R E P O R T

P.F. Fink, Inc.

c/o Attorney Joseph A. Hoida

403 South Jefferson Street

Green Bay, Wisconsin 54301

Additional Site Investigation and Remedial Action Recommendations Report

One Hour Martinizing

1233 South Military Avenue

Green Bay, Wisconsin

24871XF

April 2000

STS

STS Consultants, Ltd.
Solutions through Science & Engineering

April 20, 2000

Ms. Kristin Nell
Wisconsin Department of Natural Resources
1125 North Military Avenue
P.O. Box 10448
Green Bay, Wisconsin 54307-0448

Subject: Additional Site Investigation and Remedial Action Recommendations Report, One-Hour Martinizing, 1233 South Military Avenue, Green Bay, Wisconsin -- WDNR ERP Case No. 02-05-217270 -- STS Project No. 24871XF

Dear Ms. Nell:

Accompanying this letter is a copy of the Additional Site Investigation and Remedial Action Recommendations Report for the One-Hour Martinizing Dry Cleaners facility located at 1233 South Military Avenue, Green Bay, Wisconsin.

Based on the results of the environmental investigation conducted at the site referenced above, we are recommending 1) one year of quarterly groundwater monitoring to determine the feasibility of natural attenuation of chlorinated hydrocarbons to restore groundwater quality and 2) the performance of a pilot test to determine the effectiveness of vapor extraction to address non-saturated zone soil chlorinated hydrocarbon impacts.

Please review the attached report and comment accordingly. If you have any questions, please contact us.

Sincerely,

STS CONSULTANTS, LTD.

Paul M. Garvey
Project Scientist

Roger A. Miller, P.G.
Senior Project Hydrogeologist

"I, Roger A. Miller, P.G., hereby certify that I am a hydrogeologist as that term is defined in s. NR 712.03(1), Wis. Adm. Code, and that, to the best of my knowledge, all of the information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code."

Roger A. Miller, P.G. 4/20/00
Senior Project Hydrogeologist

PMG/jlp.wd

Copy: P.F. Fink, Inc.
c/o Attorney Joseph A. Hoida
403 South Jefferson Street
Green Bay, Wisconsin 54301

C471F008.DOC

TABLE OF CONTENTS

LIST OF FIGURES

TABLE OF CONTENTS
(Page 2)

LIST OF TABLES

LIST OF APPENDICES

EXECUTIVE SUMMARY

On March 10, 1999, as part of a Phase II Environmental Site Assessment (ESA) associated with a real estate transaction, Northern Environmental, Inc. (Northern), Green Bay, Wisconsin, identified chlorinated hydrocarbon contamination and notified the Wisconsin Department of Natural Resources (WDNR) following receipt of confirmatory analytical results.

As a result of that notification and a subsequent WDNR letter (which outlined the legal responsibilities regarding site investigation and cleanup), STS Consultants, Ltd. (STS), was retained by P.F. Fink, Inc. (former owner), to conduct site assessment activities and to provide remedial action recommendations.

STS completed a site investigation of this property, which included the following:

1) Seven soil borings, six of which were converted into groundwater monitoring wells and one of which was converted to a piezometer.

2) Chemical analyses of selected soil and groundwater samples.

3) Calculation of site-specific residual contaminant levels (SSRCLs).

Soils encountered at the One-Hour Martinizing site consisted primarily of silty clays. Sandy fill material was encountered immediately east of the building area to a depth of approximately 4 feet. The water table was encountered at depths of approximately 5 to 8 feet below ground surface (bgs).

Field and laboratory results indicate Wisconsin Administrative Code (WAC) Chapter NR 140 exceedances for some chlorinated hydrocarbons were detected in the groundwater. Chlorinated hydrocarbon-related impacts were also identified at concentrations above calculated SSRCLs in the non-saturated zone soils near the dry cleaning machine (under the floor slab) and also immediately east of the building.

Based on these results, STS is recommending a pilot test to determine the feasibility of vapor extraction as a remedial option for removal of chlorinated hydrocarbons in the vadose zone.

To address groundwater impacts, STS is recommending one year of natural attenuation monitoring to determine if biodegradation of chlorinated hydrocarbons is occurring at a reasonable rate or if biodegradation needs stimulation through the addition of simple carbon sources, such as glucose or lactate.

1.0 PROJECT DIRECTORY

Project:	One-Hour Martinizing Dry Cleaning Service
Project Location:	1233 South Military Avenue Green Bay, Wisconsin
Responsible Party Representative:	Mr. Joseph A. Hoida, Attorney for P. F. Fink, Inc. 403 South Jefferson Street Green Bay, Wisconsin 54301 Phone: (920) 432-0401
Engineer:	STS Consultants, Ltd. 1035 Kepler Drive Green Bay, Wisconsin 54311
Contacts:	Mr. Paul M. Garvey and Mr. Mark A. Bergeon Phone: (920) 468-1978 (Fax: 920-468-3312)
Regulator:	Wisconsin Department of Natural Resources 1125 North Military Avenue P.O. Box 10448 Green Bay, Wisconsin 54307-0448
Contact:	Ms. Kristin Nell Phone: (920) 492-5861 (Fax: 920-492-5859)

