52:14	OK		5.2	112	178
98/02/03	14:52:29	OK		0.4	1.3	5.2
98/02/03	14:52:44	OK		0.1	97	189
98/02/03	14:52:59	OK		189	193	195
98/02/03	14:57:22	OK		0	0.1	1.4
98/02/03	14:57:37	OK		0	0	0
98/02/03	14:57:52	OK		0	82.2	184
98/02/03	14:58:07	OK		184	189	192
98/02/03	14:58:22	OK		192	194	195
98/02/03	14:58:37	OK		2.2	147	196
98/02/03	14:58:52	OK		0.6	1.1	2.2
98/02/03	14:59:07	OK		0	0.2	0.6
98/02/03	14:59:22	OK		0	0	0
98/02/03	14:59:37	OK		0	0	0

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP F - SECOND DAY OF SAMPLING

	0.3	0.9	2.2			
98/02/04		13:45:07 OK		0	6	34
98/02/04		13:45:22 OK		19.6	49.7	82.1
98/02/04		13:45:37 OK		10.3	59.6	98
98/02/04		13:45:52 OK		8.9	47.5	122
98/02/04		13:46:07 OK		6.6	59.7	185
98/02/04		13:46:22 OK		0	1.2	42.1
98/02/04		14:00:04 OK		0	0.1	1.1
98/02/04		14:00:19 OK		0	0.1	1.7

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP N - FIRST DAY OF SAMPLING

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/04	7:27:13	OK	0	0.8	1.8
98/02/04	7:27:28	OK	1.3	1.5	1.7
98/02/04	7:27:43	OK	1.1	1.2	1.3
98/02/04	7:27:58	OK	0.8	0.9	1.1
98/02/04	7:28:13	OK	0.6	0.7	0.8
98/02/04	7:28:28	OK	0.4	0.5	0.6
98/02/04	7:28:43	OK	0.2	0.3	0.4
98/02/04	7:28:58	OK	0	0.1	0.2
98/02/04	7:29:13	Cal	0	1.8	8.3
98/02/04	7:29:28	Cal	0	0.3	2.2
98/02/04	7:29:43	Cal	0	0	0.1
98/02/04	7:29:58	Cal	0	79	166
98/02/04	7:30:13	Cal	166	178	199
98/02/04	7:30:28	Cal	0.8	92.3	199
98/02/04	7:30:43	OK	0	0.3	0.8
98/02/04	7:30:58	OK	0	0	0
98/02/04	7:31:13	OK	0	103	203
98/02/04	7:59:50	OK	0.4	0.7	1.5
98/02/04	8:00:05	OK	0.6	0.6	0.7
98/02/04	8:00:20	OK	0.4	0.5	0.7
98/02/04	8:00:35	OK	0.3	0.4	0.5
98/02/04	8:00:50	OK	0.3	0.5	0.8
98/02/04	8:01:05	OK	0	0.3	0.8
98/02/04	8:01:20	OK	0	0.3	0.7
98/02/04	8:01:35	OK	0.1	0.1	0.3
98/02/04	8:01:50	OK	0.1	0.2	0.3
98/02/04	8:02:05	OK	0	0	0.1
98/02/04	8:02:20	OK	0	0	0
98/02/04	8:02:35	OK	0	0	0
98/02/04	8:02:50	OK	0	0	0
98/02/04	8:03:05	OK	0	0.1	0.4
98/02/04	8:03:20	OK	0	0	0
98/02/04	8:03:35	OK	0	0	0
98/02/04	8:03:50	OK	0	0	0
98/02/04	8:04:05	OK	0	0	0
98/02/04	8:04:20	OK	0	0	0
98/02/04	8:04:35	OK	0	0	0
98/02/04	8:04:50	OK	0	0	0
98/02/04	8:05:05	OK	0	0	0
98/02/04	8:05:20	OK	0	6	79
98/02/04	8:05:35	OK	8.1	44.5	133

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP N - FIRST DAY OF SAMPLING

98/02/04	8:05:50	OK	1.7	6.5	23.4
98/02/04	8:06:05	OK	0	1.1	2.7
98/02/04	8:06:20	OK	0	0.9	2.1
98/02/04	8:06:35	OK	0	0.1	0.6
98/02/04	8:06:50	OK	0	0	0.4
98/02/04	8:07:05	OK	0	15.3	51.8
98/02/04	8:07:20	OK	0.6	27.8	44.9
98/02/04	8:07:35	OK	1.2	13.6	34.8
98/02/04	8:07:50	OK	0.1	5.9	25.7
98/02/04	8:08:05	OK	1	7.3	14.7
98/02/04	8:08:20	OK	0	0.4	4.1
98/02/04	8:08:35	OK	0	0	0
98/02/04	8:08:50	OK	0	0	0
98/02/04	8:09:05	OK	0	0	0

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/04	8:09:20	OK	0	0	0
98/02/04	8:09:35	OK	0	0	0
98/02/04	8:09:50	OK	0	0	0
98/02/04	8:10:05	OK	0	0	0
98/02/04	8:10:20	OK	0	0	0
98/02/04	8:10:35	OK	0	0	0
98/02/04	8:10:50	OK	0	0	0
98/02/04	8:11:05	OK	0	7.8	56.4
98/02/04	8:11:20	OK	23.7	192	416
98/02/04	8:11:35	OK	65	185	377
98/02/04	8:11:50	OK	10.4	82.2	195
98/02/04	8:12:05	OK	5.6	9.8	15.6
98/02/04	8:12:20	OK	3.6	6.5	13.6
98/02/04	8:12:35	OK	3.6	5.3	6.9
98/02/04	8:12:50	OK	1.7	2.6	4.3
98/02/04	8:13:05	OK	0.6	1.1	2
98/02/04	8:13:20	OK	0	0.7	1.8
98/02/04	8:13:35	OK	0	0	0
98/02/04	8:13:50	OK	0	0	0
98/02/04	8:14:05	OK	0	0	0
98/02/04	8:14:20	OK	0	0	0
98/02/04	8:14:35	OK	0	0	0
98/02/04	8:14:50	OK	0	0	0
98/02/04	8:15:05	OK	0	7	33.6
98/02/04	8:15:20	OK	4.4	26.3	63.4
98/02/04	8:15:35	OK	0	33.7	58.9
98/02/04	8:15:50	OK	10.6	21.1	40.1

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP N - FIRST DAY OF SAMPLING

98/02/04	8:16:05	OK	6.1	18.9	35.6
98/02/04	8:16:20	OK	0	4	21.8
98/02/04	8:16:35	OK	2.3	14.7	31.5
98/02/04	8:16:50	OK	12.7	23.3	33.1
98/02/04	8:17:05	OK	8	17.9	29.6
98/02/04	8:17:20	OK	5.4	14.4	22.8
98/02/04	8:17:35	OK	2.3	12.7	32.8
98/02/04	8:17:50	OK	0	2.7	12.8
98/02/04	8:18:05	OK	0	6.6	31.5
98/02/04	8:18:20	OK	0	0	0.2
98/02/04	9:00:40	OK	0	0.1	0.9
98/02/04	9:00:55	OK	0	0	0
98/02/04	9:01:10	OK	0	0.4	1.4
98/02/04	9:01:25	OK	0.4	1.3	2.1
98/02/04	9:01:40	OK	0	0	1.3
98/02/04	9:01:55	OK	0	0	0
98/02/04	9:02:10	OK	0	0.3	1.3
98/02/04	9:02:25	OK	0	3.1	27.3
98/02/04	9:02:40	OK	0	95.1	252
98/02/04	9:02:55	ALPK	66.2	511	850
98/02/04	9:03:10	ALPK	47.5	234	774
98/02/04	9:03:25	OK	16	50.6	93.6
98/02/04	9:03:40	OK	6.9	10.2	16
98/02/04	9:03:55	OK	2.4	4.9	6.9
98/02/04	9:04:10	OK	6.2	8.9	19.1
98/02/04	9:04:25	OK	4.2	9.9	19.1
98/02/04	9:04:40	OK	1.3	9.4	13.9
98/02/04	9:04:55	OK	1	7.6	12.6

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/04	9:05:10	OK	0.8	2.4	8.3
98/02/04	9:05:25	OK	4.1	6.3	9
98/02/04	9:05:40	OK	6.5	14.4	20.8
98/02/04	9:05:55	OK	3.7	7.6	20.8
98/02/04	9:06:10	OK	2.8	5.6	7.7
98/02/04	9:06:25	OK	5	7.6	9.3
98/02/04	9:06:40	OK	5.8	7.5	9.2
98/02/04	9:06:55	OK	1.6	4.8	6.9
98/02/04	9:07:10	OK	0	1.5	4.7
98/02/04	9:07:25	OK	0.8	5.2	7.7
98/02/04	9:07:40	OK	5	7.7	10.6
98/02/04	9:07:55	OK	0.3	2.3	7.2
98/02/04	9:08:10	OK	2.3	4.4	7.4

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP N - FIRST DAY OF SAMPLING

98/02/04	9:08:25	OK	1.1	2.7	3.5
98/02/04	9:08:40	OK	0	0.2	1.1
98/02/04	9:08:55	OK	0	0	0.3
98/02/04	9:09:10	OK	0	0.1	0.9
98/02/04	9:09:25	OK	0	0	0.4
98/02/04	9:09:40	OK	0	0	0.3
98/02/04	9:09:55	OK	0	0	0
98/02/04	9:10:10	OK	0	1.1	3.1
98/02/04	9:45:04	OK	0	0	0.5
98/02/04	9:45:19	OK	0	0	0
98/02/04	10:38:05	OK	0	0.6	2.8
98/02/04	10:38:20	OK	0	0	0
98/02/04	10:38:35	OK	0	0	0
98/02/04	10:38:50	OK	0	0	0
98/02/04	10:39:05	OK	0	0	0
98/02/04	10:39:20	OK	0	0	0
98/02/04	10:39:35	OK	0	0	0
98/02/04	10:39:50	OK	0	0	0
98/02/04	10:40:05	OK	0	0.2	1.8
98/02/04	10:40:20	OK	0	0	0
98/02/04	10:40:35	OK	0	0	0
98/02/04	10:40:50	OK	0	0	0
98/02/04	10:41:05	OK	0	0	0
98/02/04	10:46:22	OK	0	0	0
98/02/04	10:46:37	OK	0	0	0
98/02/04	10:46:52	OK	0	0	0
98/02/04	10:47:07	OK	0	0	0
98/02/04	10:47:22	OK	0	0	0
98/02/04	10:47:37	OK	0	0	0
98/02/04	10:47:52	OK	0	25.1	130
98/02/04	10:48:07	OK	1.2	44.1	265
98/02/04	10:48:22	OK	1.7	128	619
98/02/04	10:48:37	OK	0	34.1	209
98/02/04	10:48:52	OK	0	0.1	1
98/02/04	10:49:07	OK	0	1	3.1
98/02/04	10:49:22	OK	0.7	1.8	3.2
98/02/04	10:49:37	OK	0	0.8	1.4
98/02/04	10:49:52	OK	0.5	2.7	7
98/02/04	10:50:07	OK	0	1.6	8.8
98/02/04	10:50:22	OK	0	9.9	53.2
98/02/04	10:50:37	OK	6	13.2	53.2
98/02/04	10:50:52	OK	2.1	4.9	18.7

2020 Report

Date	Time	Status	Min	Avg	Max
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REAL-TIME PERC MEASUREMENTS  
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SHOP N - FIRST DAY OF SAMPLING

98/02/04	10:51:07 OK	0.1	12.3	29.3
98/02/04	10:51:22 OK	5.4	17.5	40.6
98/02/04	10:51:37 OK	3.1	14.5	29.6
98/02/04	10:51:52 OK	3.2	7.3	16.9
98/02/04	10:52:07 OK	1.1	7.3	29.5
98/02/04	10:52:22 OK	0.4	9.8	23.2
98/02/04	10:52:37 OK	5	9.4	15.8
98/02/04	10:52:52 OK	1.7	4.6	8.3
98/02/04	10:53:07 OK	0.9	6.5	15.1
98/02/04	10:53:22 OK	8.1	11.3	19.8
98/02/04	10:53:37 OK	4.3	12.4	25.3
98/02/04	10:53:52 OK	12.7	22.6	58.2
98/02/04	10:54:07 OK	2.6	12.7	29.4
98/02/04	10:54:22 OK	4.5	29.3	95.8
98/02/04	10:54:37 OK	7.8	20.9	61.9
98/02/04	10:54:52 OK	0.9	5.5	16.9
98/02/04	10:55:07 OK	1.9	6	8.9
98/02/04	10:55:22 OK	2.1	3.3	4.9
98/02/04	10:55:37 OK	1.8	2	2.3
98/02/04	10:55:52 OK	0.8	1.6	2.2
98/02/04	10:56:07 OK	0.7	1.2	1.7
98/02/04	10:56:22 OK	0	0.3	0.8
98/02/04	13:03:17 OK	0	5.6	11.4
98/02/04	13:03:32 OK	1.4	22.8	177
98/02/04	13:03:47 OK	14.2	191	326
98/02/04	13:04:02 OK	29.3	152	538
98/02/04	13:04:17 OK	11.6	92	315
98/02/04	13:04:32 OK	4.8	9.8	29.4
98/02/04	13:04:47 OK	2.6	5.4	11.3
98/02/04	13:05:02 OK	3.4	7.2	12.3
98/02/04	13:05:17 OK	4	7	14.1
98/02/04	13:05:32 OK	4.3	14.4	36.9
98/02/04	13:05:47 OK	3	22.2	64.8
98/02/04	13:06:02 OK	10.2	64.6	159
98/02/04	13:06:17 OK	29	52.2	100
98/02/04	13:06:32 OK	53.8	116	274
98/02/04	13:06:47 OK	53.8	105	231
98/02/04	13:07:02 OK	5.9	26.3	84.4
98/02/04	13:07:17 OK	7.5	41.2	94.4
98/02/04	13:07:32 OK	14	25.4	34.6
98/02/04	13:07:47 OK	16	40.4	57.3
98/02/04	13:08:02 OK	10.7	40.3	133
98/02/04	13:08:17 OK	15.6	51	162
98/02/04	13:08:32 OK	7.8	20.6	39.3
98/02/04	13:08:47 OK	4.1	25.4	56.3

REAL-TIME PERC MEASUREMENTS  
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SHOP N - FIRST DAY OF SAMPLING

98/02/04	13:09:02	OK	4.4	9	13.2
98/02/04	13:09:17	OK	2.5	6.4	14.6
98/02/04	13:09:32	OK	3.8	7.6	14
98/02/04	13:09:47	OK	4.1	10.8	26.4
98/02/04	13:10:02	OK	7.5	10.5	14.5
98/02/04	13:10:17	OK	3.1	9.4	30.3
98/02/04	13:10:32	OK	1.5	4.3	7.8
98/02/04	13:10:47	OK	1.3	1.7	2.4
98/02/04	13:11:02	OK	0	1.9	2.5
98/02/04	13:11:17	OK	0	1	2.4

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/04	13:11:32	OK	0.2	1.2	1.9
98/02/04	13:11:47	OK	0	0.2	0.7
98/02/04	13:52:02	OK	0	0.1	0.9
98/02/04	13:52:17	OK	0	0	0
98/02/04	13:52:32	OK	0	0.5	2.1
98/02/04	13:52:47	OK	0	0.5	2
98/02/04	13:53:02	OK	0	0.4	1.7
98/02/04	13:53:17	OK	0	0	0.1
98/02/04	13:53:32	OK	0	0	0
98/02/04	13:53:47	OK	0	0	0
98/02/04	13:54:02	OK	0	0	0
98/02/04	13:54:17	OK	0	0	0
98/02/04	13:54:32	OK	0	0	0
98/02/04	13:54:47	OK	0	0	0
98/02/04	13:55:02	OK	0	0	0
98/02/04	13:55:17	OK	0	0	0
98/02/04	13:55:32	OK	0	0	0
98/02/04	13:55:47	OK	0	0	0
98/02/04	13:56:02	OK	0	0	0
98/02/04	13:56:17	OK	0	0	0.6
98/02/04	13:56:32	OK	0	0.5	2.8
98/02/04	13:56:47	OK	0	0	0.8
98/02/04	13:57:02	OK	0	0	0
98/02/04	13:57:17	OK	0	0	0
98/02/04	13:57:32	OK	0	0	0
98/02/04	13:57:47	OK	0	0	0
98/02/04	13:58:02	OK	0	0	0
98/02/04	13:58:17	OK	0	0	0
98/02/04	13:58:32	OK	0	0	0
98/02/04	13:58:47	OK	0	0	0
98/02/04	13:59:02	OK	0	0	0

REAL-TIME PERC MEASUREMENTS  
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SHOP N - FIRST DAY OF SAMPLING

98/02/04	13:59:17	OK	0	0	0
98/02/04	13:59:32	OK	0	0	0
98/02/04	13:59:47	OK	0	0	0
98/02/04	14:00:02	OK	0	34.9	224
98/02/04	14:00:17	OK	85	248	536
98/02/04	14:00:32	OK	0.4	54.8	219
98/02/04	14:00:47	OK	0	2.8	16.3
98/02/04	14:01:02	OK	0	6.2	17.5
98/02/04	14:01:17	OK	0	4.5	12.5
98/02/04	14:01:32	OK	0.6	3.4	9.2
98/02/04	14:01:47	OK	0	0.8	4.8
98/02/04	14:02:02	OK	0	1.8	5.3
98/02/04	14:02:17	OK	0	3.7	40.8
98/02/04	14:02:32	OK	1.9	15.7	41.6
98/02/04	14:02:47	OK	0	12	28
98/02/04	14:03:02	OK	0	2.5	10
98/02/04	14:03:17	OK	0	0.5	1.4
98/02/04	14:03:32	OK	0.5	0.9	1.6
98/02/04	14:03:47	OK	1	1.3	1.6
98/02/04	14:04:02	OK	0.8	1.3	1.9
98/02/04	14:04:17	OK	1.6	2.2	3.2
98/02/04	14:04:32	OK	1.4	2.9	7.9
98/02/04	14:04:47	OK	0.8	2.4	3.2
98/02/04	14:05:02	OK	0.8	3.4	7.2

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/04	14:05:17	OK	6.9	22.2	66.6
98/02/04	14:05:32	OK	5.8	24.4	63.1
98/02/04	14:05:47	OK	0.7	4.1	25
98/02/04	14:06:02	OK	0.2	3.5	9.3
98/02/04	14:06:17	OK	0.7	2.4	4.4
98/02/04	14:06:32	OK	0.4	1.4	4.1
98/02/04	14:06:47	OK	0	0.3	1.1
98/02/04	14:07:02	OK	0	0.8	2.9
98/02/04	14:07:17	OK	0	0.4	2.1

REAL-TIME PERC MEASUREMENTS  
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SHOP N - SECOND DAY OF SAMPLING

2020 Report

Date	Time	Status	Min	Avg	Max	
98/02/05	8:02:37	Off		0	0.1	1.8
98/02/05	8:02:52	Cal		1.1	3.3	10.2
98/02/05	8:03:07	Cal		0	0	1.1
98/02/05	8:03:22	Cal		0	2.7	10.3
98/02/05	8:03:37	Cal		0	0	0.2
98/02/05	8:03:52	Cal		0	51.2	214
98/02/05	8:04:07	Cal	198	216	219	
98/02/05	8:04:22	OK		1.6	147	199
98/02/05	8:04:37	OK		0.1	0.5	1.6
98/02/05	8:04:52	OK		0	0.1	1.1
98/02/05	8:05:07	OK		0	11.3	161
98/02/05	8:05:22	OK	13.9	182	200	
98/02/05	8:17:21	OK		0	0.2	1.1
98/02/05	8:17:36	OK		0	0	0
98/02/05	8:17:51	OK		0	0	0
98/02/05	8:18:06	OK		0	0	0
98/02/05	8:18:21	OK		0	0	0
98/02/05	8:18:36	OK		0	0	0
98/02/05	8:24:19	OK		0	0	0
98/02/05	8:24:34	OK		0	48.2	280
98/02/05	8:24:49	OK	2.4	188	612	
98/02/05	8:25:04	ALPK	457	840	1051	
98/02/05	8:25:19	ALPK	54.1	248	819	
98/02/05	8:25:34	OK	15.6	66.1	143	
98/02/05	8:25:49	OK	7.1	13.4	30.4	
98/02/05	8:26:04	OK	3.3	6.7	13.2	
98/02/05	8:26:19	OK	3.3	18.8	32.5	
98/02/05	8:26:34	OK	0	3.2	7	
98/02/05	8:26:49	OK	6.5	12.9	19.8	
98/02/05	8:27:04	OK	1.8	5.7	11.5	
98/02/05	8:27:19	OK	8.1	16	23.7	
98/02/05	8:27:34	OK	1.7	14.4	28.3	
98/02/05	8:27:49	OK	1.7	12.5	32.5	
98/02/05	8:28:04	OK	10.8	39.3	59.7	
98/02/05	8:28:19	OK	5.5	19.6	40	
98/02/05	8:28:34	OK	10.9	24.4	33	
98/02/05	8:28:49	OK	10.9	31.8	73.4	
98/02/05	8:29:04	OK	1.5	13.5	32.2	
98/02/05	8:29:19	OK	6.5	17.4	40.4	
98/02/05	8:29:34	OK	5.7	14.7	27.5	
98/02/05	8:29:49	OK	2.3	10.9	27.5	
98/02/05	8:30:04	OK	3.6	20.7	55.5	

**REAL-TIME PERC MEASUREMENTS  
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SHOP N - SECOND DAY OF SAMPLING

98/02/05	8:30:19	OK	1.3	13.6	34.4
98/02/05	8:30:34	OK	4.4	16.9	38.7
98/02/05	8:30:49	OK	6.3	12.6	24.7
98/02/05	8:31:04	OK	7	18	34.9
98/02/05	8:31:19	OK	10.5	19.7	33.8
98/02/05	8:31:34	OK	8.9	17.8	28.8
98/02/05	8:31:49	OK	0	5.1	12.9
98/02/05	8:32:04	OK	0.3	4	12.9
98/02/05	8:32:19	OK	0	25.9	162
98/02/05	8:32:34	ALPK	44.2	312	1059
98/02/05	8:32:49	OK	65.6	111	212
98/02/05	8:33:04	OK	24.4	63.4	178
98/02/05	8:33:19	ALPK	31.8	188	850

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/05	8:33:34	OK	7.2	47.4	117
98/02/05	8:33:49	OK	30.4	49.3	71.1
98/02/05	8:34:04	OK	33.6	45.4	56.2
98/02/05	8:34:19	OK	25.4	35.9	49.5
98/02/05	8:34:34	OK	14.2	29	73.1
98/02/05	8:34:49	OK	13.7	54.2	118
98/02/05	8:35:04	OK	8.4	30.1	68
98/02/05	8:35:19	OK	30.4	53.9	92.2
98/02/05	8:35:34	OK	9.1	25.9	53.6
98/02/05	8:35:49	OK	11.2	17.2	24.8
98/02/05	8:36:04	OK	10.3	13.8	18.6
98/02/05	8:36:19	OK	8.6	11.7	15.3
98/02/05	8:36:34	ALPK	8.5	337	1080
98/02/05	8:36:49	ALPK	64.6	269	750
98/02/05	8:37:04	OK	2.6	13	64.6
98/02/05	8:37:19	OK	3.9	7.7	14.4
98/02/05	8:37:34	OK	2.8	3.7	7
98/02/05	8:37:49	OK	1.1	3.4	5.5
98/02/05	8:38:04	OK	0.3	1.1	2
98/02/05	8:38:19	OK	0.9	2.6	4.4
98/02/05	8:38:34	OK	0	2.1	4.9
98/02/05	8:38:49	OK	0	0	0
98/02/05	8:39:04	OK	0	0	0
98/02/05	8:39:19	OK	0	0	0
98/02/05	9:19:24	OK	0	0	0.6
98/02/05	9:19:39	OK	0	0	0
98/02/05	9:19:54	OK	0	0	0
98/02/05	9:20:09	OK	0	0	0

**REAL-TIME PERC MEASUREMENTS  
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SHOP N - SECOND DAY OF SAMPLING

98/02/05	9:20:24	OK	0	0	0
98/02/05	9:20:39	OK	0	0	0
98/02/05	9:20:54	OK	0	18.3	62.4
98/02/05	9:21:09	OK	0	104	226
98/02/05	9:21:24	OK	45.5	165	316
98/02/05	9:21:39	OK	61.7	394	633
98/02/05	9:21:54	OK	3.4	201	574
98/02/05	9:22:09	OK	16.6	48.9	63.6
98/02/05	9:22:24	OK	7.3	14.2	29.2
98/02/05	9:22:39	OK	4.1	5.1	7.3
98/02/05	9:22:54	OK	1.3	3.9	8.4
98/02/05	9:23:09	OK	2.1	20.4	36.1
98/02/05	9:23:24	OK	9.5	32	59.4
98/02/05	9:23:39	OK	8.3	16.6	35.7
98/02/05	9:23:54	OK	4	19	58.8
98/02/05	9:24:09	OK	8.1	24.7	42.6
98/02/05	9:24:24	OK	9	36.9	113
98/02/05	9:24:39	OK	6.3	19	42.6
98/02/05	9:24:54	OK	6.5	27.9	60.5
98/02/05	9:25:09	OK	11.8	26.3	53.2
98/02/05	9:25:24	OK	17.4	32.7	52
98/02/05	9:25:39	OK	10.7	24.4	41.1
98/02/05	9:25:54	OK	4.9	17.5	36.6
98/02/05	9:26:09	OK	18.1	29.1	45.1
98/02/05	9:26:24	OK	8.5	46.2	118
98/02/05	9:26:39	OK	8.5	30.5	38.9
98/02/05	9:26:54	OK	22.2	34.1	52.2

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/05	9:27:09	OK	16.2	25.9	52.2
98/02/05	9:27:24	OK	13.9	18.4	29.8
98/02/05	9:27:39	OK	5.8	15.6	30.1
98/02/05	9:27:54	OK	5.9	10.6	18.1
98/02/05	9:28:09	OK	3.5	12.2	48.2
98/02/05	9:28:24	OK	3.3	10.4	22.8
98/02/05	9:28:39	OK	4.7	11	20
98/02/05	9:28:54	OK	1.1	10.2	20.8
98/02/05	9:29:09	OK	10.9	18.8	36.6
98/02/05	9:29:24	OK	13.5	30.8	80.5
98/02/05	9:29:39	OK	6.5	16.8	44.5
98/02/05	9:29:54	OK	3.6	14.9	49.8
98/02/05	9:30:09	OK	4.9	14.3	28.2
98/02/05	9:30:24	OK	1	2.4	7.3

**REAL-TIME PERC MEASUREMENTS  
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**SHOP N - SECOND DAY OF SAMPLING**

98/02/05	9:30:39 OK	1.7	9.3	19.8
98/02/05	9:30:54 OK	3.6	13.8	51
98/02/05	9:31:09 OK	7.9	20.8	63.8
98/02/05	9:31:24 OK	13.5	26.8	39.5
98/02/05	9:31:39 OK	8.8	24.3	60.4
98/02/05	9:31:54 OK	2.3	13.7	35
98/02/05	9:32:09 OK	6.2	12.7	24.4
98/02/05	9:32:24 OK	6.2	13.8	24.4
98/02/05	9:32:39 OK	5.2	11.3	18.8
98/02/05	9:32:54 OK	1.9	8.1	15
98/02/05	9:33:09 OK	1.9	32.3	103
98/02/05	9:33:24 OK	16.8	75.8	242
98/02/05	9:33:39 OK	16.8	126	273
98/02/05	9:33:54 OK	24.3	67.5	156
98/02/05	9:34:09 OK	15.6	24.5	34.5
98/02/05	9:34:24 OK	3.7	106	654
98/02/05	9:34:39 OK	23.2	69.3	140
98/02/05	9:34:54 OK	44.4	85.3	139
98/02/05	9:35:09 OK	14.5	49.1	105
98/02/05	9:35:24 OK	14.5	39.1	70.8
98/02/05	9:35:39 OK	25.5	39	68.8
98/02/05	9:35:54 OK	28.5	54.4	118
98/02/05	9:36:09 OK	26.5	47.2	71.9
98/02/05	9:36:24 OK	15.2	29.5	49.4
98/02/05	9:36:39 OK	18.8	30.1	49.9
98/02/05	9:36:54 OK	8.1	23	38.1
98/02/05	9:37:09 OK	5.4	14.1	18.3
98/02/05	9:37:24 OK	3.2	11	20.7
98/02/05	9:37:39 OK	12.2	16.8	30
98/02/05	9:37:54 OK	8.2	16.6	29.4
98/02/05	9:38:09 OK	5.5	11.4	19.9
98/02/05	9:38:24 OK	2.2	5.1	9.5
98/02/05	9:38:39 OK	4.1	5.9	9.7
98/02/05	9:38:54 OK	2.8	4	5
98/02/05	9:39:09 OK	1.9	3.1	5
98/02/05	9:39:24 OK	1.1	2.4	4.1
98/02/05	9:39:39 OK	0.1	0.7	1.3
98/02/05	9:39:54 OK	0	0.3	0.7
98/02/05	10:37:03 OK	0	86.6	187
98/02/05	10:37:18 OK	187	189	190
98/02/05	10:37:33 OK	190	191	192

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

SHOP N - SECOND DAY OF SAMPLING

Date	Time	Status	Min	Avg	Max
98/02/05	10:37:48	OK	192	192	192
98/02/05	11:01:38	OK	0	0.3	2.8
98/02/05	11:01:53	OK	0	35.7	196
98/02/05	11:02:08	OK	0.6	4.7	27.5
98/02/05	11:02:23	OK	9.1	111	285
98/02/05	11:02:38	ALPK	208	537	1042
98/02/05	11:02:53	ALPK	83.3	335	857
98/02/05	11:03:08	OK	30	142	345
98/02/05	11:03:23	OK	11.3	17.6	32.4
98/02/05	11:03:38	OK	8.2	13.8	25.7
98/02/05	11:03:53	OK	5	9.8	16.7
98/02/05	11:04:08	OK	5.8	18.6	49.3
98/02/05	11:04:23	OK	5.3	27.5	82.1
98/02/05	11:04:38	OK	11.4	21.8	36.4
98/02/05	11:04:53	OK	6.9	11.1	20.1
98/02/05	11:05:08	OK	1.8	6.8	22.9
98/02/05	11:05:23	OK	1.4	6.1	20.5
98/02/05	11:05:38	OK	0.8	16.9	62.1
98/02/05	11:05:53	OK	13.5	23.7	34.2
98/02/05	11:06:08	OK	15.6	25	49.9
98/02/05	11:06:23	OK	1.1	13.5	62.2
98/02/05	11:06:38	OK	1.1	16	62.2
98/02/05	11:06:53	OK	2.7	19.4	53.9
98/02/05	11:07:08	OK	11.7	34.7	75.1
98/02/05	11:07:23	OK	11.1	27.8	55.1
98/02/05	11:07:38	OK	9.9	18.1	33.5
98/02/05	11:07:53	OK	4.5	19.1	31.2
98/02/05	11:08:08	OK	6.2	14.1	21.9
98/02/05	11:08:23	OK	5.9	16.7	32.9
98/02/05	11:08:38	OK	6.4	11.7	17.3
98/02/05	11:08:53	OK	3.6	9.1	16.7
98/02/05	11:09:08	OK	0.7	2	4.5
98/02/05	11:09:23	OK	1.2	5.8	13.2
98/02/05	11:09:38	OK	0	0	1.2
98/02/05	11:09:53	ALPK	0	281	1371
98/02/05	11:10:08	ALPK	23.3	189	940
98/02/05	11:10:23	OK	53.8	94.3	258
98/02/05	11:10:38	OK	10	56.6	97.5
98/02/05	11:10:53	OK	23.6	46.1	140
98/02/05	11:11:08	OK	6.8	15.8	24.2
98/02/05	11:11:23	OK	2	7.2	26.7
98/02/05	11:11:38	OK	0.2	14	41.1
98/02/05	11:11:53	OK	11.2	16.2	33.9
98/02/05	11:12:08	OK	11.1	18.2	35.8
98/02/05	11:12:23	OK	10	20.4	35.8
98/02/05	11:12:38	OK	2.1	9.5	14.3

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

SHOP N - SECOND DAY OF SAMPLING

98/02/05	11:42:16	OK	0	0.1	1.4
98/02/05	11:42:31	OK	0	20.9	178
98/02/05	11:42:46	OK	3.6	28.9	60.7
98/02/05	11:43:01	OK	38.4	173	282
98/02/05	11:43:16	OK	7.2	102	282
98/02/05	11:43:31	OK	8.3	18.8	55.1
98/02/05	11:43:46	OK	8.3	20.9	38.8
98/02/05	11:44:01	OK	15.8	33.3	56.2
98/02/05	11:44:16	OK	5.5	27.5	51.8

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/05	11:44:31	OK	13.3	23.1	39.3
98/02/05	11:44:46	OK	5.5	14.8	39.3
98/02/05	11:45:01	OK	13.1	26.3	52.5
98/02/05	11:45:16	OK	5.3	32.9	71.1
98/02/05	11:45:31	OK	1.6	21.3	59.1
98/02/05	11:45:46	OK	9.9	21.6	30.6
98/02/05	11:46:01	OK	4.8	17.5	38.9
98/02/05	11:46:16	OK	4.1	20.7	34.1
98/02/05	11:46:31	OK	19.5	33.6	57
98/02/05	11:46:46	OK	4.1	23.6	63.8
98/02/05	11:47:01	OK	3.5	7.6	26.3
98/02/05	11:47:16	OK	5.1	10.4	38.7
98/02/05	11:47:31	OK	4.4	6	9.6
98/02/05	11:47:46	OK	3.8	23.1	43.9
98/02/05	11:48:01	OK	4	17.6	72.5
98/02/05	11:48:16	OK	5.4	10.9	22.2
98/02/05	11:48:31	OK	4.6	6.3	8.2
98/02/05	11:48:46	OK	3.1	9.5	31.2
98/02/05	11:49:01	OK	2.7	3.8	5.5
98/02/05	11:49:16	OK	3.6	5.2	9.7
98/02/05	11:49:31	OK	2.1	3.5	4.8
98/02/05	11:49:46	OK	0	1.8	3.8
98/02/05	11:50:01	ALPK	1.7	432	1537
98/02/05	11:50:16	OK	119	223	346
98/02/05	11:50:31	OK	40.9	89.4	221
98/02/05	11:50:46	OK	27.8	40	60.8
98/02/05	11:51:01	OK	15	56.4	139
98/02/05	11:51:16	OK	37.2	77.2	139
98/02/05	11:51:31	OK	34.9	47.8	55.4
98/02/05	11:51:46	OK	28.1	33.8	46.5
98/02/05	11:52:01	OK	21.4	24.9	28.4
98/02/05	11:52:16	OK	22	81.5	210

**REAL-TIME PERC MEASUREMENTS  
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SHOP N - SECOND DAY OF SAMPLING

98/02/05	11:52:31	OK	107	147	238
98/02/05	11:52:46	OK	14.9	62.5	120
98/02/05	11:53:01	OK	11.1	63.7	140
98/02/05	11:53:16	OK	22.2	43.1	79.9
98/02/05	11:53:31	OK	9.8	18.7	34.9
98/02/05	11:53:46	OK	3.6	8.1	16.6
98/02/05	11:54:01	OK	3.6	6.1	9.2
98/02/05	11:54:16	OK	2.7	6.5	12.6
98/02/05	12:09:55	OK	2.2	22.8	85.3
98/02/05	12:10:10	OK	13.9	16.7	20.9
98/02/05	12:10:25	OK	9.1	15	33.2
98/02/05	12:10:40	OK	3.7	6.3	9.1
98/02/05	12:10:55	OK	3.8	7.5	13.5
98/02/05	12:11:10	OK	7.8	12.1	18.3
98/02/05	12:11:25	OK	4.6	6.6	10.4
98/02/05	12:11:40	OK	4.1	6.9	8.8
98/02/05	12:11:55	OK	2.3	6.4	9.4
98/02/05	12:12:10	OK	2	3.5	5
98/02/05	12:12:25	OK	2.2	5.5	7
98/02/05	12:12:40	OK	3.4	4.2	5.5
98/02/05	12:12:55	OK	2.4	3.7	4.4
98/02/05	12:13:10	OK	1.6	2.2	2.7
98/02/05	12:13:25	OK	0.9	1.7	3.7

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/05	12:13:40	OK	1.5	1.5	1.7
98/02/05	12:57:50	OK	0.5	1.5	2.7
98/02/05	12:58:05	OK	0.2	1.6	3.6
98/02/05	12:58:20	OK	1	26.6	125
98/02/05	12:58:35	OK	13.2	62.2	144
98/02/05	12:58:50	OK	48.5	144	229
98/02/05	12:59:05	OK	77.7	316	528
98/02/05	12:59:20	OK	48.4	116	224
98/02/05	12:59:35	OK	29.1	65.7	99.4
98/02/05	12:59:50	OK	16	19.7	33.5
98/02/05	13:00:05	OK	10.1	20.5	27.8
98/02/05	13:00:20	OK	5.3	8.4	15.7
98/02/05	13:00:35	OK	7.1	14.8	17.8
98/02/05	13:00:50	OK	12.5	23.6	31.7
98/02/05	13:01:05	OK	12.5	31.8	36.8
98/02/05	13:01:20	OK	14.4	26.2	38.2
98/02/05	13:01:35	OK	8.6	30.1	41.9
98/02/05	13:01:50	OK	2.8	6.4	13.1

**REAL-TIME PERC MEASUREMENTS  
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**SHOP N - SECOND DAY OF SAMPLING**

98/02/05	13:02:05	OK	1.8	4.2	6.9
98/02/05	13:02:20	OK	2.8	5	9.3
98/02/05	13:02:35	OK	2.4	3.4	5
98/02/05	13:02:50	OK	1.2	2.7	3.9
98/02/05	13:03:05	OK	0	0.2	1.5
98/02/05	13:03:20	OK	0	0	0.5
98/02/05	13:03:35	OK	0	1.1	3.9
98/02/05	13:03:50	OK	0.5	4.1	10.3
98/02/05	13:04:05	OK	0.7	3	8.6
98/02/05	13:04:20	OK	2.7	7	14.6
98/02/05	13:51:35	OK	0	1.9	3.2
98/02/05	13:51:50	OK	1.2	1.6	2.3
98/02/05	13:52:05	OK	2	2.9	3.7
98/02/05	13:52:20	OK	2.6	20.8	122
98/02/05	13:52:35	OK	2	25.7	122
98/02/05	13:52:50	OK	16.4	75.5	224
98/02/05	13:53:05	OK	4.4	46.6	199
98/02/05	13:53:20	OK	21.2	80.6	181
98/02/05	13:53:35	OK	16.8	18.8	24.9
98/02/05	13:53:50	OK	3.5	7.8	18
98/02/05	13:54:05	OK	3.9	5.5	7.6
98/02/05	13:54:20	OK	2.9	3.7	5.3
98/02/05	13:54:35	OK	2	3.1	4.8
98/02/05	13:54:50	OK	1.2	2.3	5.7
98/02/05	13:55:05	OK	1	1.9	5.2
98/02/05	13:55:20	OK	0.9	1.5	2.4
98/02/05	13:55:35	OK	0.8	1.2	1.8
98/02/05	13:55:50	OK	1	1.9	3.1
98/02/05	13:56:05	OK	1.3	1.3	1.7
98/02/05	13:56:20	OK	1	1.1	1.3
98/02/05	13:56:35	OK	1.2	1.4	2
98/02/05	13:56:50	OK	1.4	1.8	2.1
98/02/05	13:57:05	OK	0.5	0.8	1.4
98/02/05	14:35:36	OK	0	0	0.8
98/02/05	14:35:51	OK	0	0.1	0.9
98/02/05	14:36:06	OK	0	70.8	307
98/02/05	14:36:21	ALPK	34.1	427	1236

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/05	14:36:36	ALPK	102	666	1236
98/02/05	14:36:51	OK	26	112	415
98/02/05	14:37:06	OK	1.4	27.3	67.8
98/02/05	14:37:21	OK	0.7	1.3	1.9
98/02/05	14:37:36	OK	0.4	1.6	2.3