2.0 PROJECT OVERVIEW

2.1 Background

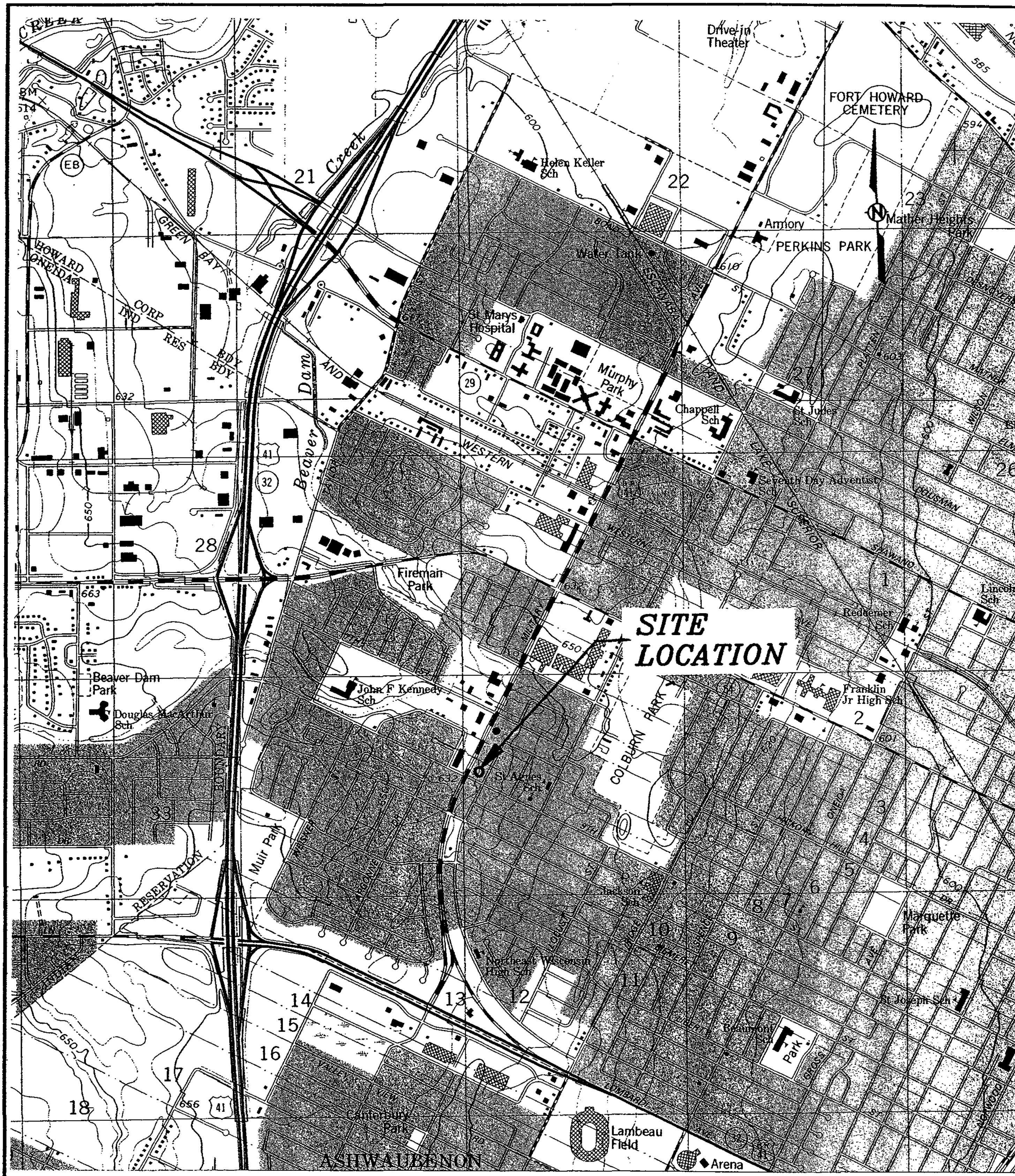
The subject property is located at 1233 South Military Avenue, city of Green Bay, Brown County, Wisconsin (Subdivision of Private Claim No. 8, west side of the Fox River, city of Green Bay, Brown County, Wisconsin, T24N, R20E). Figure 1 shows the site location on a portion of the Green Bay-West, Wisconsin, United States Geological Survey (USGS) 7.5-minute (1:24,000-scale) quadrangle map. The One-Hour Martinizing facility is located in a one-story mini-mall developed with commercial businesses. The site is bordered by a residential area to the east.

The One-Hour Martinizing site has operated as a dry cleaning facility for more than 20 years. In 1967, Marti-Chic Corporation of Madison, Wisconsin, opened a One-Hour Martinizing franchised dry cleaning facility at the 1233 South Military Avenue location. The store was purchased by PEP Enterprises (a partnership) in April of 1972. Peter F. Fink was one of the partners. In 1975, Mr. Fink bought out the partnership and operated the location as the sole proprietor until incorporating the business in October 1997. The property continues to be developed with an active dry cleaning establishment.

Perchloroethylene (tetrachloroethene) was used as a solvent at the One-Hour Martinizing facility. Amyl acetate, tannic acid, picric (2,4,6-trinitrophenol), and ammonia were also historically used as spotting chemicals.

Virgin solvents were stored on site in a 150-gallon tank until May of 1997, when the use of 5-gallon sealed pails of solvents replaced the use of bulk storage. In May 1999, a closed loop system was installed, further limiting the potential for solvent spillage.

Historically, used solvents, filters, and non-volatile residues have been collected and disposed of by licensed hazardous waste companies. Safety Kleen provided One-Hour Martinizing with disposal documentation as early as June 1986.



BASE MAP SOURCE: USGS GREEN BAY WEST, WISCONSIN 7.5 MINUTE QUADRANGLE (REVISED 1982)

STS Consultants Ltd.
Consulting Engineers

SITE LOCATION DIAGRAM
ONE HOUR MARTINIZING DRY CLEANING
1233 SOUTH MILITARY AVENUE
GREEN BAY, WISCONSIN

DRAWN BY	CPB	02/18/00
CHECKED BY	PMG	02/18/00
APPROVED BY		
CADFILE ATXT.dwg	SCALE 1"=2000'	
STS PROJECT NO. 24871XF	FIGURE NO. 1	

04/01/1998 08:

Dry cleaning from 1967 to March of 1994 was accomplished through the transfer system. A dry cleaning machine was used to clean the clothing, which was then transferred to a dry cleaning dryer. From 1967 to 1976, an Olson filter was used. The Olson filter required daily service by adding diatomaceous earth and activated carbon directly to the filter screen to provide a coating that the solvent flowed through. This coating was removed daily and was distilled. The distillation process left an ash residue, and the clear solvent was then returned to the cleaning machine. In 1976, a filter cartridge system was added, thereby eliminating the ash residue. In 1983, a vapor condensing unit, using refrigeration to condense the solvent vapors (instead of using water), was installed. In 1986, a concrete slab was poured and a storage shed was built to house the filter cartridges awaiting disposal by Safety Kleen. A "dry to dry cleaning machine" was installed and put into operation in March 1994.

Historical leakage of the transfer system process unit, which required continual maintenance of both its door closing mechanism and seals on the shaft housing, may have contributed to a release at this location. On March 10, 1999, as part of the real estate transaction, Northern, Green Bay, Wisconsin, identified chlorinated solvent contamination on the site and notified the WDNR. Northern summarized the results of the Phase II ESA in a report dated March 23, 1999.

As a result of that notification, the dry cleaning facility was assigned the WDNR Environmental Response Program (ERP) Case No. 02-05-217270 in a letter dated April 1, 1999. The April 1999 letter outlined legal responsibilities regarding investigation and site cleanup.

STS was retained by P.F. Fink, Inc., and submitted a Work Plan for site assessment to the WDNR on April 27, 1999. In June 1999, STS installed five soil borings in the immediate vicinity of the dry cleaning facility to determine the vertical and horizontal extent of the impacted soil and groundwater. At that time, four soil borings were converted to groundwater monitoring wells, and one soil boring was converted to a piezometer. Results of that phase of soil and groundwater sampling were summarized in the September 2, 1999, project status report. In the September 1999 report, STS recommended the installation of two additional monitoring wells to further define the extent and degree of groundwater impacts. This report presents the procedures and results of the additional investigation activities and also provides a remedial action recommendation.

2.2 Local and Regional Geology

Topography of the site is relatively flat with local relief of less than 2 feet. According to the soil survey of Brown County, Wisconsin (1974), the surface soils in the vicinity of the subject site are classified as Oshkosh silt loam with 2% to 6% slopes. The Oshkosh series consists of deep, well-drained soils on lacustrine plains dissected by V-shaped valleys. The Oshkosh silt loam consists of approximately 22 inches of weak, red silt loam over reddish-brown silty clay. Based on the Green Bay-West USGS quadrangle map, the ground surface at the site is relatively flat. Surface elevations are estimated to be approximately +640.0 feet above mean sea level in the area.

The Water Resources of Wisconsin, Fox-Wolf River Basin, Hydrogeologic Atlas HA-321 reports the area to be underlain by glacial lake deposits consisting mainly of silt and clay. Glacial deposits can range between 0 to 100 feet in thickness. Glacial lake deposits generally have a poor permeability. Regional groundwater flow direction is to the east toward the Fox River.

Possible migration pathways at the site consist primarily of soil pores and fractures (if present), utility trenches, and groundwater.

3.0 PROCEDURES

3.1 Soil Borings

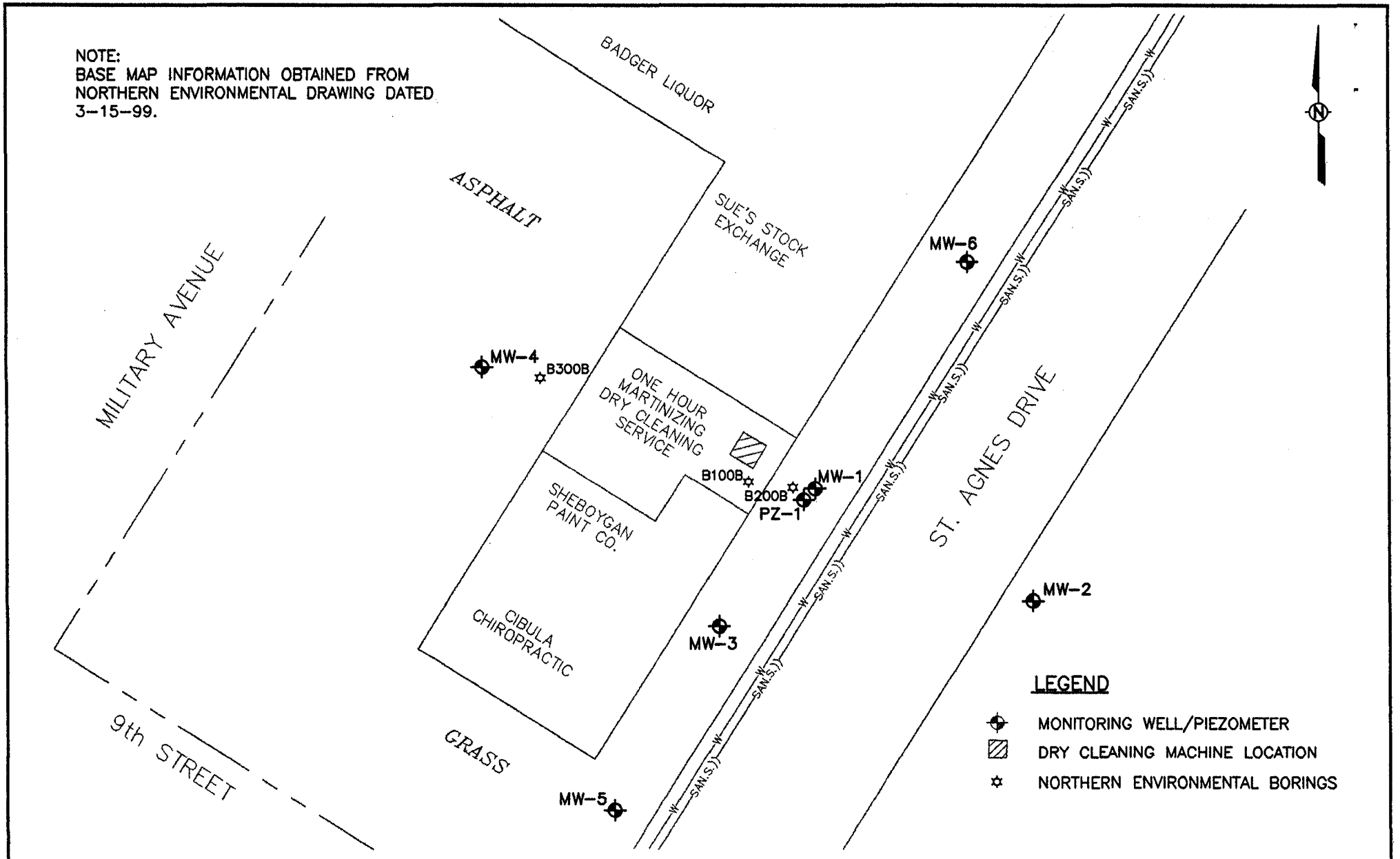
On December 14, 1999, Boart Longyear (Boart), Schofield, Wisconsin, mobilized a truck-mounted rotary drill rig to advance two soil borings (MW-5 and MW-6) at the One-Hour Martinizing site. Borings were advanced to a depth of 13.5 feet bgs, using solid-stem and 4 1/4-inch inside diameter (ID) hollow-stem augers. Soil boring locations are illustrated on Figure 2.

Soil samples were collected at 2-foot intervals using a split-spoon sampling device in accordance with ASTM D 1586-84, "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils." Soil samples were transferred from the open split-spoon to new glass jars or analytical sample containers provided by the laboratory. Soil samples were screened in the field by STS personnel using a photoionization detector (PID) equipped with a 10.6-electron volt lamp. Soil analytical samples were selected to represent the condition at or above the apparent water table or at the depth of the highest PID field-screening result. Selected analytical samples were collected immediately from the open split-spoon prior to soil screening, stored on ice in the field, and shipped under Chain of Custody control to Robert E. Lee & Associates, Inc. (REL), in Green Bay, Wisconsin, for the analysis of total organic carbon (TOC). REL's analytical laboratory was awarded the annual contract with STS for 1999, based on competitive bidding results.

Soil screening samples were classified according to the Unified Soil Classification System (ASTM D 2488-84). The WDNR soil boring logs are included in Appendix A.

3.2 Groundwater Monitoring Well Installation and Sampling

Following soil borings installation and soil sampling, Boart used a truck-mounted rotary drill rig to install groundwater monitoring wells at the MW-5 and MW-6 locations. Wells were constructed using 2-inch diameter, Schedule 40 polyvinyl chloride (PVC) with flush-threaded joints. The screened section of each water table observation well consisted of a 10-foot length of 2-inch diameter, Schedule 40 PVC with 0.006-inch factory-cut slots. The screens of the water table observation wells were installed so that they would intersect the apparent water table at the time of installation.



STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO. 24871XF
STS PROJECT FILE G471F004A.dwg
SCALE 1"=30'
FIGURE NO. 2

SOIL BORING/MONITORING WELL LOCATIONS
ONE HOUR MARTINIZING DRY CLEANING SERVICE
1233 SOUTH MILITARY AVENUE
GREEN BAY, WISCONSIN

DRAWN BY PDP	DATE 6-21-99
CHECKED BY JLC	DATE 8-6-99
APPROVED BY	DATE
CADFILE X:\PROJECTS\Dwg99\24871\XF\G471F004A.dwg	

08/27/1999 13:52

The annulus of each well was backfilled with uniformly-graded silica sand to a level above the top of the screen. The remainder of the annulus was backfilled with hydrated granular bentonite. The wells were developed by alternately surging and purging and removing water, until the well was dry. A WDNR Monitoring Well Construction Form (4400-113A) and Well Development Form (4400-113B) was completed for each well installed (Appendix A). Groundwater monitoring well locations are illustrated on Figure 2.