REAL-TIME PERC MEASUREMENTS  
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SHOP N - SECOND DAY OF SAMPLING

98/02/05	14:37:51 OK	0.7	1.2	1.6
98/02/05	15:02:44 OK	0	115	191
98/02/05	15:02:59 OK	191	192	192
98/02/05	15:03:14 OK	192	192	193
98/02/05	15:28:26 OK	0	0.7	193
98/02/05	15:28:41 OK	0	15.6	151
98/02/05	15:28:56 OK	1.6	34.4	91.3
98/02/05	15:29:11 OK	3.6	40.9	117
98/02/05	15:29:26 OK	2.6	97.9	200
98/02/05	15:29:41 OK	3	7.7	50
98/02/05	15:29:56 OK	2.7	4.4	5.9
98/02/05	15:30:11 OK	2.3	4.3	10.3
98/02/05	15:30:26 OK	2	3	4
98/02/05	15:30:41 OK	1.5	17.8	60.4
98/02/05	15:30:56 OK	1.4	17.7	60.4
98/02/05	15:31:11 OK	3	8.8	36.1
98/02/05	15:31:26 OK	2.9	18.7	51.8
98/02/05	15:31:41 OK	1	4.9	16.7
98/02/05	15:31:56 OK	1.5	4	15.3
98/02/05	15:32:11 OK	1.7	5	22
98/02/05	15:32:26 OK	7	32.9	63.4
98/02/05	15:32:41 OK	4.7	25.4	56.4
98/02/05	15:32:56 OK	1.1	2.4	12.1
98/02/05	15:33:11 OK	0.3	2.1	5.5
98/02/05	15:33:26 OK	1	5.6	16.9
98/02/05	15:33:41 OK	1	1.4	2.8
98/02/05	15:33:56 OK	1.4	13.5	29.1
98/02/05	15:34:11 OK	1.3	4	31.1
98/02/05	15:34:26 OK	0.9	9.6	25.4
98/02/05	15:34:41 OK	0.4	1.6	6
98/02/05	15:34:56 OK	0	3.6	29.3
98/02/05	15:35:11 OK	2.2	13.9	61.9
98/02/05	15:35:26 OK	1	3.2	8.7
98/02/05	15:35:41 OK	1.5	3.5	8.3
98/02/05	15:35:56 OK	0	0.2	2
98/02/05	15:36:11 OK	0	0.2	0.7
98/02/05	15:36:26 OK	0	1	10.4
98/02/05	15:36:41 OK	0	0.1	2.2
98/02/05	15:36:56 OK	0	1.4	4.4

**REAL-TIME PERC MEASUREMENTS  
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SHOP L - FIRST DAY OF SAMPLING

98/02/17	8:46:19 OK	0	4.2	5.6
98/02/17	8:46:34 OK	4.4	4.6	4.8
98/02/17	8:46:49 Cal	4	4.7	11
98/02/17	8:47:04 Cal	0	1.9	11
98/02/17	8:47:19 Cal	0	0	0
98/02/17	8:47:34 Cal	0	0	0
98/02/17	8:47:49 Cal	0	64.4	128
98/02/17	8:48:04 Cal	29.9	30	30
98/02/17	8:48:19 Cal	29.9	29.9	30
98/02/17	8:48:34 OK	0	22.4	29.9
98/02/17	8:48:49 OK	0	0	0

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/17	8:49:04 OK		0	0	0
98/02/17	8:49:19 OK		0	0	0.1
98/02/17	8:49:34 OK		0	5	12.9
98/02/17	8:49:49 OK		0	0	0
98/02/17	8:50:04 OK		0	0	0
98/02/17	8:50:19 OK		0	0	0
98/02/17	8:50:34 OK		0	0	0
98/02/17	8:50:49 OK		0	0	0
98/02/17	8:51:04 OK		0	0	0
98/02/17	8:51:19 OK		0	0	0
98/02/17	9:29:26 OK		0	0	0
98/02/17	9:29:41 OK		0	4.1	26.5
98/02/17	9:29:56 OK		0	6.5	26.7
98/02/17	9:30:11 OK		0	3.7	23.3
98/02/17	9:30:26 OK		4.7	20.6	45.3
98/02/17	9:30:41 OK		0	4.7	43.1
98/02/17	9:30:56 OK		0	0	0
98/02/17	9:31:11 OK		0	0	0
98/02/17	10:17:48 OK		0	0	0
98/02/17	10:18:03 OK		0	0	0
98/02/17	10:18:18 OK		0	2.2	10.3
98/02/17	10:18:33 OK		0	2.9	13
98/02/17	10:18:48 OK		0	0	0.9
98/02/17	10:19:03 OK		0	7.3	26.9
98/02/17	10:19:18 OK		0	7.1	26.2
98/02/17	10:19:33 OK		0	0	0.1
98/02/17	10:57:34 OK		0	0.7	10.6
98/02/17	10:57:49 OK		3.3	7.3	12.2
98/02/17	10:58:04 OK		0	8.7	24.7

**REAL-TIME PERC MEASUREMENTS  
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SHOP L - FIRST DAY OF SAMPLING

98/02/17	11:37:32 OK	0	0	0
98/02/17	11:37:47 OK	0	14.6	58.8
98/02/17	11:38:02 OK	0	25.4	55.5
98/02/17	11:38:17 OK	0	0	0
98/02/17	11:38:32 OK	0	0	0
98/02/17	11:55:04 OK	0	0	0
98/02/17	11:55:19 Cal	0	0.1	1.4
98/02/17	11:55:34 Cal	0	0.1	1.2
98/02/17	11:55:49 Cal	0	0	0
98/02/17	11:56:04 OK	0	0	0
98/02/17	11:56:19 OK	0	0	0.2
98/02/17	11:56:34 OK	0	0	0
98/02/17	11:56:49 Cal	0	0	0
98/02/17	11:57:04 Cal	0	22.2	50.7
98/02/17	11:57:19 Cal	48.6	49	49.2
98/02/17	11:57:34 OK	1.2	131	199
98/02/17	11:57:49 OK	0.3	0.5	1.2
98/02/17	11:58:04 OK	0	0.2	1.6
98/02/17	11:58:19 OK	0	3.5	6.9
98/02/17	11:58:34 OK	2.3	4.6	19.7
98/02/17	11:58:49 OK	0.8	19.2	26.5
98/02/17	11:59:04 OK	0.1	0.2	0.8
98/02/17	11:59:19 ALPK	0.1	1112	>2000
98/02/17	11:59:34 ALPK	6	96.3	701
98/02/17	11:59:49 OK	3.6	8.5	18.2
98/02/17	12:00:04 OK	1	4.1	10
98/02/17	12:00:19 OK	0.4	3	9.6
98/02/17	12:00:34 OK	0.1	0.7	3.5
98/02/17	12:00:49 OK	0	0	0.2
98/02/17	12:01:04 OK	0	0	0
98/02/17	12:01:19 OK	0	0	0
98/02/17	12:01:34 OK	0	0	0
98/02/17	12:01:49 OK	0	0	0
98/02/17	12:02:04 OK	0	0	0
98/02/17	12:02:19 OK	0	0	0
98/02/17	12:02:34 OK	0	0	0
98/02/17	12:40:06 OK	0	0.2	1.5
98/02/17	12:40:21 OK	0	0	0
98/02/17	12:40:36 OK	0	69.5	219
98/02/17	12:40:51 OK	0	52.6	242
98/02/17	12:41:06 OK	0	0	0.6
98/02/17	12:41:21 OK	0	60.8	156
98/02/17	12:41:36 OK	0	0.2	1.9
98/02/17	13:20:12 OK	0	0.3	1.4
98/02/17	13:20:27 OK	0	0	0
98/02/17	13:20:42 OK	0	17	99
98/02/17	13:20:57 OK	4.6	92.4	210

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

SHOP L - FIRST DAY OF SAMPLING

98/02/17	13:21:12	OK	0	28.6	143
98/02/17	13:21:27	OK	0	0.1	2.8
98/02/17	13:21:42	OK	0	0	0
98/02/17	14:01:52	OK	0	0.2	1.1
98/02/17	14:02:07	OK	0	0	0
98/02/17	14:02:21	OK	0	19.4	142
98/02/17	14:02:37	OK	2.6	57.5	201
98/02/17	14:02:51	OK	2.6	104	239
98/02/17	14:03:06	OK	39.8	178	460
98/02/17	14:03:22	OK	0.1	8.2	112
98/02/17	14:03:37	OK	0	0	0.1
98/02/17	14:03:52	OK	0	0	0
98/02/17	14:04:07	OK	0	0	0
98/02/17	14:04:22	OK	0	0	0
98/02/17	14:04:37	OK	0	0	0
98/02/17	14:04:52	OK	0	0	0
98/02/17	14:05:07	OK	0	0	0
98/02/17	14:05:22	OK	0	0	0
98/02/17	14:05:37	OK	0	0	0
98/02/17	14:05:52	OK	0	0	0
98/02/17	14:06:07	OK	0	0	0
98/02/17	14:06:22	OK	0	0	0
98/02/17	14:06:37	OK	0	0	0
98/02/17	14:06:52	OK	0	0	0
98/02/17	14:07:07	OK	0	0	0
98/02/17	14:07:22	OK	0	4.4	17.5
98/02/17	14:07:37	OK	0	0	0.8
98/02/17	14:07:52	OK	0	0	0
98/02/17	14:08:07	OK	0	0	0
98/02/17	14:08:22	OK	0	0	0
98/02/17	14:08:37	OK	0	0	0
98/02/17	14:08:52	OK	0	0	0
98/02/17	14:09:07	OK	0	0	0
98/02/17	14:09:22	OK	0	0	0

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/17	14:09:37	OK	0	0	0
98/02/17	14:09:52	OK	0	0	0
98/02/17	14:10:07	OK	0	0	0
98/02/17	14:10:22	OK	0	0	0
98/02/17	14:10:37	OK	0	0	0
98/02/17	14:10:52	OK	0	0	0
98/02/17	14:11:07	OK	0	0	0
98/02/17	14:11:22	OK	0	0	0

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP L - FIRST DAY OF SAMPLING

98/02/17	14:11:37 OK	0	0	0
98/02/17	14:11:52 OK	0	0	0
98/02/17	14:12:07 OK	0	0	0
98/02/17	14:12:22 OK	0	0	0
98/02/17	14:12:37 OK	0	0	0
98/02/17	14:12:52 OK	0	0	0
98/02/17	14:13:07 OK	0	0	0
98/02/17	14:13:22 OK	0	0	0
98/02/17	14:13:37 OK	0	0	0
98/02/17	14:13:52 OK	0	0	0
98/02/17	14:14:07 OK	0	0	0
98/02/17	14:14:22 OK	0	0	0
98/02/17	14:14:37 OK	0	0	0
98/02/17	14:14:52 OK	0	0	0
98/02/17	14:15:07 OK	0	0	0
98/02/17	14:15:22 OK	0	0	0
98/02/17	14:15:37 OK	0	0	0
98/02/17	14:15:52 OK	0	0	0
98/02/17	14:16:07 OK	0	0	0
98/02/17	14:16:22 OK	0	0	0
98/02/17	14:16:37 OK	0	0	0
98/02/17	14:16:52 OK	0	0	0
98/02/17	14:17:07 OK	0	0	0
98/02/17	14:17:22 OK	0	0	0
98/02/17	14:17:37 OK	0	0	0
98/02/17	14:17:52 OK	0	0	0
98/02/17	14:18:07 OK	0	0	0
98/02/17	14:18:22 OK	0	0	0
98/02/17	14:18:37 OK	0	0	0
98/02/17	14:18:52 OK	0	0	0
98/02/17	14:19:07 OK	0	0	0
98/02/17	14:19:22 OK	0	0	0
98/02/17	14:19:37 OK	0	0.6	4.1
98/02/17	14:19:52 OK	0.4	5.9	14.6
98/02/17	14:20:07 OK	0	4.9	15.1

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP L - SECOND DAY OF SAMPLING**

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/18	9:14:14	OK	0	2.9	3.8
98/02/18	9:14:29	OK	2.8	2.9	3.2
98/02/18	9:14:44	OK	2.5	2.6	2.8
98/02/18	9:14:59	OK	2.2	2.2	2.5
98/02/18	9:15:14	OK	1.9	2	2.2
98/02/18	9:15:29	OK	1.7	1.8	1.9
98/02/18	9:15:44	OK	1.5	1.6	1.7
98/02/18	9:15:59	OK	1.3	1.4	1.5
98/02/18	9:16:14	OK	1.1	1.2	1.3
98/02/18	9:16:29	OK	0.9	1	1.1
98/02/18	9:16:44	Cal	0.7	1	4.6
98/02/18	9:16:59	Cal	0	1.5	7
98/02/18	9:17:14	Cal	0	0	0
98/02/18	9:17:29	OK	0	0	0
98/02/18	9:17:44	Cal	0	0	0
98/02/18	9:17:59	Cal	0	0	0
98/02/18	9:18:14	Cal	0	118	182
98/02/18	9:18:29	Cal	182	185	198
98/02/18	9:18:44	OK	36.4	188	199
98/02/18	9:18:59	OK	0.1	1	36.4
98/02/18	9:19:14	OK	0	0	0.1
98/02/18	9:19:29	OK	0	0	0
98/02/18	9:19:44	OK	0	0	0
98/02/18	9:28:21	OK	0	0	0.3
98/02/18	9:28:36	OK	0	0	0
98/02/18	9:28:51	OK	0	0	0
98/02/18	9:29:06	OK	0	17.3	168
98/02/18	9:29:21	OK	0	0.6	9.1
98/02/18	9:29:36	OK	0	0	0
98/02/18	9:29:51	OK	0	0.7	3.7
98/02/18	9:30:06	OK	0.2	11.2	34.6
98/02/18	9:30:21	OK	0	25.5	71.9
98/02/18	9:30:36	OK	0	32.2	63.4
98/02/18	9:30:51	OK	0	0.1	1.4
98/02/18	9:31:06	OK	0	2.1	19.2
98/02/18	9:31:21	OK	1.1	13.2	22.3
98/02/18	9:31:36	OK	0.9	13.5	37.6
98/02/18	9:31:51	OK	0	3.5	19.9
98/02/18	9:32:06	OK	0	0	0
98/02/18	9:32:21	OK	0	0	0
98/02/18	9:32:36	OK	0	0	0
98/02/18	9:32:51	OK	0	0	0

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

SHOP L - SECOND DAY OF SAMPLING

98/02/18	9:33:06	OK	0	0	0
98/02/18	9:33:21	OK	0	0	0
98/02/18	9:33:36	OK	0	0	0
98/02/18	9:33:51	OK	0	0	0
98/02/18	10:26:21	OK	0	0	0.3
98/02/18	10:26:36	OK	0	0	0
98/02/18	10:26:51	OK	0	0	0
98/02/18	10:27:06	OK	0	0	0
98/02/18	10:27:21	OK	0	0	0
98/02/18	10:27:36	OK	0	0	0
98/02/18	10:27:51	OK	0	0	0
98/02/18	10:28:06	OK	0	0.4	2
98/02/18	10:28:21	OK	0	0.3	2.2

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/18	10:28:36	OK	0	1.4	8.7
98/02/18	10:28:51	OK	0	1.5	7.5
98/02/18	10:29:06	OK	0	0.4	5.3
98/02/18	10:29:21	OK	0	0	0
98/02/18	10:29:36	OK	0	0	0
98/02/18	10:29:51	OK	0	0	0
98/02/18	10:30:06	OK	0	0	0
98/02/18	11:28:39	OK	0	0	0
98/02/18	11:28:54	OK	0	0	0
98/02/18	11:29:09	OK	0	0	0
98/02/18	11:29:24	OK	0	5.3	30.4
98/02/18	11:29:39	OK	0	4.9	30.5
98/02/18	11:29:54	OK	0	8.4	32.4
98/02/18	11:30:09	OK	0	14.1	62.8
98/02/18	11:30:24	OK	0	53.8	113
98/02/18	11:30:39	OK	0	9.3	15.5
98/02/18	11:30:54	OK	0.7	5.7	17.8
98/02/18	11:31:09	OK	0.2	0.7	2.6
98/02/18	11:31:24	OK	0	0.5	2
98/02/18	11:31:39	OK	0	0	0

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP L - SECOND DAY OF SAMPLING**

98/02/18	11:31:54 OK	0	0	0
98/02/18	11:32:09 OK	0	0	0
98/02/18	11:32:24 OK	0	0	0
98/02/18	11:32:39 OK	0	0	0
98/02/18	11:32:54 OK	0	0	0
98/02/18	11:33:09 OK	0	0	0
98/02/18	11:33:24 OK	0	0	0
98/02/18	11:33:39 OK	0	0	0
98/02/18	11:33:54 OK	0	0	0
98/02/18	12:23:15 OK	0	0	0
98/02/18	12:23:30 OK	0	0	0
98/02/18	12:23:45 OK	0	1.9	13.9
98/02/18	12:24:00 OK	0	7.1	35
98/02/18	12:24:15 OK	0	10.7	32
98/02/18	12:24:30 OK	2.8	48.5	89.4
98/02/18	12:24:45 OK	2.9	19.3	89.4
98/02/18	12:25:00 OK	4	12	21.2
98/02/18	12:25:15 OK	6.1	14.6	20.3
98/02/18	12:25:30 OK	2.2	12.8	32.1
98/02/18	12:25:45 OK	0.8	1.2	2.7
98/02/18	12:26:00 OK	0	0.3	1.1
98/02/18	12:26:15 OK	0	0	0
98/02/18	12:26:30 OK	0	0	0
98/02/18	12:26:45 OK	0	0	0
98/02/18	12:27:00 OK	0	0	0
98/02/18	12:27:15 OK	0	0.1	1
98/02/18	13:29:53 OK	0	0	0
98/02/18	13:30:08 OK	0	0	0
98/02/18	13:30:23 OK	0	23.4	100
98/02/18	13:30:38 OK	0	29.2	160
98/02/18	13:30:53 OK	0	12.7	38.7
98/02/18	13:31:08 OK	1.5	15.3	47.1
98/02/18	13:31:23 OK	2.4	37.3	90.9
98/02/18	13:31:38 OK	22	106	359
98/02/18	13:31:53 OK	2.5	28.4	43.8

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP L - SECOND DAY OF SAMPLING

Date	Time	Status	Min	Avg	Max
98/02/18	13:32:08	OK	9.2	25.1	62.3
98/02/18	13:32:23	OK	5.1	18.6	68.4
98/02/18	13:32:38	OK	0.1	1.4	10.9
98/02/18	13:32:53	OK	0	0.2	0.5
98/02/18	13:33:08	OK	0	0	0
98/02/18	13:33:23	OK	0	0	0
98/02/18	13:33:38	OK	0	0	0
98/02/18	13:33:53	OK	0	0	0
98/02/18	13:34:08	OK	0	0	0
98/02/18	13:34:23	OK	0	0	0
98/02/18	13:34:38	OK	0	0	0
98/02/18	13:34:53	OK	0	0	0
98/02/18	13:35:08	OK	0	0	0
98/02/18	13:35:23	OK	0	0	0
98/02/18	13:35:38	OK	0	0	0
98/02/18	13:35:53	OK	0	0	0
98/02/18	13:36:08	OK	0	0	0
98/02/18	13:36:23	OK	0	0	0
98/02/18	13:36:38	OK	0	0	0
98/02/18	13:36:53	OK	0	0	0
98/02/18	13:37:08	OK	0	0	0
98/02/18	13:37:23	OK	0	0	0
98/02/18	14:32:54	OK	0	0	0
98/02/18	14:33:09	OK	0	0	0
98/02/18	14:33:24	OK	0	0	0.5
98/02/18	14:33:39	OK	0	4.6	40.6
98/02/18	14:33:54	OK	0	32.6	66.4
98/02/18	14:34:09	OK	0	1.6	49.1
98/02/18	14:34:24	OK	0	0	0
98/02/18	14:34:39	OK	0	0	0
98/02/18	14:34:54	OK	0	0	0
98/02/18	14:35:09	OK	0	0	0
98/02/18	14:35:24	OK	0	0	0
98/02/18	14:35:39	OK	0	0	0
98/02/18	14:35:54	OK	0	0	0
98/02/18	14:36:09	OK	0	0	0
98/02/18	14:36:24	OK	0	0	0
98/02/18	14:39:13	OK	0	0	0
98/02/18	14:39:28	OK	0	0	0
98/02/18	14:39:43	OK	0	0	0
98/02/18	14:39:58	OK	0	0	0
98/02/18	14:40:13	OK	0	0	0
98/02/18	14:40:28	OK	0	0	0
98/02/18	14:40:43	OK	0	0	0

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP L - SECOND DAY OF SAMPLING**

98/02/18	14:40:58	OK	0	0	0
98/02/18	14:41:13	OK	0	0	0
98/02/18	14:41:28	OK	0	0	0
98/02/18	14:41:43	OK	0	0	0
98/02/18	14:41:58	OK	0	0	0
98/02/18	14:42:13	OK	0	0	0
98/02/18	14:42:28	OK	0	0	0
98/02/18	14:42:43	OK	0	4	33.9
98/02/18	14:42:58	OK	0	0.4	2.4
98/02/18	14:43:13	OK	0	0	0.5
98/02/18	14:43:28	OK	0	0	0