Groundwater samples were collected by STS field personnel on January 4, 2000, from Monitoring Wells MW-1 through MW-6 and Piezometer PZ-1. Groundwater samples were collected using disposable polyethylene bailers for field parameters and laboratory analysis. Field parameters include water level, pH, conductivity, temperature, color, odor, turbidity, dissolved oxygen, and ferrous iron. Groundwater samples were submitted on ice to REL under Chain of Custody control for the analysis of volatile organic compounds (VOCs), sulfate, nitrate/nitrite, methane, ethane, and ethene.

3.3 Chemical Analyses

Soil samples collected while conducting Soil Borings MW-5 and MW-6 were analyzed for TOC (EPA Method 9060). Soil samples collected from previous borings were analyzed for VOC (EPA Method 8021).

Groundwater samples collected following the monitoring well installation activities were analyzed for VOCs (EPA Method 8021) soluble sulfate (EPA Method 300.0), and nitrate/nitrite (EPA Method 353.2). Methane, ethane, and ethene were also analyzed using EPA Method 8015-B. Ferrous iron and dissolved oxygen (DO) concentrations were recorded in the field using Chemetrics (colorimetric) ampoules.

4.0 RESULTS

4.1 Field Results

Soil encountered at the site consisted primarily of brown silty clay. Approximately 4 feet of sandy fill material was encountered under and immediately east of the existing dry cleaning facility. Details of the soils encountered are provided on the WDNR Form 4400-122, Soil Boring Log Information Forms, provided in Appendix A. Results of the PID screening of soil samples are also summarized on the Soil Boring Log Information Forms.

Elevated PID readings (above 25 instrument units) were previously recorded at the MW-1/PZ-1 location.

4.2 Soil Chemical Results

A summary of the soil sample analytical test results is provided on Table 1. Tetrachloroethene, trichloroethene, and cis 1,2-dichloroethene were detected in the soil at several locations (Table 1). No other VOCs were detected. SSRCLs were calculated for detected chlorinated hydrocarbons, because there are currently no generic residual contaminant levels for chlorinated hydrocarbons in Wisconsin Administrative Code. SSRCLs generated for the chlorinated hydrocarbons of concern are summarized on Table 1 (see Section 4.2.1). Laboratory reports are included in Appendix B.

Soil impacts appear to be concentrated primarily in two areas: 1) immediately below the floor slab of the One-Hour Martinizing dry cleaning machine location and 2) outside the back door in the vicinity of B200B, PZ-1, and MW-1. Soil impacts in these areas appear to extend to the depth of the shallow water table (approximately 7 feet bgs).

As indicated on Table 1, tetrachloroethene and trichloroethene were detected above calculated SSRCLs in the unsaturated zone soils analyzed from Borings PZ-1, B100B, and B200B. Tetrachloroethene at a concentration of 33 milligrams per kilogram (mg/kg) was detected above non-industrial soil ingestion and inhalation SSRCLs (18 mg/kg and 20 mg/kg, respectively) under the building floor slab (Boring B100B). Groundwater pathway SSRCL exceedances were detected in the unsaturated zone soil (ground surface to 7 feet bgs) at the PZ-1, B100B, and B200B locations.

Table 1
Soil Analytical Results
One Hour Martinizing
1233 S. Military Avenue
Green Bay, Wisconsin

			Analyte	Benzene	cis 1,2-Dichloroethene	Ethylbenzene	Methylene Chloride	Naphthalene	Tetrachloroethene	Trichloroethene	Toluene	Trimethylbenzenes	Xylenes	TOC
			Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	mg/kg
			Depth-ft											
MW-1/PZ-1	**6/3/99**	**S-2**	**2.0 - 4.0**	<116	<115	<120	<157	<50.7	**10100**	**511**	<68.0	<501	<352	--
		S-3	**4.0 - 6.0**	<11.4	**21.2 (p)**	<11.8	<15.4	<4.97	**2760**	**134**	<6.67	<49.1	<34.6	--
MW-2	**6/3/99**	**S-3**	**4.0 - 6.0**	<12.6	<12.5	<13.0	<17.1	<5.51	**106**	<14.2	<7.39	<54.5	<38.3	--
MW-3	**6/3/99**	**S-2**	**2.0 - 4.0**	<11.7	<11.6	<12.1	<15.8	<5.12	<21.0	<13.2	<6.86	<50.6	<35.6	--
		S-4	**6.0 - 8.0**	<12.9	<12.8	<13.3	<17.5	<5.64	**378**	<14.6	<7.56	<55.7	<39.1	--
MW-4	**6/3/99**	**S-2**	**3.0 - 5.0**	<11.7	<11.6	<12.1	<15.8	<5.11	<21.0	<13.2	<6.86	<50.5	<35.5	--
MW-5	**12/14/99**	**S-2**	**2.0 - 4.0**	--	--	--	--	--	--	--	--	--	--	4640
MW-6	**12/14/99**	**S-2**	**2.0 - 4.0**	--	--	--	--	--	--	--	--	--	--	2150
Soil Analytical Results from Northern Environmental's March 23, 1999, Phase 2 ESA.														
B100B	**S102B**	**3/10/99**	**1.0 - 3.0**	<25	**38**	<25	<25	<25	**33000**	**66**	<25	<50	<75	--
B200B	**S201B**	**3/10/99**	**1.0 - 3.0**	<25	<25	<25	<25	<25	**7800**	**88**	<25	<50	<75	--
B300B	**S301B**	**3/10/99**	**1.0 - 3.0**	<25	<25	<25	<25	<25	**34**	<25	<25	<50	<75	--
WAC NR 720 Generic RCL[1]				5.5		2,900					1,500		4,100	
Site-Specific RCL - Non-industrial Ingestion Pathway					1100000				18000	83000				
Site-Specific RCL - Industrial Ingestion Pathway					--				55000	260000				
Site-Specific RCL - Non-industrial Inhalation Pathway					150000				20000	5300				
Site-Specific RCL - Industrial Inhalation Pathway					120000				19000	5200				
Site-Specific RCL - Leaching to Groundwater Pathway					240				130	36				

Notes:
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
(p) = Reported result is less than the practical quantitation limit
[1]Wisconsin Administrative Code Chapter NR 720 Generic Residual Contaminant Level
TOC = Total Organic Compounds

4.2.1 Site-Specific Residual Contaminant Levels

While commercial use of the One-Hour Martinizing site is the most likely scenario to occur in the near future, SSRCLs were calculated for detected VOCs for both industrial and non-industrial sites (i.e., unrestricted land use scenarios). Based on site conditions, we reviewed the following exposure pathways: 1) direct contact (soil ingestion or inhalation) and 2) leaching to groundwater. SSRCLs were calculated for direct contact and the groundwater pathway for the three detected VOCs using the algorithms presented in the WDNR's Interim PAH Guidance (WDNR Publication RR-519-97). As summarized on the calculation sheets in Appendix E, default values from WDNR Guidance were used in the calculations, if available. Chemical fate parameters and health criteria for VOCs were obtained from EPA sources where possible (e.g., Integrated Risk Information System; EPA Region IX Preliminary Remediation Goals Toxicity and Physical/Chemical Tables). References for chemical fate input parameters and health criteria are listed with the SSRCL calculations.

For direct contact, SSRCLs were calculated for both soil ingestion and inhalation pathways. As allowed in s. NR 720.19(5)1, WAC, the excess cancer risk was adjusted to 1×10^{-6} and the hazard quotient was adjusted to one (1) for the non-industrial SSRCL calculations. In addition, because the surface soils are frozen for approximately four months out of the year, the exposure frequency was reduced from 350 to 245 days per year. Although SSRCL calculations for industrial sites are also included for comparison, we selected the SSRCLs for non-industrial sites as the SSRCLs for this site. The direct contact SSRCLs are considered to be conservative because the non-industrial SSRCLs have been compared to the highest organic compound concentrations detected in the soils.

As summarized on Table 1, the soil concentration for tetrachloroethene in Sample B100B (collected under the floor slab) was in exceedance of the direct contact SSRCLs for both the non-industrial ingestion pathway and industrial/non-industrial inhalation pathways.

SSRCLs for the groundwater pathway were calculated for three VOCs (tetrachloroethene, trichloroethene, and cis-1,2-dichloroethene). The SSRCLs equation combines a soil:water partitioning expression with a dilution attenuation factor for the groundwater mixing zone. Groundwater pathway SSRCLs were not found to be protective against an ES exceedance at the MW-1/PZ-1, MW-3, B100B, and B200B boring locations, using the lowest soil TOC concentration detected (2,150 mg/kg). Groundwater pathway SSRCLs are summarized on Table 1.

4.2.2 Cumulative Risk

Cumulative risks were estimated for carcinogens and non-carcinogens for both the ingestion and inhalation pathways. As shown on the calculations provided in Appendix E and in accordance with s. NR 720.11(3), WAC, the cumulative excess cancer risk does not exceed 1×10^{-5} for carcinogens, nor does the hazard quotient exceed one (1) for non-carcinogens. Risks for carcinogens and non-carcinogens are conservatively presumed to be additive for each category.

4.3 Groundwater Monitoring Results

The most recent static water level measurements were obtained from the groundwater monitoring wells on January 4, 2000. Groundwater elevations and field parameters were recorded during the sampling activities and are summarized on the Field Sampling Summary (Table 2).

The most recent groundwater elevations recorded in the monitoring wells were used to prepare a Groundwater Contour Map presented as Figure 3. The Groundwater Contour Map indicates groundwater flow is generally southwest across the site at a hydraulic gradient of approximately 0.01 feet per foot.

Based on field observations indicating that groundwater monitoring wells were installed within the natural clays at the site, hydraulic conductivity (K) of saturated soils surrounding the screened interval of the monitoring wells on site has been estimated at 1×10^{-6} centimeters per second (Fetter, 1994).

Based on groundwater elevations measured on January 4, 2000, and the estimated field hydraulic conductivity, the average linear velocity of groundwater flow is estimated to be 0.03 foot per year. The vertical gradient is estimated to be slightly downward at 0.06 feet per foot during the January sampling event. Average linear velocity and vertical gradient calculations are included in Appendix C.

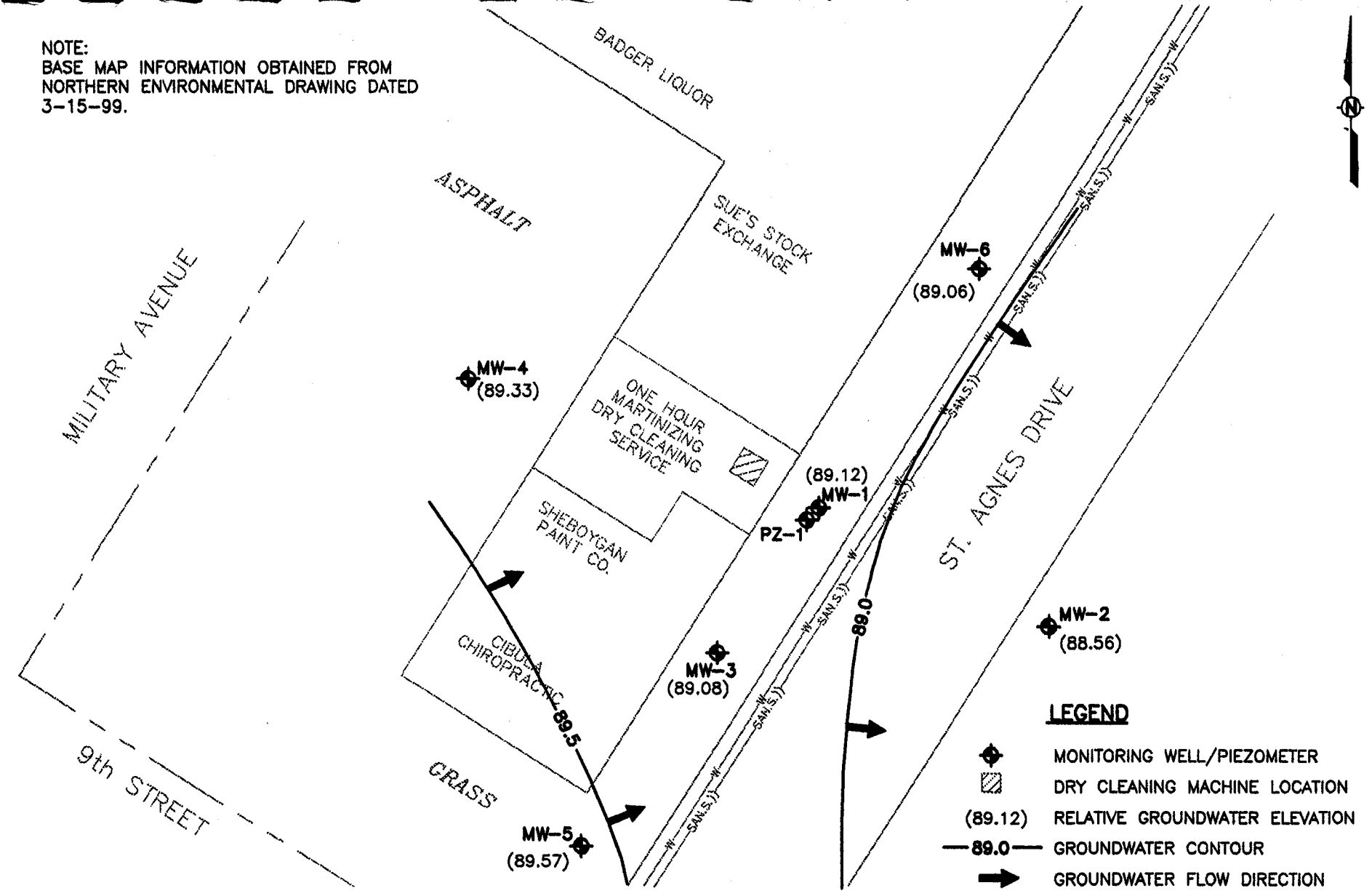
Results of laboratory analyses of groundwater samples collected from the monitoring wells are summarized on Table 3. Also indicated on Table 3 are the preventive action limits (PALs) and enforcement standards (ESs), as established under Chapter NR 140 (NR 140), WAC. Compounds detected in groundwater above the NR 140 ES include tetrachloroethene, bromodichloromethane, trichloroethene, and 1,1,1-trichloroethane. One or more NR 140 ES exceedances were detected in Monitoring Wells MW-1, MW-3, and MW-6 and Piezometer PZ-1. NR 140 PAL exceedances for cis-1,2-dichloroethene were detected in MW-1 and MW-6.