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/18	14:43:43	OK	0	0.1	0.8
98/02/18	14:43:58	OK	0	0	0
98/02/18	14:44:13	OK	0	0	0
98/02/18	14:44:28	OK	0	0	0
98/02/18	14:44:43	OK	0	0	0
98/02/18	14:44:58	OK	0	0	0
98/02/18	14:45:13	OK	0	0	0
98/02/18	14:45:28	OK	0	0	0
98/02/18	14:45:43	OK	0	0	0
98/02/18	14:45:58	OK	0	0	0
98/02/18	14:46:13	OK	0	0	0
98/02/18	14:46:28	OK	0	0	0
98/02/18	14:46:43	OK	0	0	0
98/02/18	14:46:58	OK	0	0	0
98/02/18	14:47:13	OK	0	0	0
98/02/18	14:47:28	OK	0	0	0
98/02/18	14:47:43	OK	0	0	0
98/02/18	14:47:58	OK	0	0	0
98/02/18	14:48:13	OK	0	0	0

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP L - SECOND DAY OF SAMPLING**

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/18	8:15:07	OK	0	2.2	3.1
98/02/18	8:15:22	OK	1.3	1.5	1.9
98/02/18	8:15:37	Cal	0.1	2	6.7
98/02/18	8:15:52	Cal	0	0	0.1
98/02/18	8:16:07	OK	0	0.3	1.5
98/02/18	8:16:22	Cal	1.2	186	218
98/02/18	8:16:37	Cal	192	194	198
98/02/18	8:16:52	OK	73.6	190	199
98/02/18	8:17:07	OK	0.4	1.7	73.6
98/02/18	8:17:22	OK	0.4	146	187
98/02/18	8:17:37	OK	130	157	200
98/02/18	8:17:52	OK	1.2	106	198
98/02/18	8:18:07	OK	0.3	0.6	1.2
98/02/18	8:18:22	OK	0	0	0.3
98/02/18	8:18:37	OK	0	0	0
98/02/18	8:18:52	OK	0	0	0
98/02/18	8:19:07	OK	0	0	0
98/02/18	8:20:07	ALPK	0	257	>2000
98/02/18	8:20:22	ALPK	2.1	389	>2000
98/02/18	8:20:37	OK	0	0.6	3.9
98/02/18	8:20:52	OK	0	0	0.1
98/02/18	9:20:44	OK	0	0.1	1.7
98/02/18	9:20:59	OK	0	0	0
98/02/18	9:21:14	OK	0	4.6	70.4
98/02/18	9:21:29	OK	0	36.8	255
98/02/18	9:55:06	OK	0	0.1	1.2
98/02/18	9:55:21	OK	0	0	1.2
98/02/18	9:55:36	OK	0	0	0
98/02/18	9:55:51	OK	0	0	0
98/02/18	9:56:06	OK	0	0	0
98/02/18	9:56:21	OK	0	0	0
98/02/18	9:56:36	OK	0	0	0
98/02/18	9:56:51	OK	0	0	0
98/02/18	9:57:06	OK	0	0	0
98/02/18	9:57:21	OK	0	0	0
98/02/18	9:57:36	OK	0	0	0
98/02/18	9:57:51	OK	0	95.7	336
98/02/18	9:58:06	ALPK	211	486	749
98/02/18	9:58:21	OK	7.6	25.4	211
98/02/18	9:58:36	OK	1.2	4.7	13.5

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

SHOP L - SECOND DAY OF SAMPLING

98/02/18	9:58:51 OK	2.2	5.3	14.9
98/02/18	9:59:06 OK	0.3	1.3	2.4
98/02/18	9:59:21 OK	0	0.2	0.8
98/02/18	10:47:54 OK	0	0	0.7
98/02/18	10:48:09 OK	0	7.2	109
98/02/18	10:48:24 OK	3.8	69.3	154
98/02/18	10:48:39 OK	19.5	81.1	164
98/02/18	10:48:54 OK	17.2	80.7	226
98/02/18	10:49:09 OK	5.8	37.6	96.5
98/02/18	10:49:24 OK	0.3	4.4	14.8
98/02/18	10:49:39 OK	0	1.7	4.4
98/02/18	11:13:34 OK	0	0	0.6
98/02/18	11:13:49 OK	0	148	172
98/02/18	11:14:04 OK	172	174	175
98/02/18	11:14:19 OK	175	175	176

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/18	11:14:34	Cal	176	176	177
98/02/18	11:14:49	Cal	177	177	177
98/02/18	11:15:04	Cal	1.1	108	198
98/02/18	11:15:19	OK	0	0.1	1.1
98/02/18	11:15:34	OK	0	41	188
98/02/18	11:15:49	OK	188	193	194
98/02/18	11:16:04	OK	0.9	119	196
98/02/18	11:16:19	OK	0	0.1	0.9
98/02/18	11:35:17	OK	0	1.5	4.4
98/02/18	11:35:32	OK	0	82.1	255
98/02/18	11:35:47	OK	16.7	229	505
98/02/18	11:36:02	OK	47.6	157	490
98/02/18	11:36:17	OK	1.9	32.8	120
98/02/18	11:36:32	OK	0.8	2.7	5.5
98/02/18	11:36:47	OK	0	0.7	1.9
98/02/18	12:49:01	OK	0	0	0.5
98/02/18	12:49:16	OK	0	0	0
98/02/18	12:49:31	OK	0	166	570

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP L - SECOND DAY OF SAMPLING**

98/02/18	12:49:46 ALPK	107	475	1185
98/02/18	12:50:01 OK	3.8	31.2	107
98/02/18	12:50:16 OK	3.8	12.2	18.6
98/02/18	12:50:31 OK	0	2.3	7.2
98/02/18	12:50:46 OK	0	0.9	1.7
98/02/18	13:25:55 OK	0	0	0.9
98/02/18	13:26:10 OK	0	0	0
98/02/18	13:26:25 OK	0	0	0
98/02/18	13:26:40 OK	0	0	0
98/02/18	13:26:55 OK	0	23.8	83.2
98/02/18	13:27:10 OK	14.3	62.1	135
98/02/18	13:27:25 OK	0	1.6	14.3
98/02/18	13:27:40 OK	0	0	0
98/02/18	14:08:21 OK	0	0	0.3
98/02/18	14:08:36 OK	0	0	0
98/02/18	14:08:51 OK	0	20.9	59.5
98/02/18	14:09:06 OK	3.7	35.5	108
98/02/18	14:09:21 OK	0	1.8	4.4
98/02/18	14:09:36 OK	0	0	0
98/02/18	14:09:51 OK	0	0	0
98/02/18	14:10:06 OK	0	0	0
98/02/18	14:10:21 OK	0	0	0
98/02/18	14:10:36 OK	0	0	0
98/02/18	14:10:51 OK	0	0	0
98/02/18	14:12:05 OK	0	0	0
98/02/18	14:12:20 OK	0	0	0
98/02/18	14:12:35 OK	0	0	0
98/02/18	14:12:50 OK	0	0	0
98/02/18	14:13:05 OK	0	5.7	67.7
98/02/18	14:13:20 OK	0	0	0
98/02/18	14:13:35 OK	0	0.1	1.7
98/02/18	14:13:50 OK	0	0	0
98/02/18	14:14:05 OK	0	0	0
98/02/18	14:14:20 OK	0	0	0.8
98/02/18	14:14:35 OK	0	0	0.4
98/02/18	14:14:50 OK	0	4.9	25.1
98/02/18	14:15:05 OK	0	0.5	4.6

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP L - SECOND DAY OF SAMPLING

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/18	14:15:20	OK	0	0.1	1.6
98/02/18	14:15:35	OK	0	0	1.6
98/02/18	14:15:50	OK	0	0	0
98/02/18	14:16:05	OK	0	0	0
98/02/18	14:16:46	OK	0	0	0
98/02/18	14:43:34	OK	0	0	0
98/02/18	14:43:49	OK	0	0	0
98/02/18	14:44:04	OK	0	0	0
98/02/18	14:44:19	OK	0	0	0
98/02/18	14:44:34	OK	0	0	0
98/02/18	14:44:49	OK	0	0	0
98/02/18	14:45:04	OK	0	36	121
98/02/18	14:45:19	OK	0	6.8	25.5
98/02/18	14:45:34	OK	0	0	0

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP T - FIRST DAY OF SAMPLING

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/18	9:14:14	OK	0	2.9	3.8
98/02/18	9:14:29	OK	2.8	2.9	3.2
98/02/18	9:14:44	OK	2.5	2.6	2.8
98/02/18	9:14:59	OK	2.2	2.2	2.5
98/02/18	9:15:14	OK	1.9	2	2.2
98/02/18	9:15:29	OK	1.7	1.8	1.9
98/02/18	9:15:44	OK	1.5	1.6	1.7
98/02/18	9:15:59	OK	1.3	1.4	1.5
98/02/18	9:16:14	OK	1.1	1.2	1.3
98/02/18	9:16:29	OK	0.9	1	1.1
98/02/18	9:16:44	Cal	0.7	1	4.6
98/02/18	9:16:59	Cal	0	1.5	7
98/02/18	9:17:14	Cal	0	0	0
98/02/18	9:17:29	OK	0	0	0
98/02/18	9:17:44	Cal	0	0	0
98/02/18	9:17:59	Cal	0	0	0
98/02/18	9:18:14	Cal	0	118	182
98/02/18	9:18:29	Cal	182	185	198
98/02/18	9:18:44	OK	36.4	188	199
98/02/18	9:18:59	OK	0.1	1	36.4
98/02/18	9:19:14	OK	0	0	0.1
98/02/18	9:19:29	OK	0	0	0
98/02/18	9:19:44	OK	0	0	0
98/02/18	9:28:21	OK	0	0	0.3
98/02/18	9:28:36	OK	0	0	0
98/02/18	9:28:51	OK	0	0	0
98/02/18	9:29:06	OK	0	17.3	168
98/02/18	9:29:21	OK	0	0.6	9.1
98/02/18	9:29:36	OK	0	0	0
98/02/18	9:29:51	OK	0	0.7	3.7
98/02/18	9:30:06	OK	0.2	11.2	34.6
98/02/18	9:30:21	OK	0	25.5	71.9
98/02/18	9:30:36	OK	0	32.2	63.4
98/02/18	9:30:51	OK	0	0.1	1.4
98/02/18	9:31:06	OK	0	2.1	19.2
98/02/18	9:31:21	OK	1.1	13.2	22.3
98/02/18	9:31:36	OK	0.9	13.5	37.6
98/02/18	9:31:51	OK	0	3.5	19.9
98/02/18	9:32:06	OK	0	0	0
98/02/18	9:32:21	OK	0	0	0
98/02/18	9:32:36	OK	0	0	0
98/02/18	9:32:51	OK	0	0	0

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

SHOP T - FIRST DAY OF SAMPLING

98/02/18	9:33:06	OK	0	0	0
98/02/18	9:33:21	OK	0	0	0
98/02/18	9:33:36	OK	0	0	0
98/02/18	9:33:51	OK	0	0	0
98/02/18	10:26:21	OK	0	0	0.3
98/02/18	10:26:36	OK	0	0	0
98/02/18	10:26:51	OK	0	0	0
98/02/18	10:27:06	OK	0	0	0
98/02/18	10:27:21	OK	0	0	0
98/02/18	10:27:36	OK	0	0	0
98/02/18	10:27:51	OK	0	0	0
98/02/18	10:28:06	OK	0	0.4	2
98/02/18	10:28:21	OK	0	0.3	2.2

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/18	10:28:36	OK	0	1.4	8.7
98/02/18	10:28:51	OK	0	1.5	7.5
98/02/18	10:29:06	OK	0	0.4	5.3
98/02/18	10:29:21	OK	0	0	0
98/02/18	10:29:36	OK	0	0	0
98/02/18	10:29:51	OK	0	0	0
98/02/18	10:30:06	OK	0	0	0
98/02/18	11:28:39	OK	0	0	0
98/02/18	11:28:54	OK	0	0	0
98/02/18	11:29:09	OK	0	0	0
98/02/18	11:29:24	OK	0	5.3	30.4
98/02/18	11:29:39	OK	0	4.9	30.5
98/02/18	11:29:54	OK	0	8.4	32.4
98/02/18	11:30:09	OK	0	14.1	62.8
98/02/18	11:30:24	OK	0	53.8	113
98/02/18	11:30:39	OK	0	9.3	15.5
98/02/18	11:30:54	OK	0.7	5.7	17.8
98/02/18	11:31:09	OK	0.2	0.7	2.6
98/02/18	11:31:24	OK	0	0.5	2
98/02/18	11:31:39	OK	0	0	0

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

SHOP T - FIRST DAY OF SAMPLING

98/02/18	11:31:54 OK	0	0	0
98/02/18	11:32:09 OK	0	0	0
98/02/18	11:32:24 OK	0	0	0
98/02/18	11:32:39 OK	0	0	0
98/02/18	11:32:54 OK	0	0	0
98/02/18	11:33:09 OK	0	0	0
98/02/18	11:33:24 OK	0	0	0
98/02/18	11:33:39 OK	0	0	0
98/02/18	11:33:54 OK	0	0	0
98/02/18	12:23:15 OK	0	0	0
98/02/18	12:23:30 OK	0	0	0
98/02/18	12:23:45 OK	0	1.9	13.9
98/02/18	12:24:00 OK	0	7.1	35
98/02/18	12:24:15 OK	0	10.7	32
98/02/18	12:24:30 OK	2.8	48.5	89.4
98/02/18	12:24:45 OK	2.9	19.3	89.4
98/02/18	12:25:00 OK	4	12	21.2
98/02/18	12:25:15 OK	6.1	14.6	20.3
98/02/18	12:25:30 OK	2.2	12.8	32.1
98/02/18	12:25:45 OK	0.8	1.2	2.7
98/02/18	12:26:00 OK	0	0.3	1.1
98/02/18	12:26:15 OK	0	0	0
98/02/18	12:26:30 OK	0	0	0
98/02/18	12:26:45 OK	0	0	0
98/02/18	12:27:00 OK	0	0	0
98/02/18	12:27:15 OK	0	0.1	1
98/02/18	13:29:53 OK	0	0	0
98/02/18	13:30:08 OK	0	0	0
98/02/18	13:30:23 OK	0	23.4	100
98/02/18	13:30:38 OK	0	29.2	160
98/02/18	13:30:53 OK	0	12.7	38.7
98/02/18	13:31:08 OK	1.5	15.3	47.1
98/02/18	13:31:23 OK	2.4	37.3	90.9
98/02/18	13:31:38 OK	22	106	359
98/02/18	13:31:53 OK	2.5	28.4	43.8
98/02/18	13:32:08 OK	9.2	25.1	62.3
98/02/18	13:32:23 OK	5.1	18.6	68.4
98/02/18	13:32:38 OK	0.1	1.4	10.9
98/02/18	13:32:53 OK	0	0.2	0.5
98/02/18	13:33:08 OK	0	0	0
98/02/18	13:33:23 OK	0	0	0
98/02/18	13:33:38 OK	0	0	0
98/02/18	13:33:53 OK	0	0	0
98/02/18	13:34:08 OK	0	0	0
98/02/18	13:34:23 OK	0	0	0
98/02/18	13:34:38 OK	0	0	0

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

SHOP T - FIRST DAY OF SAMPLING

98/02/18	13:34:53	OK	0	0	0
98/02/18	13:35:08	OK	0	0	0
98/02/18	13:35:23	OK	0	0	0
98/02/18	13:35:38	OK	0	0	0
98/02/18	13:35:53	OK	0	0	0
98/02/18	13:36:08	OK	0	0	0
98/02/18	13:36:23	OK	0	0	0
98/02/18	13:36:38	OK	0	0	0
98/02/18	13:36:53	OK	0	0	0
98/02/18	13:37:08	OK	0	0	0
98/02/18	13:37:23	OK	0	0	0
98/02/18	14:32:54	OK	0	0	0
98/02/18	14:33:09	OK	0	0	0
98/02/18	14:33:24	OK	0	0	0.5
98/02/18	14:33:39	OK	0	4.6	40.6
98/02/18	14:33:54	OK	0	32.6	66.4
98/02/18	14:34:09	OK	0	1.6	49.1
98/02/18	14:34:24	OK	0	0	0
98/02/18	14:34:39	OK	0	0	0
98/02/18	14:34:54	OK	0	0	0
98/02/18	14:35:09	OK	0	0	0
98/02/18	14:35:24	OK	0	0	0
98/02/18	14:35:39	OK	0	0	0
98/02/18	14:35:54	OK	0	0	0
98/02/18	14:36:09	OK	0	0	0
98/02/18	14:36:24	OK	0	0	0
98/02/18	14:39:13	OK	0	0	0
98/02/18	14:39:28	OK	0	0	0
98/02/18	14:39:43	OK	0	0	0
98/02/18	14:39:58	OK	0	0	0
98/02/18	14:40:13	OK	0	0	0
98/02/18	14:40:28	OK	0	0	0
98/02/18	14:40:43	OK	0	0	0
98/02/18	14:40:58	OK	0	0	0
98/02/18	14:41:13	OK	0	0	0
98/02/18	14:41:28	OK	0	0	0
98/02/18	14:41:43	OK	0	0	0
98/02/18	14:41:58	OK	0	0	0
98/02/18	14:42:13	OK	0	0	0
98/02/18	14:42:28	OK	0	0	0
98/02/18	14:42:43	OK	0	4	33.9
98/02/18	14:42:58	OK	0	0.4	2.4
98/02/18	14:43:13	OK	0	0	0.5
98/02/18	14:43:28	OK	0	0	0

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP T - FIRST DAY OF SAMPLING

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/18	14:43:43	OK	0	0.1	0.8
98/02/18	14:43:58	OK	0	0	0
98/02/18	14:44:13	OK	0	0	0
98/02/18	14:44:28	OK	0	0	0
98/02/18	14:44:43	OK	0	0	0
98/02/18	14:44:58	OK	0	0	0
98/02/18	14:45:13	OK	0	0	0
98/02/18	14:45:28	OK	0	0	0
98/02/18	14:45:43	OK	0	0	0
98/02/18	14:45:58	OK	0	0	0
98/02/18	14:46:13	OK	0	0	0
98/02/18	14:46:28	OK	0	0	0
98/02/18	14:46:43	OK	0	0	0
98/02/18	14:46:58	OK	0	0	0
98/02/18	14:47:13	OK	0	0	0
98/02/18	14:47:28	OK	0	0	0
98/02/18	14:47:43	OK	0	0	0
98/02/18	14:47:58	OK	0	0	0
98/02/18	14:48:13	OK	0	0	0

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP T - SECOND DAY OF SAMPLING

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/19	9:23:49	OK	0	1.4	2
98/02/19	9:24:04	Cal	1	2.5	8.1
98/02/19	9:24:19	Cal	0	0.1	1
98/02/19	9:24:34	OK	0	0	0
98/02/19	9:24:49	OK	0	0	0
98/02/19	9:25:04	OK	0	0	0
98/02/19	9:25:19	OK	0	0	0
98/02/19	9:25:34	OK	0	50.5	167
98/02/19	9:25:49	Cal	167	178	182
98/02/19	9:26:04	Cal	182	185	198
98/02/19	9:26:19	OK	198	199	201
98/02/19	9:26:34	OK	7	45.6	201
98/02/19	9:26:49	OK	3.4	4.6	7
98/02/19	9:27:04	OK	1.7	2.5	3.4
98/02/19	9:27:19	OK	0.8	1.1	1.7
98/02/19	9:27:34	OK	0.2	0.4	0.8
98/02/19	9:27:49	OK	0	0	0.2
98/02/19	9:28:04	OK	0	0.1	1.2
98/02/19	9:28:19	OK	0	0	0
98/02/19	9:28:34	OK	0	0	0
98/02/19	9:28:49	OK	0	0	0
98/02/19	9:29:04	OK	0	0	0
98/02/19	9:29:19	OK	0	0	0
98/02/19	9:29:34	OK	0	0	0
98/02/19	9:29:49	OK	0	0	0
98/02/19	9:30:04	OK	0	0	0
98/02/19	9:30:19	OK	0	0	0
98/02/19	9:30:34	OK	0	0	0
98/02/19	9:30:49	OK	0	0	0
98/02/19	9:31:04	OK	0	0	0
98/02/19	9:31:19	OK	0	0	0
98/02/19	9:31:34	OK	0	0	0
98/02/19	9:31:49	OK	0	0	0
98/02/19	9:32:04	OK	0	0	0
98/02/19	9:32:19	OK	0	0	0
98/02/19	9:32:34	OK	0	0	0
98/02/19	9:32:49	OK	0	0	0
98/02/19	9:33:04	OK	0	53.8	192
98/02/19	9:33:19	OK	192	200	203
98/02/19	9:33:34	OK	203	204	204
98/02/19	9:33:49	Cal	204	205	206
98/02/19	9:34:04	Cal	198	205	208

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP T - SECOND DAY OF SAMPLING**

98/02/19	9:34:19 OK	199	200	200
98/02/19	9:34:34 OK	199	200	200
98/02/19	10:27:50 OK	0	0	14.6
98/02/19	10:34:45 OK	0	0	0
98/02/19	10:35:00 OK	0	0	0
98/02/19	10:35:15 OK	0	0	0
98/02/19	10:35:30 OK	0	0	0
98/02/19	10:35:45 OK	0	0	0
98/02/19	10:36:00 OK	0	0	0
98/02/19	10:36:15 OK	0	0	0
98/02/19	10:36:30 OK	0	0	0
98/02/19	10:36:45 OK	0	0	0
98/02/19	10:37:00 OK	0	0	0

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/19	10:37:15 OK		0	0	0
98/02/19	10:37:30 OK		0	19.8	181
98/02/19	10:37:45 OK		0	21.3	84.5
98/02/19	10:38:00 OK		0	14.9	62.3
98/02/19	10:38:15 OK		2.2	56.2	227
98/02/19	10:38:30 OK		8.2	58	300
98/02/19	10:38:45 OK		4.1	40.9	296
98/02/19	10:39:00 OK		18.3	63.5	296
98/02/19	10:39:15 OK		0	7.2	20.8
98/02/19	10:39:30 OK		0	2.2	14.1
98/02/19	10:39:45 OK		0	3.8	33.9
98/02/19	10:40:00 OK		0	3.3	33.9
98/02/19	10:40:15 OK		0	3.1	24.8
98/02/19	10:40:30 OK		0	4	17.6
98/02/19	10:40:45 OK		0	2	16.7
98/02/19	11:35:35 OK		0	0	0
98/02/19	11:35:50 OK		0	0	0
98/02/19	11:36:05 OK		0	0	0
98/02/19	11:36:20 OK		0	0	0
98/02/19	11:36:35 OK		0	0	0

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP T - SECOND DAY OF SAMPLING

98/02/19	11:36:50 OK	0	0	0
98/02/19	11:37:05 OK	0	2.3	27.5
98/02/19	11:37:20 OK	0	13.2	147
98/02/19	11:37:35 OK	2.4	54.6	307
98/02/19	11:37:50 OK	32	149	620
98/02/19	11:38:05 OK	4.8	47.1	268
98/02/19	11:38:20 OK	3.7	33.2	70.4
98/02/19	11:38:35 OK	0.6	21.2	64.3
98/02/19	11:38:50 OK	2.1	2.9	3.6
98/02/19	11:39:05 OK	0	0.3	2.8
98/02/19	12:22:24 OK	0	0	0
98/02/19	12:22:39 OK	0	0	0
98/02/19	12:22:54 OK	0	0	0
98/02/19	12:23:09 OK	0	0	0
98/02/19	12:23:24 OK	0	0	0
98/02/19	12:23:39 OK	0	0	0
98/02/19	12:23:54 OK	0	0	0
98/02/19	12:24:09 OK	0	0	0
98/02/19	12:24:24 OK	0	0	0
98/02/19	12:24:39 OK	0	0	0
98/02/19	12:24:54 OK	0	0.1	2.1
98/02/19	12:25:09 OK	0	20.5	170
98/02/19	12:25:24 OK	3.1	57.2	263
98/02/19	12:25:39 OK	14.3	62.3	180
98/02/19	12:25:54 OK	15.9	41.4	122
98/02/19	12:26:09 OK	1.6	16.4	39.3
98/02/19	12:26:24 OK	0	13.6	52.1
98/02/19	12:27:53 OK	0	0	0
98/02/19	12:28:08 OK	0	0	0
98/02/19	13:27:09 OK	0	0	0
98/02/19	13:27:24 OK	0	0	0
98/02/19	13:27:39 OK	0	10.1	51.5
98/02/19	13:27:54 OK	0	50.7	339
98/02/19	13:28:09 OK	22.6	155	281
98/02/19	13:28:24 OK	19.4	106	181

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP T - SECOND DAY OF SAMPLING

Date	Time	Status	Min	Avg	Max
98/02/19	13:28:39	OK	13.6	39.3	74.5
98/02/19	13:28:54	OK	6.4	47.1	218
98/02/19	13:29:09	OK	0	13.3	64.8
98/02/19	15:25:00	OK	0	0	0.2
98/02/19	15:25:15	OK	0	0	0
98/02/19	15:25:30	OK	0	0	0
98/02/19	15:25:45	OK	0	0	0
98/02/19	15:26:00	OK	0	0	0
98/02/19	15:26:15	OK	0	3	22.1
98/02/19	15:26:30	OK	0	2.1	8.4
98/02/19	15:26:45	OK	2.1	22	66.8

" X# X\$ New ūc. +ē×/.††

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

SHOP G - FIRST DAY OF SAMPLING

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/19	9:23:35	OK	0	0.7	1.3
98/02/19	9:24:09	OK	0	0	0.2
98/02/19	9:24:24	Cal	0	1.8	7.8
98/02/19	9:24:39	Cal	0	1.1	7.5
98/02/19	9:24:54	Cal	0	0.9	7.5
98/02/19	9:25:09	Cal	0	0	0.1
98/02/19	9:25:24	OK	0	0	0
98/02/19	9:25:39	OK	0	0	0
98/02/19	9:25:54	OK	0	0	0
98/02/19	9:26:09	OK	0	0	0
98/02/19	9:26:24	OK	0	11	134
98/02/19	9:26:39	Cal	134	212	284
98/02/19	9:26:54	Cal	210	210	211
98/02/19	9:27:09	Cal	8.9	49.2	211
98/02/19	9:27:24	OK	2.2	8.4	9
98/02/19	9:27:39	OK	0	0	2.2
98/02/19	9:27:54	OK	0	0	0
98/02/19	9:28:09	OK	0	0	0
98/02/19	9:28:24	OK	0	0	0
98/02/19	9:28:39	OK	0	0	0
98/02/19	9:28:54	OK	0	1.4	8.6
98/02/19	9:29:09	Cal	8.6	8.9	9.6
98/02/19	9:29:24	Cal	9	9	9
98/02/19	9:29:39	Cal	9	9	9
98/02/19	9:29:54	Cal	9	9	9
98/02/19	9:30:09	Cal	9	9	9
98/02/19	9:30:24	Cal	0	3.6	9
98/02/19	9:30:39	Cal	0	0	0
98/02/19	9:30:54	Cal	0	13.1	198
98/02/19	9:31:09	OK	22.4	96.3	198
98/02/19	9:31:24	OK	0.6	6.7	70.7
98/02/19	9:31:39	Cal	0.1	1.8	6.9
98/02/19	9:31:54	Cal	0	0	0.1
98/02/19	9:32:09	OK	0	26.7	187
98/02/19	9:32:24	OK	187	200	218
98/02/19	9:32:39	OK	0.2	31.2	200
98/02/19	9:32:54	OK	0	0	0.2
98/02/19	9:33:09	OK	0	0	0
98/02/19	9:33:24	OK	0	0	0
98/02/19	9:33:39	OK	0	0	0
98/02/19	9:33:54	OK	0	0	0
98/02/19	9:34:09	OK	0	0	0

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP G - FIRST DAY OF SAMPLING**

98/02/19	9:59:46 OK	0	0	0.9
98/02/19	10:00:01 OK	0	1	7.5
98/02/19	10:00:16 OK	6.3	31.4	49.3
98/02/19	10:00:31 OK	4.8	45.8	120
98/02/19	10:00:46 OK	1.7	91	142
98/02/19	10:01:01 OK	0.3	9.7	40.5
98/02/19	10:01:16 OK	0	4.5	14.2
98/02/19	10:59:31 OK	0	1.5	8.3
98/02/19	10:59:46 OK	0	8.4	40.7
98/02/19	11:00:01 OK	0	12.4	54.1
98/02/19	11:00:16 OK	0	0	1.4
98/02/19	11:00:31 OK	0	0	0
98/02/19	11:00:46 OK	0	0	0

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/19	12:30:15	OK	0	0.4	3.3
98/02/19	12:30:30	OK	0	16.9	50
98/02/19	12:30:45	OK	0	0	0.1
98/02/19	12:31:00	OK	0	0	0
98/02/19	16:23:21	OK	0	0.1	0.8

" X# X\$ New ûc. +¿ -†.†

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP G - SECOND DAY OF SAMPLING

2020 Report

Date	Time	Status	Min	Avg	Max
98/02/20	8:58:51	OK	0	0	0
98/02/20	9:20:21	OK	0	0.2	1.7
98/02/20	9:20:36	OK	0	0	0
98/02/20	9:20:51	OK	0	0	0
98/02/20	9:21:06	OK	0	0	0
98/02/20	10:29:02	OK	0	0.1	1.3
98/02/20	10:29:17	OK	0	0	0
98/02/20	10:29:32	OK	0	0	0
98/02/20	10:29:47	OK	0	0	0
98/02/20	10:30:02	OK	0	16.8	126
98/02/20	10:30:17	OK	18.3	45.7	102
98/02/20	10:30:32	OK	0.3	127	340
98/02/20	10:30:47	OK	2.1	157	329
98/02/20	10:31:02	OK	2.1	211	371
98/02/20	10:31:17	OK	0.3	32.3	171
98/02/20	10:31:32	OK	0.3	8.4	52.1
98/02/20	10:31:47	OK	0	0.7	16.6
98/02/20	11:29:48	OK	0	0.1	1.7
98/02/20	11:30:03	OK	0	0	0
98/02/20	11:30:18	OK	0	0	0
98/02/20	11:30:33	OK	0	0	0
98/02/20	11:30:48	OK	0	13.8	28.8
98/02/20	11:31:03	OK	0	50.8	75.4
98/02/20	11:31:18	OK	0	16	69.1
98/02/20	11:31:33	OK	0	0.2	1.7
98/02/20	11:31:48	OK	0	0	0
98/02/20	11:32:03	OK	0	0	0
98/02/20	11:32:18	OK	0	0	0
98/02/20	11:32:33	OK	0	0	0
98/02/20	11:32:48	OK	0	0	0
98/02/20	11:33:03	OK	0	0	0
98/02/20	11:33:18	OK	0	0	0
98/02/20	11:33:33	OK	0	0	0
98/02/20	11:33:48	OK	0	0	0
98/02/20	12:23:14	OK	0	0.1	1.7
98/02/20	12:23:29	OK	1.7	21.2	43
98/02/20	12:23:44	OK	0.2	49	128
98/02/20	12:23:59	OK	0	0.3	3

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP D - FIRST DAY OF SAMPLING

do 1 - HyperTerminal data file  
not attempt to modify this

2020 Report

Date	Time	Status	Min	Avg	Max	
98/04/14	7:16:41	OK		0.6	0.7	1
98/04/14	7:16:56	OK		0.5	0.5	0.6
98/04/14	7:17:11	OK		0.2	0.3	0.6
98/04/14	7:17:26	OK		0	0.1	0.3
98/04/14	7:17:41	Cal		0	1.9	8.2
98/04/14	7:17:56	Cal		0	1.1	8
98/04/14	7:18:11	Cal		0	1	8
98/04/14	7:18:26	Cal		0	0	0
98/04/14	7:18:41	OK		0	0	0
98/04/14	7:18:56	OK		0	0	0
98/04/14	7:19:11	OK		0	0	0
98/04/14	7:19:26	Cal		0	0.3	3.4
98/04/14	7:19:41	Cal		2.5	158	186
98/04/14	7:19:56	Cal		186	193	199
98/04/14	7:20:11	OK		0.7	82.3	199
98/04/14	7:20:26	OK		0	0.2	0.7
98/04/14	7:20:41	OK		0	0	0
98/04/14	7:20:56	OK		0	0	0
98/04/14	7:21:11	OK		0	0	0
98/04/14	7:21:26	OK		0	0	0
98/04/14	7:21:41	OK		0	0	0
98/04/14	7:21:56	OK		0	0	0
98/04/14	7:22:11	OK		0	0	0
98/04/14	7:22:26	OK		0	0	0
98/04/14	7:22:41	OK		0	0	0
98/04/14	7:22:56	OK		0	0	0
98/04/14	7:23:11	OK		0	0	0
98/04/14	7:23:26	OK		0	0	0
98/04/14	7:23:41	OK		0	0	0
98/04/14	7:23:56	OK		0	0	0
98/04/14	7:24:11	OK		0	0	0
98/04/14	7:24:26	OK		0	0	0
98/04/14	7:24:41	OK		0	0	0
98/04/14	7:24:56	OK		0	0	0
98/04/14	7:25:11	OK		0	0	0
98/04/14	7:25:26	OK		0	0	0
98/04/14	7:25:41	OK		0	0	0
98/04/14	7:25:56	OK		0	1.5	6

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP D - FIRST DAY OF SAMPLING**

98/04/14	7:26:11	OK	0	0.2	2.3
98/04/14	7:26:26	OK	0	0	0
98/04/14	7:26:41	OK	0	0	0
98/04/14	7:26:56	OK	0	0	0
98/04/14	7:27:11	OK	0	0	0
98/04/14	7:27:26	OK	0	0	0
98/04/14	7:27:41	OK	0	0	0
98/04/14	7:27:56	OK	0	0	0
98/04/14	7:28:11	OK	0	0	0
98/04/14	7:28:26	OK	0	0	0
98/04/14	7:28:41	OK	0	0	0
98/04/14	7:28:56	OK	0	0	0
98/04/14	7:29:11	OK	0	0	0
98/04/14	7:29:26	OK	0	0	0.7
98/04/14	7:29:41	OK	0	0	0
98/04/14	7:29:56	OK	0	0	0
98/04/14	7:30:11	OK	0	0.4	2.4

2020 Report

Date	Time	Status	Min	Avg	Max
98/04/14	7:30:26	OK	0	1.1	3.5
98/04/14	7:30:41	OK	0	0.7	3.5
98/04/14	7:30:56	OK	0	0	0
98/04/14	7:31:11	OK	0	0	0
98/04/14	7:31:26	OK	0	0	0
98/04/14	7:31:41	OK	0	0	0
98/04/14	7:31:56	OK	0	0	0
98/04/14	7:32:11	OK	0	0	0
98/04/14	7:32:26	OK	0	0	0
98/04/14	7:32:41	OK	0	0	0
98/04/14	7:32:56	OK	0	0	0
98/04/14	7:33:11	OK	0	0	0
98/04/14	7:33:26	OK	0	0	0
98/04/14	7:33:41	OK	0	0	0
98/04/14	7:33:56	OK	0	0	0
98/04/14	7:34:11	OK	0	0	0
98/04/14	7:34:26	OK	0	0	0
98/04/14	7:34:41	OK	0	0	0
98/04/14	7:34:56	OK	0	0	0
98/04/14	8:24:12	OK	0	0	0
98/04/14	8:24:27	OK	0	0	0
98/04/14	8:24:42	OK	0	0	0
98/04/14	8:24:57	OK	0	0	0
98/04/14	8:25:12	OK	0	0	0
98/04/14	8:25:27	OK	0	0	0
98/04/14	8:25:42	OK	0	0	0

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

SHOP D - FIRST DAY OF SAMPLING

98/04/14	8:25:57	OK	0	0	0
98/04/14	8:26:12	OK	0	0	0
98/04/14	8:26:27	OK	0	0	0
98/04/14	8:26:42	OK	0	0	0
98/04/14	8:26:57	OK	0	0	0
98/04/14	8:27:12	OK	0	0	0
98/04/14	8:27:27	OK	0	0	0
98/04/14	8:27:42	OK	0	0	0
98/04/14	8:27:57	OK	0	0	0
98/04/14	8:28:12	OK	0	0	0
98/04/14	8:28:27	OK	0	0	0
98/04/14	8:28:42	OK	0	0	0
98/04/14	8:28:57	OK	0	0	0
98/04/14	8:29:12	OK	0	0	0
98/04/14	8:29:27	OK	0	0	0
98/04/14	8:29:42	OK	0	0	0
98/04/14	8:29:57	OK	0	0	0
98/04/14	8:30:12	OK	0	0	0
98/04/14	8:30:27	OK	0	0	0
98/04/14	8:30:42	OK	0	0	0
98/04/14	8:30:57	OK	0	0	0
98/04/14	8:31:12	OK	0	0	0
98/04/14	8:31:27	OK	0	0	0
98/04/14	8:31:42	OK	0	0	0
98/04/14	8:31:57	OK	0	0	0
98/04/14	8:32:12	OK	0	0	0
98/04/14	8:32:27	OK	0	0	0
98/04/14	8:32:42	OK	0	0	0
98/04/14	8:32:57	OK	0	0	0

2020 Report

Date	Time	Status	Min	Avg	Max
98/04/14	8:33:12	OK	0	0	0
98/04/14	8:33:27	OK	0	0	0
98/04/14	8:33:42	OK	0	5	19.7
98/04/14	8:33:57	OK	0	2.1	7.4
98/04/14	8:34:12	OK	0	0	0
98/04/14	8:34:27	OK	0	0	0
98/04/14	8:34:42	OK	0	0	0
98/04/14	8:34:57	OK	0	0	0
98/04/14	8:35:12	OK	0	0	0
98/04/14	9:20:42	OK	0	0	0
98/04/14	9:20:57	OK	0	2.1	8.9
98/04/14	9:21:12	OK	7	18.3	38.6
98/04/14	9:21:27	OK	0	2.3	10.8

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

SHOP D - FIRST DAY OF SAMPLING

98/04/14	9:21:42	OK	0	0	0
98/04/14	9:21:57	OK	0	0	0
98/04/14	9:22:12	OK	0	0	0
98/04/14	9:22:27	OK	0	0	0
98/04/14	9:22:42	OK	0	69.7	238
98/04/14	9:22:57	OK	9.3	39.7	132
98/04/14	9:23:12	OK	0	0.7	9.3
98/04/14	9:23:27	OK	0	0	0
98/04/14	9:23:42	OK	0	0	0
98/04/14	9:23:57	OK	0	0	0
98/04/14	10:10:31	OK	0	0	0
98/04/14	10:10:46	OK	0	9.5	51.9
98/04/14	10:11:01	OK	0	19.6	90.6
98/04/14	10:11:16	OK	3.1	17.2	90.6
98/04/14	10:11:31	OK	0	1.5	7.4
98/04/14	10:11:46	OK	0	0.1	2
98/04/14	10:12:01	OK	0	0.1	1.7
98/04/14	10:12:16	OK	0	0	1.7
98/04/14	10:12:31	OK	0	0	0
98/04/14	11:01:35	OK	0	3.9	33.2
98/04/14	11:01:50	OK	1.3	29.7	85.9
98/04/14	11:02:05	OK	16.6	47.2	161
98/04/14	11:02:20	OK	9.8	23	55.8
98/04/14	11:02:35	OK	0	5.5	31.5
98/04/14	11:02:50	OK	0	0.4	5.7
98/04/14	11:03:05	OK	0	0.3	4.6
98/04/14	11:03:20	OK	0	0	0
98/04/14	11:03:35	OK	0	0	0.3
98/04/14	11:03:50	OK	0	1.6	8.2
98/04/14	11:04:05	OK	0	0.2	2.9
98/04/14	11:04:20	OK	0	0	0.8
98/04/14	11:04:35	OK	0.8	10.1	42.1
98/04/14	11:04:50	OK	16.3	30.6	50.9
98/04/14	11:05:05	OK	15.2	19.5	24.3
98/04/14	11:05:20	OK	6.6	12.2	15.2
98/04/14	11:05:35	OK	3.2	4.9	9
98/04/14	11:05:50	OK	1.5	3.7	6.8
98/04/14	11:06:05	OK	0.3	1.1	1.9
98/04/14	11:06:20	OK	0.3	0.7	2.5
98/04/14	11:06:35	OK	0	0.1	1.2
98/04/14	11:06:50	OK	0	0	0
98/04/14	11:07:05	OK	0	0	0

2020 Report

Date	Time	Status	Min	Avg	Max
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**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP D - FIRST DAY OF SAMPLING**