Table 2
Field Sampling Summary
One Hour Martinizing
1233 S. Military Avenue
Green Bay, Wisconsin

Location	Date	TPVC Elevation	Water Level TPVC	Water Level Elev. (ft)	Dissolved Oxygen (mg/L)	Ferrous Iron (mg/L)	pH (units)	Specific Conductance (µmhos/cm)	Temperature (^{0} Celsius)	Color	Odor	Turbidity	Gallons Purged
MW-1	17-Jun-99	96.63	5.19	91.44	--	--	6.80	985	--	Clear	None	Low	5.0
	4-Jan-00	96.63	7.51	89.12	2	0.1	7.10	725	11.9	Clear	Slight	Low	4.0
MW-2	17-Jun-99	96.60	6.05	90.55	--	--	6.24	880	--	Clear	None	Low	5.0
	4-Jan-00	96.60	8.04	88.56	1	0.2	6.63	765	11.7	Clear	None	Low	3.8
MW-3	17-Jun-99	96.96	5.63	91.33	--	--	6.74	839	--	Clear	None	Low	4.0
	4-Jan-00	96.96	7.88	89.08	1	0.3	6.94	674	10.6	Clear	None	Low	4.0
MW-4	17-Jun-99	96.32	7.43	88.89	--	--	6.49	2350	--	Clear	None	Low	4.0
	4-Jan-00	96.32	6.99	89.33	<1	<0.1	6.77	1839	11.1	Clear	None	Low	4.0
MW-5	4-Jan-00	97.43	7.86	89.57	5	0.1	7.26	2950	9.6	Lt. Brown	None	Low	3.8
MW-6	4-Jan-00	96.65	7.59	89.06	3	0.1	7.04	1100	11.8	Clear	None	Low	4.0
PZ-1	17-Jun-99	96.55	6.39	90.16	--	--	8.10	395	--	Clear	None	Low	5.0
	4-Jan-00	96.55	8.07	88.48	<1	0.2	8.06	369	12.4	Lt. Brown	None	Medium	4.5

Notes:
-- = not recorded

NOTE:
BASE MAP INFORMATION OBTAINED FROM NORTHERN ENVIRONMENTAL DRAWING DATED 3-15-99.



STS PROJECT NO.	24871XF
STS PROJECT FILE	G471F004B.dwg
SCALE	1"=30'
FIGURE NO.	3

STS Consultants Ltd.
Consulting Engineers

GROUNDWATER CONTOUR MAP (01/04/2000)
ONE HOUR MARTINIZING DRY CLEANING SERVICE
1233 SOUTH MILITARY AVENUE
GREEN BAY, WISCONSIN

DRAWN BY	PDP	DATE	6-21-99
CHECKED BY	PMG	DATE	8-6-99
APPROVED BY		DATE	
CADFILE	X:\PROJECTS\Dwg99\24871\XF\G471F004B.dwg		

Table 3
Groundwater Analytical Results
One Hour Martinizing
1223 S. Military Avenue
Green Bay, Wisconsin

		Volatile Organic Compounds													*Natural Attenuation Parameters*					
Analyte		Benzene µg/L	cis 1,2-Dichloro ethene µg/L	1,1-Dichloro-ethene µg/L	Ethyl-benzene µg/L	Bromodichloro-methane µg/L	Methylene Chloride µg/L	Naphthalene µg/L	Tetrachloro-ethene µg/L	Trichloro-ethene µg/L	Toluene µg/L	Trans-1,2-Dichloro-ethene µg/L	1,1,1-Trichloro-ethane µg/L	Trimethyl-benzenes µg/L	Xylenes µg/L	Nitrate/ Nitrite mg/L	Ethane µg/L	Ethene µg/L	Methane µg/L	Chloride mg/L	Sulfate mg/L
MW-1	**6/17/99**	<94	<93	<55	<97	<124	<127	<41	**22800**	**233 (p)**	<55	<105	**257 (p)**	<405	<285	-	-	-	-	-	-
	1/4/00	<0.19	**62**	0.38	<0.19	**2.4**	<0.25	<0.082	**13400**	**85**	**0.13**	**0.33**	<0.3	<0.81	<0.39	**11**	<14	<14	**1100**	**72**	**40**
MW-2	**6/17/99**	<0.19	<0.19	<0.11	<0.19	<0.25	<0.25	<0.08	<0.34	<0.21	<0.11	<0.21	<0.30	<0.81	<0.57	-	-	-	-	-	-
	1/4/00	<0.19	<0.19	<0.11	<0.19	<0.25	<0.25	<0.082	<0.34	<0.21	<0.11	<0.21	<0.30	<0.81	<0.39	<0.14	<14	<14	**11**	**17**	**32**
MW-3	**6/17/99**	<9.4	<9.3	<5.5	<9.7	<12.5	<12.7	<4.1	**477**	<10.6	<5.5	<10.5	<15.1	<40.5	<28.5	-	-	-	-	-	-
	1/4/00	<0.19	**1.8**	<0.11	<0.19	<0.25	<0.25	<0.082	**489**	**5.9**	<0.11	<0.21	<0.3	<0.81	<0.39	**16**	<14	<14	<7.2	**47**	**38**
MW-4	**6/17/99**	<0.19	<0.19	<0.11	<0.19	<0.25	<0.25	<0.08	<0.34	<0.21	**0.47**	<0.21	<0.30	<0.81	<0.57	-	-	-	-	-	-
	1/4/00	<0.19	<0.19	<0.11	<0.19	<0.25	<0.25	<0.082	<0.34	<0.21	<0.11	<0.21	<0.3	<0.81	<0.39	<0.14	<14	<14	**11**	**365**	**339**
MW-5	**1/4/00**	<0.19	<0.19	<0.11	<0.19	<0.25	<0.25	<0.082	<0.34	<0.21	<0.11	<0.21	<0.3	<0.81	<0.39	1.2	<14	<14	<7.2	**1200**	**258**
MW-6	**1/4/00**	<0.19	**4.7**	<0.11	<0.19	**0.61**	<0.25	<0.082	**124**	**62**	<0.11	<0.21	<0.3	<0.81	<0.39	2.7	<14	<14	**12**	**193**	**76**
PZ-1	**6/17/99**	<0.94	<0.93	<0.55	<0.97	<1.24	<1.27	<0.41	**98.3**	**4**	<0.55	<1.05	**5.04**	<4.05	<2.85	-	-	-	-	-	-
	1/4/00	<0.19	**1.2**	<0.11	<0.19	<0.25	<0.25	<0.082	**27**	**2.9**	<0.11	<0.21	<0.19	<0.81	<0.39	<0.14	<14	<14	**136**	**42**	**50**
NR 140 ES		5	70	850	700	0.6	5	40	5	5	343	NE	200	480	620						
NR140 PAL		0.5	7	85	140	0.06	0.5	8	0.5	0.5	68.6	NE	40	96	124						

Notes:
µg/L = micrograms per liter
(p) = Reported result is less than the practical quantitation limit
NE = Not established
120 Wisconsin Administrative Code Chapter NR 140 Enforcement Standard (ES) Exceedance
140 Wisconsin Administrative Code Chapter NR 140 Preventive Action Limit (PAL) Exceedance

Results of the January 4, 2000, sampling round suggest that the extent of groundwater impacts has been substantially identified. The locations of groundwater impacts are consistent with soil boring and field screening data collected during subsurface exploration activities. Laboratory reports are included in Appendix B.