98/04/14	11:07:20 OK	0	0.2	2.4
98/04/14	11:07:35 OK	0	0.1	1.5
98/04/14	11:07:50 OK	0	0	1.5
98/04/14	11:08:05 OK	0	0	0
98/04/14	11:08:20 OK	0	0	0
98/04/14	11:08:35 OK	0	0	0
98/04/14	11:08:50 OK	0	0	0
98/04/14	11:51:27 OK	0	0	0
98/04/14	11:51:42 OK	0	0	0
98/04/14	11:51:57 OK	0	0	0
98/04/14	12:16:21 OK	0	0	0
98/04/14	12:18:56 OK	0	0	0
98/04/14	12:19:11 OK	0	0	0
98/04/14	12:19:26 OK	0	0	0
98/04/14	12:19:41 OK	0	0	0
98/04/14	12:19:56 OK	0	0	0
98/04/14	12:20:11 OK	0	0	0
98/04/14	14:46:35 OK	0	0	0
98/04/14	14:46:50 OK	0	0	0
98/04/14	14:47:05 OK	0	1.4	21.4
98/04/14	14:47:20 OK	2.5	29	106
98/04/14	14:47:35 OK	3.7	54	90.9
98/04/14	14:47:50 OK	7.2	43.7	86.2
98/04/14	14:48:05 OK	0	2.6	7.2
98/04/14	14:48:20 OK	0	0.8	6.6
98/04/14	14:48:35 OK	0	3.3	9.3
98/04/14	14:48:50 OK	0	13	51.1
98/04/14	14:49:05 OK	0.9	37.7	82.6
98/04/14	14:49:20 OK	0	20.7	56.2
98/04/14	15:37:22 OK	0	0	0
98/04/14	15:37:37 OK	0	0	0
98/04/14	15:37:52 OK	0	0	0
98/04/14	15:38:07 OK	0	0	0
98/04/14	15:38:22 OK	0	0	0
98/04/14	15:38:37 OK	0	0	0
98/04/14	15:38:52 OK	0	0	0
98/04/14	15:39:07 OK	0	0	0
98/04/14	15:39:22 OK	0	7.8	33
98/04/14	15:39:37 OK	21.9	65.5	156
98/04/14	15:39:52 OK	17.4	72.3	129
98/04/14	15:40:07 OK	0	7.5	44.6
98/04/14	15:40:22 OK	0.6	15.6	44.1
98/04/14	15:40:37 OK	9	17	33.4
98/04/14	15:40:52 OK	3.6	6.9	13.4
98/04/14	15:41:07 OK	2	3.4	5.1
98/04/14	15:41:22 OK	0.5	1.9	3.2

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP D - FIRST DAY OF SAMPLING**

98/04/14	15:41:37 OK	0	0.6	1.6
98/04/14	15:41:52 OK	0	0	0.5
98/04/14	15:42:07 OK	0	0	0
98/04/14	16:11:35 OK(CAL CK)	0	22.8	170
98/04/14	16:11:50 OK(CAL CK)	170	178	182
98/04/14	16:12:05 OK(CAL CK)	175	183	185
98/04/14	16:36:04 OK	0	0	0
98/04/14	16:36:19 OK	0	3.5	20.3
98/04/14	16:36:34 OK	13.3	50.1	107
98/04/14	16:36:49 OK	1.7	26.6	105

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

SHOP D - SECOND DAY OF SAMPLING

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2020 Report

Date	Time	Status	Min	Avg	Max
98/04/15	7:11:06	OK	0	0.1	1.1
98/04/15	7:11:29	Off	0	0	0
98/04/15	7:11:44	OK	0	0	0
98/04/15	7:11:59	Cal	0	0	0
98/04/15	7:12:14	Cal	0	1.6	6.4
98/04/15	7:12:29	Cal	0	0	0
98/04/15	7:12:44	Cal	0	0	0
98/04/15	7:12:59	Cal	0	0	0
98/04/15	7:13:14	Cal	0	118	188
98/04/15	7:13:29	Cal	2.5	159	199
98/04/15	7:13:44	OK	0	0.3	2.5
98/04/15	7:13:59	OK	0	158	197
98/04/15	7:14:14	OK	0.1	56.8	197
98/04/15	7:14:29	OK	0	0	0.1
98/04/15	7:54:30	OK	0	0.1	0.9
98/04/15	7:54:45	OK	0	0	0
98/04/15	7:55:00	OK	0	103	415
98/04/15	7:55:15	ALPK	41	297	881
98/04/15	7:55:30	OK	0.1	7.7	41
98/04/15	8:54:00	OK	0	0.1	1.1
98/04/15	8:54:15	OK	0	0	0
98/04/15	8:54:30	OK	0	0	0
98/04/15	8:54:45	OK	0	0	0
98/04/15	8:55:00	OK	0	0	0
98/04/15	8:55:15	OK	0	0	0
98/04/15	8:55:30	OK	0	0	0
98/04/15	8:55:45	OK	0	0	0
98/04/15	8:56:00	OK	0	0	0
98/04/15	8:56:15	OK	0	0	0
98/04/15	8:56:30	OK	0	35	210
98/04/15	8:56:45	OK	50	227	442
98/04/15	8:57:00	OK	74.8	258	498
98/04/15	8:57:15	OK	15.6	54	192
98/04/15	8:57:30	OK	5.6	35.7	110

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP D - SECOND DAY OF SAMPLING**

98/04/15	8:57:45 OK	0.4	2.5	5.6
98/04/15	8:58:00 OK	0.7	3.7	9.8
98/04/15	8:58:15 OK	0	1.3	7.8
98/04/15	8:58:30 OK	0	0	0
98/04/15	8:58:45 OK	0	0	0.5
98/04/15	8:59:00 OK	0	5.4	13.8
98/04/15	8:59:15 OK	0	1.4	10
98/04/15	8:59:30 OK	0	0	0
98/04/15	8:59:45 OK	0	0	0
98/04/15	9:00:00 OK	0	0	0
98/04/15	9:00:15 OK	0	0	0
98/04/15	9:00:30 OK	0	0	0
98/04/15	9:00:45 OK	0	0.1	2
98/04/15	9:01:00 OK	0	0	0
98/04/15	9:01:15 OK	0	0	0
98/04/15	9:01:30 OK	0	0	0
98/04/15	9:01:45 OK	0	0	0
98/04/15	9:02:00 OK	0	0	0.4
98/04/15	9:02:15 OK	0	0	0
98/04/15	9:02:30 OK	0	0	0
98/04/15	9:02:45 OK	0	0	0

2020 Report

Date	Time	Status	Min	Avg	Max
98/04/15	9:03:00	OK	0	2	8
98/04/15	9:03:15	OK	0	0.2	1.8
98/04/15	9:03:30	OK	0	0.5	4.1
98/04/15	9:03:45	OK	0	0.3	2.1
98/04/15	9:04:00	OK	0	0.1	1.2
98/04/15	9:04:15	OK	0	0.7	5.4
98/04/15	9:04:30	OK	0	2.6	8.2
98/04/15	9:04:45	OK	0	0.6	3.2
98/04/15	9:05:00	OK	0	2	9.2
98/04/15	9:05:15	OK	0	1.7	10.1
98/04/15	9:05:30	OK	0	2.1	6.1
98/04/15	9:05:45	OK	0	3.1	9

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

SHOP D - SECOND DAY OF SAMPLING

98/04/15	9:06:00 OK	0	1.5	5.8
98/04/15	9:06:15 OK	0.3	2.4	6.1
98/04/15	9:06:30 OK	0	1.5	8.7
98/04/15	9:06:45 OK	1.4	5.5	11.2
98/04/15	9:07:00 OK	0	1.2	6.2
98/04/15	9:07:15 OK	0	0	0
98/04/15	9:07:30 OK	0	0	0
98/04/15	9:07:45 OK	0	0	0
98/04/15	9:08:00 OK	0	0	0
98/04/15	9:08:15 OK	0	0	0
98/04/15	9:08:30 OK	0	0	0
98/04/15	9:39:29 OK	0	0.1	1.1
98/04/15	9:39:44 OK	0	0	0
98/04/15	9:39:59 OK	0	0.1	1.2
98/04/15	9:40:14 OK	0	0	0
98/04/15	9:40:29 OK	0	0	0
98/04/15	9:40:44 OK	0	0	0
98/04/15	9:40:59 OK	0	0	0
98/04/15	9:41:14 OK	0	0	0
98/04/15	9:41:29 OK	0	0	0
98/04/15	9:41:44 OK	0	0	0
98/04/15	9:41:59 OK	0	0	0
98/04/15	9:42:14 OK	0	0	0
98/04/15	9:42:29 OK	0	0	0
98/04/15	9:42:44 OK	0	0	0
98/04/15	9:42:59 OK	0	0	0
98/04/15	9:43:14 OK	0	0	0
98/04/15	9:43:29 OK	0	0	0
98/04/15	9:43:44 OK	0	0	0
98/04/15	9:43:59 OK	0	0	0
98/04/15	9:44:14 OK	0	0	0
98/04/15	9:44:29 OK	0	0	0
98/04/15	9:44:44 OK	0	0	0
98/04/15	9:44:59 OK	0	0	0
98/04/15	10:10:06 OK	0	0	0
98/04/15	10:10:21 OK	0	0	0
98/04/15	10:10:36 OK	0	0	0
98/04/15	10:10:51 OK	0	9	79.2
98/04/15	10:11:06 OK	1.1	15.8	40
98/04/15	10:11:21 OK	0	38.1	181
98/04/15	10:11:36 OK	0	1.1	6.9
98/04/15	10:11:51 OK	0	0.1	1.8
98/04/15	10:12:06 OK	0	0	0

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP D - SECOND DAY OF SAMPLING**

2020 Report

Date	Time	Status	Min	Avg	Max
98/04/15	10:12:21	OK	0	3.6	43.2
98/04/15	10:12:36	OK	0	9.9	43.2
98/04/15	10:12:51	OK	0	0	0.1
98/04/15	10:13:06	OK	0	0	0
98/04/15	10:29:31	OK	0	0	0
98/04/15	10:29:46	OK	0	29.1	391
98/04/15	10:30:01	OK	0	78.1	366
98/04/15	10:30:16	OK	6.7	29.8	64.1
98/04/15	10:30:31	OK	0	1.3	6.7
98/04/15	10:30:46	OK	0	0	0
98/04/15	10:31:01	OK	0	0	0
98/04/15	11:25:23	OK	0	0	0
98/04/15	11:25:38	OK	0	0	0
98/04/15	11:25:53	OK	0	0	0
98/04/15	11:26:08	OK	0	0	0
98/04/15	11:26:23	OK	0	0	0
98/04/15	11:26:38	OK	0	23.4	59.3
98/04/15	11:26:53	OK	12.1	25.2	55.7
98/04/15	11:27:08	OK	0	2.6	26.9
98/04/15	11:27:23	OK	0	0	0
98/04/15	11:27:38	OK	0	15.3	66.7
98/04/15	11:27:53	OK	1.9	11.7	66.7
98/04/15	11:28:08	OK	14.1	24.6	45.5
98/04/15	11:28:23	OK	9.5	20.7	42.1
98/04/15	11:28:38	OK	5.2	9.7	22.1
98/04/15	11:28:53	OK	5.1	8.9	14.1
98/04/15	11:29:08	OK	5	8.1	15.4
98/04/15	11:29:23	OK	4.2	7.9	15
98/04/15	11:29:38	OK	0	1.4	5.7
98/04/15	14:30:02	OK	0	175	177
98/04/15	14:30:40	Cal	174	180	181
98/04/15	14:30:55	Cal	181	181	181
98/04/15	14:31:10	Cal	181	181	182
98/04/15	14:31:25	Cal	182	182	182
98/04/15	14:32:10	OK	0	1.9	198
98/04/15	14:32:25	OK	0	0	0

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP D - SECOND DAY OF SAMPLING**

98/04/15	15:15:28	OK	0	0.3	1.5
98/04/15	15:15:43	OK	0	0	0
98/04/15	15:15:58	OK	0	6.4	56.1
98/04/15	15:16:13	OK	6.3	29.9	93.1
98/04/15	15:16:28	OK	0	5.8	18.7
98/04/15	15:16:43	OK	0	0	0
98/04/15	16:04:51	OK	0	0	0.8
98/04/15	16:05:06	OK	0	0	0
98/04/15	16:05:21	OK	0	0	0
98/04/15	16:05:36	OK	0	30.7	185
98/04/15	16:05:51	OK	0.3	23.6	156
98/04/15	16:06:06	OK	0	5.1	35.7
98/04/15	16:06:21	OK	0	0.6	4.6
98/04/15	16:06:36	OK	0	2.6	9.6
98/04/15	16:06:51	OK	0	0.1	3
98/04/15	16:07:06	OK	0	0.8	6.5
98/04/15	16:07:21	OK	0	1.8	9.3
98/04/15	16:07:36	OK	0	0.7	10.6
98/04/15	16:07:51	OK	0	1.8	16

2020 Report

á	Date	Time	Status	Min	Avg	Max
	98/04/15	16:08:06	OK	0	19.3	90.2
	98/04/15	16:08:21	OK	0	5.8	19.8
	98/04/15	16:08:36	OK	0	2.1	32.8
	98/04/15	16:08:51	OK	0.2	16.4	79.9
	98/04/15	16:09:06	OK	0	0	0.2
	98/04/15	16:09:21	OK	0	6	90.9
	98/04/15	16:09:36	Over	0	115	1532
	98/04/15	16:09:51	OK	0	59.2	397
	98/04/15	16:10:06	OK	0	16	98.7
	98/04/15	16:10:21	OK	0	1.6	22.5

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP A - FIRST DAY OF SAMPLING

HyperTer 1 – HyperTer data file  
Please do not attempt to modify this

2020 Report

Date	Time	Status	Min	Avg	Max
95/05/15	3:34:50	OK	0	5.1	8.8
95/05/15	3:37:00	OK	6.6	8.3	8.7
95/05/15	3:37:15	OK	8.1	8.1	8.2
95/05/15	3:37:30	Cal	0.5	4.8	8.1
95/05/15	3:37:45	Cal	0	0.1	0.5
95/05/15	3:38:00	OK	0	0	0
95/05/15	3:38:15	OK	0	0	0
95/05/15	3:38:30	OK	0	0	0
95/05/15	3:38:45	OK	0	0	0
95/05/15	3:39:00	OK	0	0	0
95/05/15	3:39:15	OK	0	0	0
95/05/15	3:39:30	OK	0	0	0
95/05/15	3:39:45	OK	0	0	0
95/05/15	3:40:00	OK	0	0	0
95/05/15	3:40:15	OK	0	0	0
95/05/15	3:40:30	OK	0	0	0
95/05/15	3:40:45	OK	0	0	0
95/05/15	3:41:00	OK	0	0	0
95/05/15	3:41:15	OK	0	0	0
95/05/15	3:41:30	OK	0	0	0
95/05/15	3:41:45	OK	0	0	0
95/05/15	3:42:00	OK	0	0	0
95/05/15	3:42:15	OK	0	0	0
95/05/15	3:57:51	OK	0	0	0
95/05/15	3:58:06	OK	0	0	0
95/05/15	3:58:21	Cal	0	1.2	6.3
95/05/15	3:58:36	Cal	0	0.4	3.3
95/05/15	3:58:51	Cal	0	0	0
95/05/15	3:59:06	OK	0	0	0
95/05/15	3:59:21	OK	0	0	0.1
95/05/15	3:59:36	OK	0	0	0.2
95/05/15	3:59:51	Cal	0	27.4	105
95/05/15	4:00:06	Cal	0.1	37.7	109
95/05/15	4:00:21	Cal	0	0	0.1
95/05/15	4:00:36	Cal	0	0	0
95/05/15	4:00:51	Cal	0	0	0

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP A - FIRST DAY OF SAMPLING**

95/05/15	4:01:06	Cal	0	0	0
95/05/15	4:01:21	Cal	0	61.7	107
95/05/15	4:01:36	Cal	2.9	124	199
95/05/15	4:01:51	Cal	0.1	9.8	142
95/05/15	4:02:06	Cal	142	193	197
95/05/15	4:02:21	Cal	190	191	195
95/05/15	4:02:36	Cal	0	15.2	190
95/05/15	4:02:51	OK	0	2.7	8.4
95/05/15	4:03:06	Cal	0	0	0
95/05/15	4:03:21	Cal	0	0	0
95/05/15	4:03:36	Cal	0	0	0.5
95/05/15	4:03:51	Cal	0	0	0.1
95/05/15	4:04:06	Cal	0	0	0.4
95/05/15	4:04:21	Cal	0	0	0
95/05/15	4:04:36	Cal	0	0	0.4
95/05/15	4:04:51	Cal	0	0	0
95/05/15	4:05:06	OK	0	0	0
95/05/15	4:05:21	OK	0	0	0.1
95/05/15	4:05:36	Cal	0	0	0.1

2020 Report

Date	Time	Status	Min	Avg	Max
95/05/15	4:05:51	Cal	0	0	0
95/05/15	4:06:06	Cal	0	0	0.1
95/05/15	4:06:21	Cal	0.1	8.1	8.4
95/05/15	4:06:36	Cal	1.2	82	199
95/05/15	4:06:51	OK	0.3	0.5	1.2
95/05/15	4:07:06	ALPK	0.3	154	194
95/05/15	4:07:21	ALPK	0.8	59.1	194
95/05/15	4:07:36	OK	0.3	0.4	0.8
95/05/15	4:07:51	Off	0	0.1	0.3
95/05/15	4:08:06	OK	0	0	0.1
95/05/15	4:08:21	OK	0	0	0
95/05/15	4:08:36	OK	0	0	0
95/05/15	4:08:51	OK	0	0	0

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP A - FIRST DAY OF SAMPLING

95/05/15	4:09:06 OK	0	0	0
95/05/15	4:09:21 OK	0	0	0
95/05/15	4:09:36 OK	0	0	0
95/05/15	4:09:51 OK	0	0	0
95/05/15	4:10:06 OK	0	0	0
95/05/15	4:10:21 OK	0	0	0
95/05/15	4:10:36 OK	0	0	0
95/05/15	4:10:51 OK	0	108	186
95/05/15	4:11:06 OK	185	187	187
95/05/15	4:11:21 OK	1.3	134	187
95/05/15	4:11:36 OK	0	0.3	1.3
95/05/15	4:11:51 OK	0	0	0
95/05/15	4:12:06 Cal	0	2.6	10
95/05/15	4:12:21 Cal	0	0	0
95/05/15	4:12:36 OK	0	0	0
95/05/15	4:12:51 OK	0	1.4	6.8
95/05/15	4:13:06 Cal	0	86.1	202
95/05/15	4:13:21 Cal	8.4	86.1	205
95/05/15	4:13:36 OK	0.9	93.2	205
95/05/15	4:13:51 OK	0.5	26.9	193
95/05/15	4:14:06 OK	0.9	89.5	198
95/05/15	4:29:33 OK	0.6	0.9	1.8
95/05/15	4:29:48 OK	0.6	0.6	0.7
95/05/15	4:30:03 OK	0.4	0.4	0.6
95/05/15	4:30:18 OK	0.4	0.4	0.6
95/05/15	4:30:33 OK	0.6	1.1	1.8
95/05/15	9:08:29 OK	1.6	1.7	2
95/05/15	9:08:44 OK	1.7	2.4	2.8
95/05/15	9:08:59 OK	1.8	2.3	2.4
95/05/15	9:09:14 OK	1.9	2.2	2.6
95/05/15	9:09:29 OK	1.7	1.7	2.1
95/05/15	9:09:44 OK	1.6	1.6	1.9
95/05/15	9:09:59 OK	1.6	6	22.9
95/05/15	9:10:14 OK	11.1	36.7	101
95/05/15	9:10:29 OK	8.8	36.2	101
95/05/15	9:10:44 OK	8.8	37.4	89.7
95/05/15	9:10:59 OK	1.8	11.7	38.7
95/05/15	9:11:14 OK	0.9	6.3	39.1
95/05/15	9:11:29 OK	3	31.9	145
95/05/15	9:11:44 OK	4.4	30.9	80.5
95/05/15	9:11:59 OK	16.6	28.8	49.7
95/05/15	9:12:14 OK	13.7	30.4	52.5

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP A - FIRST DAY OF SAMPLING

2020 Report

Date	Time	Status	Min	Avg	Max	
95/05/15	9:12:29	OK		3.4	14.2	29.5
95/05/15	9:12:44	OK		0	0.8	3.4
95/05/15	9:13:38	OK		0	1.2	3.9
95/05/15	9:13:53	OK		0	0.3	1.5
95/05/15	9:14:08	OK		0	0.5	2
95/05/15	9:14:23	OK		0	0	0
95/05/15	9:14:38	OK		0	0	0.5
95/05/15	9:14:53	OK		0	0	0.4
95/05/15	9:15:08	OK		0	0.1	0.9
95/05/15	9:15:23	OK		0	0.3	1.2
95/05/15	9:15:38	OK		0	0	0
95/05/15	9:15:53	OK		0	0	0.2
95/05/15	9:16:08	OK		0	0	0
95/05/15	9:16:23	OK		0	0	0
95/05/15	9:16:38	OK		0	0	1.3
95/05/15	9:16:53	OK		0	1.9	6.3
95/05/15	9:17:08	OK		0	3.8	17.6
95/05/15	9:17:23	OK		0	1.8	14
95/05/15	10:17:31	OK		0	41.7	151
95/05/15	10:17:46	OK	85.8	157	245	
95/05/15	10:18:01	OK	18.9	83.7	152	
95/05/15	10:18:16	OK	23.6	51.5	136	
95/05/15	10:18:31	OK	26.8	77.7	153	
95/05/15	10:18:46	OK	3.5	106	202	
95/05/15	10:28:28	OK	1.4	194	363	
95/05/15	10:28:43	OK	43	154	276	
95/05/15	10:28:58	OK	31.6	59.4	276	
95/05/15	10:29:13	OK	2.9	15.7	49.4	
95/05/15	10:29:28	OK	4.9	11.9	25.9	
95/05/15	10:29:43	OK	3.4	7.4	12.1	
95/05/15	10:29:58	OK	0.5	1.7	3.7	
95/05/15	10:31:54	OK	0	1.6	7.9	
95/05/15	10:32:09	OK	0	0.6	7.9	
95/05/15	10:32:24	OK	0	0.9	2.9	
95/05/15	10:32:39	OK	0	6	12	

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

SHOP A - FIRST DAY OF SAMPLING

95/05/15	10:32:54	OK	0.1	7.4	25.9
95/05/15	10:33:09	OK	0	0	1.1
95/05/15	10:33:24	OK	0	0	0
95/05/15	10:33:39	OK	0	0	0
95/05/15	10:33:54	OK	0	0	0
95/05/15	10:34:09	OK	0	0.3	2.2
95/05/15	10:34:24	OK	0	0	0
95/05/15	10:34:39	OK	0	0	0
95/05/15	11:19:45	OK	0	0.1	1.3
95/05/15	11:20:00	OK	0	0	0
95/05/15	11:20:15	OK	0	0	0
95/05/15	11:20:30	OK	0	0	0
95/05/15	11:20:45	OK	0	0	0
95/05/15	11:21:00	OK	0	0	0
95/05/15	11:21:15	OK	0	0	0
95/05/15	11:21:30	OK	0	0	0
95/05/15	11:21:45	OK	0	0	0
95/05/15	11:22:00	OK	0	0	0
95/05/15	11:22:15	OK	0	0	0
95/05/15	11:22:30	OK	0	0	0

2020 Report

Date	Time	Status	Min	Avg	Max
95/05/15	11:23:09	OK	0	0	0
95/05/15	11:23:24	OK	0	0	0
95/05/15	11:23:39	OK	0	0	0
95/05/15	11:23:54	OK	0	0	0
95/05/15	11:24:09	OK	0	0	0
95/05/15	11:24:24	OK	0	0	0
95/05/15	11:24:39	OK	0	0	0
95/05/15	11:24:54	OK	0	0	0
95/05/15	11:25:09	OK	0	0	0
95/05/15	11:25:24	OK	0	0	0
95/05/15	11:25:39	OK	0	0	0
95/05/15	11:25:54	OK	0	0	0

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

SHOP A - FIRST DAY OF SAMPLING

95/05/15	11:26:09 OK	0	0	0
95/05/15	11:26:24 OK	0	0	0
95/05/15	11:26:39 OK	0	0	0
95/05/15	11:26:54 OK	0	0.2	3.7
95/05/15	11:27:09 OK	0	12.3	26.9
95/05/15	11:27:24 OK	0.6	8.3	29.9
95/05/15	11:27:39 OK	0	0.8	29.9
95/05/15	11:27:54 OK	0	0.3	2.4
95/05/15	11:28:09 OK	0	9.4	41.3
95/05/15	11:28:24 OK	0	0	0.7
95/05/15	11:28:39 OK	0	0	0
95/05/15	11:28:54 OK	0	0	0
95/05/15	12:28:29 OK	0	28.6	148
95/05/15	12:28:44 OK	6.1	37.7	94.8
95/05/15	12:28:59 OK	13.2	39.4	75.8
95/05/15	12:29:14 OK	22.2	61	106
95/05/15	12:29:29 OK	1.2	112	246
95/05/15	12:29:44 OK	0	63.4	246
95/05/15	12:29:59 OK	0	0	0
95/05/15	12:30:14 OK	0	0	0
95/05/15	12:30:29 OK	0	0	0.3
95/05/15	13:39:01 OK	0	0	0.8
95/05/15	13:39:16 OK	0	0	0
95/05/15	13:39:31 OK	0	0.1	1.5
95/05/15	13:39:46 OK	0	35.5	71.5
95/05/15	13:40:01 OK	18.2	39.3	82.2
95/05/15	13:40:16 OK	14.4	42	101
95/05/15	13:40:31 OK	11.1	136	307
95/05/15	13:40:46 OK	1.2	79.2	246
95/05/15	13:41:01 OK	96.9	284	632
95/05/15	13:41:16 OK	2.5	105	240
95/05/15	13:41:31 OK	0.9	65.9	205
95/05/15	13:41:46 OK	0.3	17.4	255
95/05/15	13:42:01 OK	26.3	248	476
95/05/15	13:42:16 OK	0	7.1	56.1
95/05/15	14:47:59 OK	0	0.2	1.8
95/05/15	14:48:14 OK	0	137	227
95/05/15	14:48:29 OK	167	223	228
95/05/15	14:48:44 OK	0	1.8	167
95/05/15	14:48:59 Cal	0	1.2	17.2
95/05/15	14:49:14 Cal	17.2	216	222
95/05/15	14:49:29 Cal	0.5	136	223
95/05/15	14:49:44 OK	0	0	0.5

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP A - FIRST DAY OF SAMPLING

2020 Report

Date	Time	Status	Min	Avg	Max
95/05/15	14:49:59	OK	0	144	192
95/05/15	15:06:00	OK	0	0.1	1.4
95/05/15	15:06:15	OK	0	0	0
95/05/15	15:06:30	OK	0	0	0
95/05/15	15:06:45	OK	0	0	0
95/05/15	15:07:00	OK	0	0	0
95/05/15	15:07:15	OK	0	0	0
95/05/15	15:07:30	OK	0	0	0
95/05/15	15:07:45	OK	0	0	0
95/05/15	15:08:00	ALPK	0	201	1208
95/05/15	15:08:15	OK	13.6	342	1059
95/05/15	15:08:30	ALPK	24.8	573	1393
95/05/15	15:08:45	OK	10.1	26.3	53.2
95/05/15	15:09:00	OK	0	4	36

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP A - SECOND DAY OF SAMPLING**

HyperTer 1 -- HyperTer data file  
Please do not attempt to modify this file directly.

Date	Time	Status	Min	Avg	Max
95/05/16	8:33:44	OK	0	0	1
95/05/16	8:33:59	Cal	0	2.4	9.1
95/05/16	8:34:14	Cal	0	0.2	2.2
95/05/16	8:34:29	OK	0	0	0
95/05/16	8:34:44	Cal	0	35.2	199
95/05/16	8:34:59	Cal	199	207	209
95/05/16	8:35:14	Cal	198	200	208
95/05/16	8:35:29	OK	0.4	41.5	201
95/05/16	8:35:44	OK	0	0.1	0.4
95/05/16	8:35:59	OK	0	0	0
95/05/16	8:36:14	OK	0	0	0.3
95/05/16	8:36:29	OK	0.3	108	196
95/05/16	9:16:11	OK	0	0.2	1.3
95/05/16	9:16:26	OK	0	0	0.5
95/05/16	9:16:41	OK	0	0	0.5
95/05/16	9:16:56	OK	0	0	0
95/05/16	9:17:11	OK	0	0	0
95/05/16	9:17:26	OK	0	0	0
95/05/16	9:17:41	OK	0	0	0
95/05/16	9:17:56	OK	0	0	0
95/05/16	9:18:11	OK	0	0	0
95/05/16	9:18:26	OK	0	0	0
95/05/16	9:18:41	OK	0	0.5	3.1
95/05/16	9:18:56	OK	0	0.9	4
95/05/16	9:19:11	OK	0	2.4	4
95/05/16	9:19:26	OK	0	0.5	1.5
95/05/16	9:19:41	OK	0	0	0
95/05/16	9:19:56	OK	0	0	0
95/05/16	9:20:11	OK	0	0	0
95/05/16	9:20:26	OK	0	0	0
95/05/16	9:20:41	OK	0	0	0
95/05/16	9:20:56	OK	0	0	0
95/05/16	9:21:11	OK	0	0	0
95/05/16	9:21:26	OK	0	0	0
95/05/16	9:21:41	OK	0	0	0
95/05/16	9:21:56	OK	0	0	0
95/05/16	9:22:11	OK	0	0	0
95/05/16	9:22:26	OK	0	0.2	3.6
95/05/16	9:22:41	OK	0.3	17	40.8
95/05/16	9:22:56	OK	0	15.4	28.2
95/05/16	9:23:11	OK	0	0.3	2.1

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP A - SECOND DAY OF SAMPLING**

95/05/16	9:23:26 OK	2	10.2	36.4
95/05/16	9:23:41 OK	0	2.8	8.2
95/05/16	9:23:56 OK	0	1.8	2.5
95/05/16	9:24:11 OK	0	0.5	1.5
95/05/16	9:24:26 OK	0.1	0.9	1.5
95/05/16	9:24:41 OK	0	0	0.6
95/05/16	9:24:56 OK	0	0	0
95/05/16	9:25:11 OK	0	0	0
95/05/16	9:25:26 OK	0	0	0.1
95/05/16	9:25:41 OK	0	0	0.1
95/05/16	9:25:56 OK	0	0	0
95/05/16	9:26:11 OK	0	0	0
95/05/16	9:26:26 OK	0	0	0.7
95/05/16	9:26:41 OK	0	0	0

2020 Report

Date	Time	Status	Min	Avg	Max
95/05/16	9:26:56	OK	0	0	0
95/05/16	9:27:11	OK	0	0	0
95/05/16	9:27:26	OK	0	0.8	4.2
95/05/16	9:27:41	OK	0	1.2	3.7
95/05/16	9:27:56	OK	0	0.4	2.6
95/05/16	9:28:11	OK	0	0.4	4
95/05/16	9:28:26	OK	0	0.1	1.4
95/05/16	9:28:41	OK	0	0	0
98/04/16	10:11:47	OK	0	0	0
98/04/16	10:12:02	OK	0	6.6	33.2
98/04/16	10:12:17	OK	1.3	9.4	39.4
98/04/16	10:12:32	OK	1.9	23.6	75
98/04/16	10:12:47	OK	0.7	62.2	155
98/04/16	10:13:02	OK	0	3.4	95.6
98/04/16	10:13:17	OK	0	20.3	84.5
98/04/16	10:13:32	OK	0	27.8	127
98/04/16	10:13:47	OK	0	0	0
98/04/16	10:14:02	OK	0	28.5	76.8
98/04/16	10:14:17	OK	0.1	23.5	89.9

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP A - SECOND DAY OF SAMPLING

98/04/16	10:14:32 OK	12	35.1	130
98/04/16	10:14:47 OK	11.8	17.7	22.1
98/04/16	10:15:02 OK	8.7	21.4	28.2
98/04/16	10:15:17 OK	8.7	139	637
98/04/16	10:15:32 OK	5.1	258	638
98/04/16	10:15:47 OK	2.4	3.7	7.3
98/04/16	10:16:02 OK	0.9	2.3	4.8
98/04/16	10:16:17 OK	0	0.3	1.3
98/04/16	10:16:32 OK	0	0.1	0.7
98/04/16	10:17:31 OK	0	1.3	6.6
98/04/16	10:19:01 OK	0	0	0
98/04/16	10:19:16 OK	0	0	0
98/04/16	10:19:31 OK	0	0	0
98/04/16	10:21:55 OK	0	90.7	179
98/04/16	10:22:10 OK	0	146	181
98/04/16	10:22:25 Cal	0	105	178
98/04/16	10:22:40 Cal	178	188	199
98/04/16	11:19:14 OK	0	0.7	199
98/04/16	11:19:29 OK	0.2	32.2	134
98/04/16	11:19:44 OK	2.9	30.8	60.2
98/04/16	11:19:59 OK	0	9.4	50.6
98/04/16	11:20:14 OK	0	0	0
98/04/16	11:20:29 OK	0	0	0
98/04/16	11:20:44 OK	0	3.6	17.1
98/04/16	11:20:59 OK	0	10.7	40.6
98/04/16	11:21:14 OK	0	8	25.5
98/04/16	11:21:29 OK	0	5.4	16.2
98/04/16	11:21:44 OK	0	5.3	16.3
98/04/16	11:21:59 OK	0	5	12.3
98/04/16	11:22:14 OK	0	4.6	14.2
98/04/16	11:22:29 OK	0	1.8	15
98/04/16	12:45:56 OK	0	1.1	14
98/04/16	12:46:11 OK	1.5	24.6	48.9
98/04/16	12:46:26 OK	31.3	51.4	66.1
98/04/16	12:46:41 OK	6.8	41.4	80.2
98/04/16	12:46:56 OK	0	5	29.4

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP A - SECOND DAY OF SAMPLING

Date	Time	Status	Min	Avg	Max
98/04/16	12:47:11	OK	0	0	0
98/04/16	12:47:26	OK	0	46.4	137
98/04/16	12:47:41	OK	2.6	67.5	149
98/04/16	12:47:56	OK	0	29.7	99.8
98/04/16	12:48:11	OK	0.3	49	139
98/04/16	12:48:26	OK	0	0.8	5.8
98/04/16	12:48:41	OK	0	0	0
98/04/16	12:48:56	OK	0	0	0
98/04/16	12:49:11	OK	0	6.4	67.8
98/04/16	12:49:26	OK	0	0	0
98/04/16	12:49:41	OK	0	0.2	1.1
98/04/16	12:49:56	OK	0	1.3	4.6
98/04/16	12:50:11	OK	0	0	0.6
98/04/16	12:50:26	OK	0	0	0
98/04/16	12:51:55	OK	0	0	0
98/04/16	12:52:10	OK	0	0	0
98/04/16	12:52:25	OK	0	0	0
98/04/16	12:52:40	OK	0	0	0
98/04/16	12:52:55	OK	0	0	0.1
98/04/16	12:53:10	OK	0	0.5	3.6
98/04/16	12:53:25	OK	0	0	0
98/04/16	12:53:40	OK	0	0	0
98/04/16	12:53:55	OK	0	0	0
98/04/16	12:54:10	OK	0	0	0
98/04/16	12:54:10	OK	0	0	0
98/04/16	12:54:40	OK	0	0	0
98/04/16	12:54:55	OK	0	0	0.2
98/04/16	12:55:10	OK	0	0	1
98/04/16	12:55:25	OK	0	0	0
98/04/16	12:55:40	OK	0	0	0.2
98/04/16	12:55:55	OK	0	0	0
98/04/16	12:56:10	OK	0	0	0
98/04/16	12:56:25	OK	0	0	0
98/04/16	12:56:40	OK	0	0	0
98/04/16	12:56:55	OK	0	0	0
98/04/16	12:57:10	OK	0	0	0
98/04/16	12:57:25	OK	0	0	0
98/04/16	12:57:40	OK	0	0	0
98/04/16	12:57:55	OK	0	0	0
98/04/16	12:58:10	OK	0	1.9	8
98/04/16	12:58:25	OK	0	0.5	7
98/04/16	12:58:40	OK	0	6	14.8
98/04/16	13:45:27	OK	0	109	301

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP A - SECOND DAY OF SAMPLING**

98/04/16	13:45:42 OK	18.6	51.8	121
98/04/16	13:45:57 OK	18.6	56.7	106
98/04/16	13:46:12 OK	4.3	65.1	147
98/04/16	13:46:27 OK	5.2	66.3	144
98/04/16	13:46:42 OK	0	0.5	5.2

REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID

SHOP J - FIRST DAY OF SAMPLING

HyperTer 1 -- HyperTer data file  
Please do not attempt to modify this

2020 Report

Date	Time	Status	Min	Avg	Max
98/04/16	7:07:29	OK	0	1.3	2
98/04/16	7:07:44	OK	0.5	0.6	0.9
98/04/16	7:07:59	OK	0.2	0.3	0.5
98/04/16	7:08:14	Cal	0	0.5	5.8
98/04/16	7:08:29	Cal	0	1.5	7.1
98/04/16	7:08:44	Cal	0	0	0.1
98/04/16	7:08:59	OK	0	16.5	189
98/04/16	7:09:14	Cal	173	188	211
98/04/16	7:09:29	Cal	166	174	183
98/04/16	7:09:44	Cal	174	201	209
98/04/16	7:09:59	Cal	195	197	206
98/04/16	7:10:14	Cal	191	201	207
98/04/16	7:34:54	OK	0.5	1.6	188
98/04/16	7:35:09	OK	0.3	0.3	0.5
98/04/16	7:35:24	OK	0.1	0.1	0.3
98/04/16	7:35:39	OK	0	0	0.1
98/04/16	7:35:54	OK	0	0	0
98/04/16	7:36:09	OK	0	0	0
98/04/16	7:36:24	OK	0	0	0.1
98/04/16	7:36:39	OK	0	0	0
98/04/16	7:36:54	OK	0	0	0
98/04/16	8:11:38	OK	0	0.2	1.3
98/04/16	8:11:53	OK	0	2.7	11
98/04/16	8:12:08	OK	0	4	11
98/04/16	8:12:23	OK	5.1	18.9	38.5
98/04/16	8:12:38	OK	2.2	14.6	47.8
98/04/16	8:12:53	OK	1.6	15.7	54.9
98/04/16	8:13:08	OK	0.2	5	40.4
98/04/16	8:13:23	OK	0.2	9.1	28.8
98/04/16	8:13:38	OK	5.6	27.1	59.1
98/04/16	8:13:53	OK	10	29.5	54.5
98/04/16	8:14:08	OK	2.3	9.7	22
98/04/16	8:14:23	OK	0.5	1.2	4.1
98/04/16	8:14:38	OK	0	0.1	0.5
98/04/16	8:31:20	OK	0	4.4	43
98/04/16	8:31:35	OK	0.3	22.6	89.1
98/04/16	8:31:50	OK	24.3	65.5	229
98/04/16	8:32:05	OK	10.4	82.5	175

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP J - FIRST DAY OF SAMPLING**

98/04/16	8:32:20	OK	0.5	10.7	62.6
98/04/16	8:32:35	OK	0.5	15.8	105
98/04/16	8:32:50	OK	4.6	57.7	105
98/04/16	8:33:05	OK	0.7	7.9	66.4
98/04/16	8:33:20	OK	0.2	0.8	2
98/04/16	9:12:18	OK	0	2.2	19.1
98/04/16	9:12:33	OK	1.1	12.9	41.4
98/04/16	9:12:48	OK	6.4	27.4	55.2
98/04/16	9:13:03	OK	7.4	40.4	87.2
98/04/16	9:13:18	OK	0.9	4.1	8.2
98/04/16	9:13:33	OK	2.1	14.5	42.2
98/04/16	9:13:48	OK	39.4	82.9	130
98/04/16	9:14:03	OK	19.1	32.3	47.8
98/04/16	9:14:18	OK	1.8	4.3	19.1
98/04/16	9:14:33	OK	0.8	1.9	5.6
98/04/16	9:14:48	OK	0.8	1.8	3.9
98/04/16	9:15:03	OK	0.9	1.9	7.6

2020 Report

Date	Time	Status	Min	Avg	Max
98/04/16	9:15:18	OK	0.4	0.8	1.3
98/04/16	9:28:21	OK	0	0.1	0.9
98/04/16	9:28:36	OK	0	0	0
98/04/16	9:28:51	OK	0	3.3	10.4
98/04/16	9:29:06	OK	0	8.7	18.7
98/04/16	9:29:21	OK	0	10.8	39.5
98/04/16	9:29:36	OK	1.2	12.3	43.5
98/04/16	9:29:51	OK	1.1	7.2	21.1
98/04/16	9:30:06	OK	9	38.5	95.3
98/04/16	9:30:21	OK	6.9	27.9	50.7
98/04/16	9:30:36	OK	6.9	13.7	25
98/04/16	9:30:51	OK	0	2.2	8.9
98/04/16	10:07:24	OK	0	0	0.6
98/04/16	10:07:39	OK	0	0	0
98/04/16	10:07:54	OK	0	2	11.7
98/04/16	10:08:09	OK	3	9.3	28.4
98/04/16	10:08:24	OK	1.7	11.1	39.1
98/04/16	10:08:39	OK	2.3	7.1	19
98/04/16	10:08:54	OK	1.2	4.9	14.3
98/04/16	10:09:09	OK	1.4	4.2	6.7

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP J - FIRST DAY OF SAMPLING**