Geochemical indicators for naturally occurring biodegradation (DO, nitrate/nitrite, sulfate, chloride, methane, ethane, and ethene) were measured during the January 2000 sampling round. Table 2 indicates that DO was detected above 2 mg/L in Monitoring Wells MW-5 and MW-6. If the concentrations of DO become limiting (i.e., below 1 to 2 mg/L), reducing conditions occur and nitrate and sulfate may serve as electron acceptors for anaerobic biodegradation.

Detectable sulfate was reported in all monitoring wells. Nitrate was detected in MW-1, MW-5, and MW-6. Reducing conditions were observed in MW-1, PZ-1, MW-2, MW-3, and MW-4. Therefore, the potential for biodegradation of chlorinated hydrocarbons through anaerobic reductive dechlorination exists in the areas with the highest reported chlorinated hydrocarbon concentrations.

During reductive dechlorination, chlorine atoms on compounds, such as tetrachloroethylene, are replaced with hydrogen as anaerobic bacteria metabolize naturally-occurring organics in the subsurface. An increase in chloride ions and an accumulation of chlorinated hydrocarbon daughter products is associated with reductive dechlorination (Wiedemeier, et. al., 1996). The reductive dechlorination (biotransformation) sequence is perchloroethylene (tetrachloroethene) to trichloroethene to dichloroethene to vinyl chloride to ethene. According to Wiedemeier, et. al. (1996), methane is the ultimate reductive daughter product of dechlorination through methanogenesis. During methanogenesis, methane is also produced by anaerobic bacteria, which use carbon dioxide as an electron acceptor. Methane production is also an indictor that anaerobic groundwater conditions exist.

Methane detected at concentrations of 1,100 µg/L in Monitoring Well MW-1 and 136 µg/L in Piezometer PZ-1 (near the apparent tetrachloroethene source area) suggests that biodegradation of chlorinated hydrocarbons is occurring via methanogenesis. Ethene and ethane, daughter products of vinyl chloride biotransformation, were not detected above the method detection limits. However, trichloroethene, a daughter product of tetrachloroethene biotransformation, was detected at Monitoring Wells MW-1, PZ-1, MW-3, and MW-6 locations.

Cis-1,2-dichloroethene, a daughter product of the reductive dechlorination of trichloroethene, was also detected at MW-1, PZ-1, and MW-6.

Vinyl chloride, a daughter product of the reductive dechlorination of dichloroethene, biodegrades more efficiently under aerobic conditions (Wiedemeier, 1996). With aerobic conditions at the perimeter of a chlorinated hydrocarbon plume (as indicated in MW-5 and MW-6), natural attenuation of vinyl chloride through aerobic biodegradation can occur.

Based on the presence of tetrachloroethene daughter products and relatively elevated methane concentrations in the source area, it can be inferred that biodegradation is occurring at the MW-1, PZ-1, MW-3, and MW-6 locations.

4.4 Municipal Utilities

The One-Hour Martinizing dry cleaning facility is located within a commercial area within the city of Green Bay. This area is serviced by municipal water and sewer and other public utilities. The municipal water supply draws water from Lake Michigan. The municipal wells are maintained by the City of Green Bay as a backup system only. The closest municipal well is the City of Green Bay Well No. 7 (7th Street well), located approximately 750 feet north-northeast of the site. The 7th Street well is cased to a depth of 250 feet. The total depth of this 7th Street well is 860 feet. According to Well Construction Records, bedrock has been recorded at a depth of 116 feet in the 7th Street well. The well is cased 134 feet into bedrock. The next closest municipal well is the Highland Avenue well, located more than 3,000 feet southwest of the site.

Municipal well water quality is monitored in accordance with state codes. No VOCs were detected in the 7th Street well during the preliminary aquifer storage and recovery feasibility evaluation conducted by CH2M Hill for the City of Green Bay Water Utility dated March 1999. A well construction diagram of the 7th Street well is included in Appendix D.

5.0 CONCLUSIONS

5.1 Soil Conditions

STS completed a site investigation of the One-Hour Martinizing property incorporating seven soil borings, six of which were converted to groundwater monitoring wells, and one which was converted to a piezometer. Laboratory results of this investigation indicate that chlorinated hydrocarbon impacted soil is present.

Chlorinated hydrocarbon impacted soil in the vadose zone was identified primarily in two areas: 1) under the floor slab in the vicinity of the dry cleaning equipment location and 2) in the vicinity of Borings MW-1/PZ-1, B100B, and B200B. Soil impacts detected at the One-Hour Martinizing site were in exceedance of calculated SSRCLs for tetrachloroethene and trichloroethene for the leaching to groundwater pathway at the MW-1/PZ-1, B100B, and B200B locations. A non-industrial direct contact SSRCL exceedance for ingestion and inhalation pathways for tetrachloroethene was detected in the soil sample collected by Northern from beneath the floor slab near the dry cleaning machine (B100B).

5.2 Groundwater Conditions

Due to the naturally occurring clayey soils, groundwater at the One-Hour Martinizing location is interpreted to flow very slowly to the east at approximately 0.03 foot per year, with a slightly downward gradient of 0.06 feet per foot.

Tetrachloroethene in exceedance of WAC Chapter NR 140 ES was identified in the groundwater samples collected from Monitoring Wells MW-1, MW-3, and MW-6 and Piezometer PZ-1. Bromodichloromethane was also identified slightly above its NR 140 ES in MW-1 and MW-6. Cis-1,2-dichloroethene was detected above its NR 140 PAL in MW-1 and MW-6. Trichloroethene was detected above its NR 140 PAL in PZ-1.

Based on field observations and laboratory results, it appears the lateral and vertical extent of groundwater impacts have been substantially defined. Piezometer PZ-1 was installed to document groundwater conditions at the base of the plume. The screened interval of PZ-1 was installed between 20.5 and 22.5 feet below ground surface. Analytical results from PZ-1 indicate that the dissolved-phase chlorinated hydrocarbons have reached a depth of 20 feet. Chlorinated

hydrocarbon-related compounds were not detected in Well MW-2, located approximately 50 feet downgradient of MW-1.

Based on the presence of geochemical indicators for naturally occurring biodegradation (sulfate, nitrate, and methane) and the presence of reductive dechlorination daughter products of tetrachloroethene, such as trichloroethene and cis-1,2-dichloroethene, it is our opinion that there is the potential for natural attenuation of chlorinated compounds at this site.

6.0 REMEDIAL ACTION PLAN

As summarized in Section 5.0 of this report, concentrations of detected chlorinated hydrocarbons are in exceedance of direct contact SSRCLs below the floor slab in the vicinity of the dry cleaning machine. Soil chlorinated hydrocarbon concentrations were also in exceedance of the SSRCL leaching to groundwater pathway both under the floor slab and immediately east of the facility.