98/04/16	10:09:24	OK	0.1	2.7	7.3
98/04/16	10:09:39	OK	1.7	5.6	13.9
98/04/16	10:09:54	OK	2.9	4.8	9.6
98/04/16	10:10:09	OK	0.5	2.4	6.4
98/04/16	10:10:24	OK	0.3	0.5	0.9
98/04/16	10:10:56	OK	0	1	3
98/04/16	10:11:11	OK	0	0.7	2.2
98/04/16	10:11:26	OK	0	1.1	4.5
98/04/16	10:23:29	OK	0	0	0.4
98/04/16	10:23:44	OK	0	8.3	36.7
98/04/16	10:23:59	OK	6	37.3	87.5
98/04/16	10:24:14	OK	1.9	14	43.1
98/04/16	10:24:29	OK	0.4	1.2	2.2
98/04/16	10:24:44	OK	0.1	2.3	10.5
98/04/16	10:24:59	OK	1.7	17.9	40.5
98/04/16	10:25:14	OK	0.6	2.4	11.8
98/04/16	10:25:29	OK	0	0.5	1.4
98/04/16	10:25:44	OK	0	0.2	1.6
98/04/16	10:25:59	OK	0	0.6	4.5
98/04/16	10:26:14	OK	0	0	0
98/04/16	10:26:29	OK	0	0	0
98/04/16	10:26:44	OK	0	0.2	0.8
98/04/16	10:26:59	OK	0	3.1	22.3
98/04/16	10:27:14	OK	0	2	17
98/04/16	10:27:29	OK	0	5	14.7
98/04/16	10:27:44	OK	0	1.7	5.2
98/04/16	10:27:59	OK	0	1	5.2
98/04/16	10:28:14	OK	0.8	3.7	7.8
98/04/16	10:28:29	OK	0	0.3	7.8
98/04/16	10:28:44	OK	0	0.4	3
98/04/16	10:28:59	OK	0	0	0
98/04/16	10:29:14	OK	0	1.4	4.5
98/04/16	10:29:29	OK	0	1	6.6
98/04/16	10:29:44	OK	0	1.7	6.9
98/04/16	10:29:59	OK	0	1.1	5.2

2020 Report

Date	Time	Status	Min	Avg	Max
98/04/16	10:30:14	OK	0.2	3.4	5.6

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

SHOP J - FIRST DAY OF SAMPLING

98/04/16	10:30:29 OK	1.3	4.3	9.3
98/04/16	10:30:44 OK	0	2.3	7.1
98/04/16	10:30:59 OK	0.6	2.3	7.4
98/04/16	10:31:14 OK	0.3	1.3	4.3
98/04/16	10:31:29 OK	0.1	0.6	1
98/04/16	10:31:44 OK	0	0.1	1.1
98/04/16	10:31:59 OK	0	0	0.6
98/04/16	10:32:14 OK	0	0	0.6
98/04/16	10:32:29 OK	0	0.1	0.8
98/04/16	10:32:44 OK	0	0	0
98/04/16	10:32:59 OK	0	0	0.7
98/04/16	10:33:14 OK	0	0.1	0.6
98/04/16	10:33:29 OK	0	0.3	2.1
98/04/16	10:33:44 OK	0	0.1	0.8
98/04/16	10:33:59 OK	0	0.5	1.9
98/04/16	10:34:14 OK	0	0.1	1.2
98/04/16	10:34:29 OK	0	0	0.1
98/04/16	11:10:07 OK	0	0	0.1
98/04/16	11:10:22 OK	0	0	0
98/04/16	11:10:37 OK	0	7.5	20.7
98/04/16	11:10:52 OK	8.3	28.4	51.4
98/04/16	11:11:07 OK	10.5	31	64.9
98/04/16	11:11:22 OK	3.6	34.5	72.7
98/04/16	11:11:37 OK	7.9	21.1	70.1
98/04/16	11:11:52 OK	1	4.1	11.5
98/04/16	11:12:07 OK	0.1	0.5	1.9
98/04/16	11:18:27 OK	0	0	0.1
98/04/16	11:18:42 OK	0	0	0
98/04/16	11:18:57 OK	0	0.9	6.3
98/04/16	11:19:12 OK	0	8.3	33.2
98/04/16	11:19:27 OK	0	6.8	39.5
98/04/16	11:19:42 OK	0	0	0
98/04/16	11:19:57 OK	0	5.6	38.2
98/04/16	11:20:12 OK	0	1.1	8.2
98/04/16	11:22:55 OK	0	1.9	11.8
98/04/16	11:23:10 OK	0	4.1	15
98/04/16	11:23:25 OK	0.9	4.3	7.3
98/04/16	11:23:40 OK	0.7	4.5	20.7
98/04/16	11:23:55 OK	1.1	6.1	12.6
98/04/16	11:24:10 OK	2.9	8.3	12.8
98/04/16	11:24:25 OK	10.4	14.9	18.3
98/04/16	11:24:40 OK	4.4	12.7	19.6
98/04/16	11:24:55 OK	8.8	14.5	27.9
98/04/16	11:25:10 OK	18.9	48.9	162
98/04/16	11:25:25 OK	9.2	20.2	35.5
98/04/16	11:25:40 OK	6.8	10.4	19.8

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

SHOP J - FIRST DAY OF SAMPLING

98/04/16	11:25:55	OK	4.3	10.1	20
98/04/16	11:26:10	OK	6.7	12.4	19.3
98/04/16	11:26:25	OK	2.5	9.8	23.7
98/04/16	11:26:40	OK	4.1	13.6	26.1
98/04/16	11:26:55	OK	2.6	7.5	14.9
98/04/16	11:27:10	OK	2.2	7.4	13.5
98/04/16	11:27:25	OK	1.5	5.3	11.9
98/04/16	11:27:40	OK	1.3	4.2	11.9

2020 Report

Date	Time	Status	Min	Avg	Max
98/04/16	11:27:55	OK	1.6	3.9	5.9
98/04/16	11:28:10	OK	2.4	6.9	22.4
98/04/16	11:28:25	OK	2.5	7.5	20.7
98/04/16	11:28:40	OK	2.3	7.5	13.8
98/04/16	11:28:55	OK	1.2	3.8	7
98/04/16	11:29:10	OK	1.2	5.6	13.4
98/04/16	11:29:25	OK	1.2	10.4	24.5
98/04/16	11:29:40	OK	1.9	4	6.5
98/04/16	11:29:55	OK	1.2	3	6.1
98/04/16	11:30:10	OK	0.6	1.6	3.1
98/04/16	11:30:25	OK	0.4	1.5	2.5
98/04/16	13:07:53	OK	0	0.5	1.1
98/04/16	13:08:08	OK	0.2	8	44.8
98/04/16	13:08:23	OK	0.2	5.2	26.4
98/04/16	13:08:38	OK	0	4.5	17.5
98/04/16	13:08:53	OK	0.4	13	50.9
98/04/16	13:09:08	OK	0.3	7.2	46.1
98/04/16	13:09:23	OK	0	19.2	73.7
98/04/16	13:09:38	OK	44.9	201	521
98/04/16	13:09:53	OK	1.5	14.7	44.9
98/04/16	13:10:08	OK	0.9	2.8	5.4
98/04/16	13:10:23	OK	0	0.8	2.7
98/04/16	13:45:56	OK	0	0.2	0.8
98/04/16	13:46:11	OK	0	0	0.4
98/04/16	13:46:26	OK	0	0.4	2.2
98/04/16	13:46:41	OK	0.7	7.8	24.5
98/04/16	13:46:56	OK	0	3.7	22.9
98/04/16	13:47:11	OK	1.6	3.8	6.6
98/04/16	13:47:26	OK	0.8	3.4	5.7

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP J - FIRST DAY OF SAMPLING**

98/04/16	13:47:41	OK	1.5	23.6	168
98/04/16	13:47:56	OK	2.7	9	18.5
98/04/16	13:48:11	OK	0	2.5	17.1
98/04/16	13:48:26	OK	0	0	1.5
98/04/16	14:05:38	OK	0	0	0.2
98/04/16	14:05:53	OK	0	14.2	39.9
98/04/16	14:06:08	OK	8	54.4	112
98/04/16	14:06:23	OK	1	32.8	149
98/04/16	14:06:38	OK	2.1	16.2	44
98/04/16	14:06:53	OK	2.7	16.5	50.6
98/04/16	14:07:08	OK	0.6	2.3	7.3
98/04/16	14:07:23	OK	0	0.2	1.6
98/04/16	14:07:38	OK	0	0	0.4
98/04/16	14:37:05	OK	0	0	0.4
98/04/16	14:37:20	OK	0	0	0
98/04/16	14:37:35	OK	0	0	0
98/04/16	14:37:50	OK	0	2.9	25.2
98/04/16	14:38:05	OK	4.5	28.3	63.9
98/04/16	14:38:20	OK	11.6	51.3	118
98/04/16	14:38:35	OK	5.2	19	47.5
98/04/16	14:38:50	OK	3.1	45.4	105
98/04/16	14:39:05	OK	2.6	24.4	52.9
98/04/16	14:39:20	OK	0.8	1.8	3.1
98/04/16	14:39:35	OK	0.3	0.4	0.8
98/04/16	14:39:50	OK	0.1	0.6	1.6
98/04/16	14:40:05	OK	0	0	1.6

2020 Report

Date	Time	Status	Min	Avg	Max
98/04/16	15:06:39	OK	0	0	0.6
98/04/16	15:06:54	OK	0	0.3	1.2
98/04/16	15:07:09	Cal	0.2	123	181
98/04/16	15:07:24	Cal	179	181	198
98/04/16	15:27:04	OK	0	0.8	199
98/04/16	15:27:19	OK	0	0	0
98/04/16	15:27:34	OK	0	25.4	68
98/04/16	15:27:49	OK	30.3	85.9	135
98/04/16	15:28:04	OK	22.4	40.2	95.9
98/04/16	15:28:19	OK	7.3	31.7	98.6
98/04/16	15:28:34	OK	4	10.8	30.8
98/04/16	15:28:49	OK	0.3	1.9	4

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP J - SECOND DAY OF SAMPLING**

98/04/17	7:23:40 OK	0	0.2	0.8
98/04/17	7:23:55 OK	0	0	0
98/04/17	7:24:10 Cal	0	2.5	9.2
98/04/17	7:24:25 Cal	0	0	0.2
98/04/17	7:24:40 OK	0	0.6	5.9
98/04/17	7:24:55 OK	0	0	0
98/04/17	7:25:10 OK	0	0	0

2020 Report

Date	Time	Status	Min	Avg	Max
98/04/17	7:25:25 OK		0	0	0
98/04/17	7:25:40 OK		0	69.6	193
98/04/17	7:25:55 Cal		193	196	198
98/04/17	7:26:10 Cal		198	198	199
98/04/17	7:26:25 OK		2	165	198
98/04/17	7:26:40 OK		0	0	2
98/04/17	8:33:41 OK		0	1	4.9
98/04/17	8:33:56 OK		0.2	5.1	32.7
98/04/17	8:34:11 OK		4.4	30.3	52.7
98/04/17	8:34:26 OK		9.5	48	80.7
98/04/17	8:34:41 OK		0	4.8	49.7
98/04/17	8:34:56 OK		0.5	4.8	20.9
98/04/17	8:35:11 OK		0	3.4	20.2
98/04/17	8:35:26 OK		0	0.7	4.4
98/04/17	8:35:41 OK		0	0	0.2
98/04/17	8:35:56 OK		0	0.2	0.6
98/04/17	8:36:11 OK		0	0.3	0.5
98/04/17	8:36:26 OK		0.3	22.3	152
98/04/17	8:36:41 OK		3.1	40	303
98/04/17	8:36:56 OK		0	4	9.4
98/04/17	8:37:11 OK		0	2.5	9.3
98/04/17	8:37:26 OK		0	1.7	9.5
98/04/17	8:37:41 OK		0	27.1	106
98/04/17	8:37:56 OK		0	9.6	43.6
98/04/17	8:38:11 OK		0	1.6	8.7
98/04/17	9:19:04 OK		0	1	7.2

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP J - SECOND DAY OF SAMPLING**

98/04/17	9:19:19 OK	6.5	12.3	21.9
98/04/17	9:19:34 OK	2.1	28.4	75.3
98/04/17	9:19:49 OK	2.3	13.1	35.2
98/04/17	9:20:04 OK	4.4	149	343
98/04/17	9:20:19 OK	5.3	8.9	17.3
98/04/17	9:20:34 OK	0	2.1	9.4
98/04/17	9:20:49 OK	0.5	30	67.6
98/04/17	9:21:04 OK	5.7	18.7	34.3
98/04/17	9:21:19 OK	0	5.1	24.2
98/04/17	9:21:34 OK	0	3.5	15.4
98/04/17	9:21:49 OK	1	4.3	15.4
98/04/17	9:22:04 OK	3.1	10.6	17.1
98/04/17	9:22:19 OK	2.6	9.3	34.6
98/04/17	9:22:34 OK	8.2	17.5	34.6
98/04/17	9:22:49 OK	4.6	8.7	12.6
98/04/17	9:23:04 OK	1.1	2.9	9.1
98/04/17	9:23:19 OK	1.3	4.2	10.8
98/04/17	9:23:34 OK	0	2.1	7
98/04/17	9:36:42 OK	0	0	0.8
98/04/17	9:36:57 OK	0	2.5	18.8
98/04/17	9:37:12 OK	0	1.6	9.6
98/04/17	9:37:27 OK	0	1.8	11.8
98/04/17	9:37:42 OK	0	0	0
98/04/17	9:37:57 OK	0	1	16.1
98/04/17	9:38:12 OK	0	18	60.3
98/04/17	9:38:27 OK	0	0.4	4.8
98/04/17	9:38:42 OK	0	0.1	1.3
98/04/17	9:38:57 OK	0	31.2	77.4
98/04/17	9:39:12 OK	0	4.5	51.5

2020 Report

Date	Time	Status	Min	Avg	Max
98/04/17	9:39:27	OK	0	0	0
98/04/17	9:39:42	OK	0	0	0
98/04/17	9:39:57	OK	0	0	0
98/04/17	10:10:25	OK	0	0	0.1

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP J - SECOND DAY OF SAMPLING**

98/04/17	10:10:40 OK	0	0	0
98/04/17	10:10:55 OK	0	0	0
98/04/17	10:11:10 OK	0	0	0
98/04/17	10:11:25 OK	0	0	0
98/04/17	10:29:23 OK	0	0	0
98/04/17	10:29:38 OK	0	0	0
98/04/17	10:29:53 OK	0	0	0
98/04/17	10:30:08 OK	0	0	0
98/04/17	10:30:23 OK	0	0	0
98/04/17	10:30:38 OK	0	0	0
98/04/17	10:30:53 OK	0	0	0
98/04/17	10:31:08 OK	0	0	0
98/04/17	10:31:23 OK	0	0	0
98/04/17	10:31:38 OK	0	0	0
98/04/17	10:31:53 OK	0	0	0
98/04/17	10:32:08 OK	0	0	0
98/04/17	10:33:38 OK	0	19.6	128
98/04/17	10:33:53 OK	27.5	122	304
98/04/17	10:34:08 OK	0	12.2	68.6
98/04/17	10:34:23 OK	0	30.9	127
98/04/17	10:34:38 OK	0	30.3	174
98/04/17	10:34:53 OK	0	29.8	174
98/04/17	10:35:08 OK	0	0	0
98/04/17	10:35:23 OK	0	0	0
98/04/17	10:35:38 OK	0	0	0
98/04/17	10:37:00 OK	0	0	3
98/04/17	10:37:15 OK	0	1.6	3.2
98/04/17	10:37:30 OK	0.7	3.3	15.1
98/04/17	10:37:45 OK	1.4	114	1097
98/04/17	10:38:00 OK	0.9	21	184
98/04/17	10:38:15 OK	0.7	7.4	54.5
98/04/17	10:38:30 OK	0	4.4	17.4
98/04/17	10:38:45 OK	0	0.3	2.5
98/04/17	10:39:00 OK	0	0.4	2.4
98/04/17	10:39:15 OK	0	0.4	6.3
98/04/17	10:39:30 OK	0	0	1.3
98/04/17	10:42:07 OK	0	4.5	15.6
98/04/17	10:42:22 OK	0	27.9	70.7
98/04/17	10:42:37 OK	2.6	29	51.7
98/04/17	10:42:52 OK	3	11.7	30.8
98/04/17	10:43:07 OK	0.4	5.7	13.9
98/04/17	10:43:22 OK	0	2.2	12.5
98/04/17	10:43:37 OK	0	1.3	10.9
98/04/17	11:34:46 OK	0	0	0
98/04/17	11:35:01 OK	0	2.9	15
98/04/17	11:35:16 OK	0	1.8	15

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

SHOP J - SECOND DAY OF SAMPLING

98/04/17	11:35:31	OK	0	9.9	38.4
98/04/17	11:35:46	OK	0.5	7.8	38.4
98/04/17	11:36:01	OK	0	15.8	58.1
98/04/17	11:36:16	OK	0	2.4	18.9
98/04/17	11:36:31	OK	0	0	0.3

2020 Report

Date	Time	Status	Min	Avg	Max
98/04/17	11:36:46	OK	0	15.6	43.8
98/04/17	11:37:01	OK	4.5	21.8	46.8
98/04/17	11:37:16	OK	0	6.6	18.4
98/04/17	11:37:31	OK	0	0.3	1.4
98/04/17	11:37:46	OK	0	0	0
98/04/17	11:38:01	OK	0	0	0
98/04/17	11:38:16	OK	0	0	0
98/04/17	11:38:31	OK	0	0	0
98/04/17	11:38:46	OK	0	0	0
98/04/17	11:39:01	OK	0	0	0
98/04/17	11:39:16	OK	0	0	0
98/04/17	11:47:10	OK	0	1.6	7.1
98/04/17	11:47:25	OK	0	0	2.2
98/04/17	11:47:40	OK	0	1.7	9.5
98/04/17	11:47:55	OK	0	5.4	18.7
98/04/17	11:48:10	OK	6	16.8	29.9
98/04/17	11:48:25	OK	9.7	37.6	84.9
98/04/17	11:48:40	OK	0.5	5.2	18
98/04/17	11:48:55	OK	1.7	32.3	71.3
98/04/17	11:49:10	OK	13	26.9	40.5
98/04/17	11:49:25	OK	4.3	18.7	38
98/04/17	11:49:40	OK	0.2	0.8	4.3
98/04/17	13:48:23	OK	0	2.6	7.8
98/04/17	13:48:38	OK	0.5	17.4	44
98/04/17	13:48:53	OK	11.5	29.2	69.6
98/04/17	13:49:08	OK	10.2	37.2	86.8
98/04/17	13:49:23	OK	11.4	15.7	34.1
98/04/17	13:49:38	OK	8.9	20.6	34.1

**REAL-TIME PERC MEASUREMENTS  
DOWNLOADED FROM PHOTOVAC 2020 PID**

**SHOP J - SECOND DAY OF SAMPLING**

98/04/17	13:49:53	OK	9.3	18.8	35.9
98/04/17	13:50:08	OK	7.3	12.6	21.6
98/04/17	13:50:23	OK	4.4	6.4	9.3
98/04/17	13:50:38	OK	1.1	3.9	6
98/04/17	14:05:48	OK	0	0.3	1.3
98/04/17	14:06:03	OK	0.1	0.2	0.4
98/04/17	14:06:18	OK	0	0.3	0.7
98/04/17	14:06:33	OK	0.5	2.3	10.8
98/04/17	14:06:48	OK	2.2	6.6	12.4
98/04/17	14:07:03	OK	2.5	9.7	33.5
98/04/17	14:07:18	OK	1	4.9	13.9
98/04/17	14:07:33	OK	1.4	6.9	15.8
98/04/17	14:07:48	OK	2.5	6.3	12.4
98/04/17	14:08:03	OK	1	14.1	37.9
98/04/17	14:08:18	OK	2.3	13.6	25.4
98/04/17	14:08:33	OK	1.9	4.7	8.7
98/04/17	14:08:48	OK	1.4	6	15.1
98/04/17	14:09:03	OK	1.4	4.1	8.7
98/04/17	14:09:18	OK	0.6	1.6	3.5
98/04/17	14:09:33	OK	0	0	1.6
98/04/17	14:50:24	OK	0	0	0.4
98/04/17	14:50:39	OK	0	4.4	11.9
98/04/17	14:50:54	OK	8.9	22.5	46.2
98/04/17	14:51:09	OK	6.4	23.9	67.4
98/04/17	14:51:24	OK	0	8.4	65.7
98/04/17	14:51:39	OK	0	5.4	34.3
98/04/17	14:51:54	OK	3.2	19.7	37.1

2020 Report

Date	Time	Status	Min	Avg	Max
98/04/17	14:52:09	OK	0	4.3	12
98/04/17	15:11:49	OK	0	0.7	5.6
98/04/17	15:12:04	OK	2.8	4.9	11.4