To address soil chlorinated hydrocarbon impacts above the water table in granular fill soils, STS recommends the installation of four vapor extraction points (two under the floor slab and in granular fill soils and two immediately east of the building) to evaluate the feasibility of extracting chlorinated hydrocarbons by performing a pilot test. The pilot test extraction points will be installed with hand equipment such that they can be connected to a common manifold if integrated into a vapor extraction system. Pilot testing (including vacuum testing, airflow determination, and radius of influence) will be performed to evaluate the feasibility of vapor extraction on the unsaturated granular fill soil as a remedial option. The proposed one-day pilot test study will be exempt from permitting requirements as the total amount of air discharge will be less than 150,000 cubic feet in accordance with NR 406.04(m)3, Wisconsin Administrative Code. The recommendation to install a vapor extraction system will be based on pilot testing results.

As summarized in Section 4.0, geochemical indicator parameters and the presence of chlorinated breakdown products suggest that reductive dechlorination is occurring in the groundwater at the site. To determine the effectiveness of natural attenuation as a remedial option to address groundwater impacts, STS recommends one year of quarterly groundwater monitoring to gather data to evaluate the potential for natural attenuation to reduce the concentrations of chlorinated hydrocarbons in a reasonable time frame. STS recommends sampling of Monitoring Wells MW-1, MW-3, and MW-6 and Piezometer PZ-1 for VOCs on a quarterly basis and the remaining wells semiannually. In addition to VOC analysis, monitoring wells will be analyzed for natural attenuation parameters including DO, nitrate/nitrite, sulfate, chloride, ferrous iron, methane, ethane, and ethene.

Following one year of natural attenuation monitoring, sampling data will be reevaluated to determine if natural attenuation is occurring at a reasonable rate or if anaerobic dechlorination needs stimulation through the addition of simple carbon sources such as glucose or lactate to the subsurface. Estimated costs for the recommended one year of groundwater monitoring and vapor extraction pilot testing are summarized in Section 7.0 of this report.

7.0 ESTIMATED COST

7.1 Groundwater Monitoring - One Year

Consulting Cost	Estimated Cost
Project Coordination/Administration	$1,000
Groundwater Sampling (four rounds)	$2,800
Groundwater Monitoring Report with Closure Request (if appropriate)	$3,400
Subtotal	**$7,200**

Groundwater Analytical Costs	
22 VOC tests @ $50/test	$1,100
22 nitrate/nitrite tests @ $8/test	$ 220
22 sulfate tests @ $5/test	$ 110
22 chloride tests @ $10/test	$ 220
22 methane, ethane, and ethene tests @ $50/test	$1,100
Subtotal	**$2,750**

Total Estimated Cost of Groundwater Monitoring Well Installation and Sampling	**$9,950**

7.2 Pilot Testing

Installation of four vapor extraction points (two inside building and two outside building), vacuum testing, measurement of air flow, and vacuum radius of influence	$1,500
Equipment rental	$ 200
Total Estimated Cost of Pilot Testing	**$1,700**

Note: This cost estimate is for budgeting purposes only and does not represent a proposal by STS.

8.0 GENERAL QUALIFICATIONS

Conclusions presented in this report are based on subsurface conditions as revealed in the soil borings, monitoring wells, subsurface conditions noted at the time of study, subcontract laboratory analyses, and our professional interpretation of this information. Stratification lines shown on boring logs represent the approximate boundary between soil types. Variations may exist in both the horizontal and vertical directions between borings. Additionally, seasonal and annual fluctuations of the groundwater table may influence the distribution of dissolved compounds causing variations in groundwater quality. The scope of this report is limited to the specific project and location described herein. Our interpretation of results represents our scientific judgment based on the available information. No other warranties, either expressed or implied, are made.

9.0 REFERENCES

Fetter, C.W., 1994. Applied Hydrogeology, 3rd Edition, Prentice Hall, New Jersey. Page 98.

United States Department of Agriculture, Soil Conservation Service. Soil Survey of Brown County, Wisconsin, 1974.

Wiedemeier, T.H., et. al. 1996. *Technical Protocol for Evaluating the Natural Attenuation of Chlorinated Ethenes in Groundwater, The Proceedings of the 1996 Petroleum Hydrocarbons and Organic Chemicals in Groundwater: Prevention, Detection, and Remediation Conference.* Pages 425 through 439.

APPENDIX A

WDNR Soil Boring Logs

WDNR Well Construction Forms

WDNR Well Development Forms

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 5-97

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
One Hour Martinizing Dry Cleaning Service		MW-5

Boring Drilled By (Firm name and name of crew chief)	Date Drilling Started	Date Drilling Completed	Drilling Method
Boart Longyear - J. Flaminio - STS Project No. 24871XF	12/14/1999	12/14/1999	Hollow-stem Auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-5	Feet MSL	97.7 Feet MSL	8.0 Inches

Boring Location or Local Grid Origin (Check if estimated: ☐)
State Plane P.C. 2-9 West Side-Fox River S/C/N
1/4 of 1/4 of Section , T N, R
Lat. ° ' "
Long. ° ' "
Local Grid Location (If applicable)
Feet ☐ N ☐ E
Feet ☐ S ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Brown	5	Green Bay

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
S-1 SS	24/6	5	1.5	Fill: Grass - dark brown organic silt - topsoil				1						
S-2 SS	24/18	8	3.0	Fill: Brown silty clay - moist at 4.0 feet				2						
	12		4.5											
S-3 SS	24/24	9	6.0					2						
	6		7.5											
S-4 SS	24/24	11	9.0	Brown silty clay - brown fine silty sand seams at 5.5 feet to 6.5 feet - moist to wet - lacustrine	CL			2						
	48		10.5											
			12.0											
			13.5	End of Boring Boring advanced from 0.0 feet to 13.5 feet by hollow-stem auger Installed 2-inch diameter Schedule 40 PVC groundwater monitoring well at 13.0 feet.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel:
	STS Consultants Ltd. 1035 Kepler Drive, Green Bay, WI 54311	Tel: 920-468-1978 Fax: 920-468-3312

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completions of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☐ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 6-97

Facility/Project Name One Hour Martinizing Dry Cleaning Service	Local Grid Location of Well ____ft. ☐N. ☐S. ____ft. ☐E. ☐W.	Well Name MW-5
Facility License, Permit or Monitoring No.	Grid Origin Location (Check if estimated: ☐) Lat. ° ' " Long. ° ' " or St. Plane P.C. 2-9 West Side-Fox River ft. N, ____ ft. E. S/C/N	Wis. Unique Well No. / DNR Well Number
Facility ID	Section Location of Waste/Source ____1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐E ☐W	Date Well Installed 12/14/1999
Type of Well Well Code 11/mw	Location of Well Relative to Waste/Source u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm J. Flaminio Boart Longyear
Distance Well Is From Waste/Source Boundary ft.		

A. Protective pipe, top elevation ____ ft. MSL
B. Well casing, top elevation 97.43 ft. MSL
C. Land surface elevation 97.7 ft. MSL
D. Surface seal, bottom 96.7 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

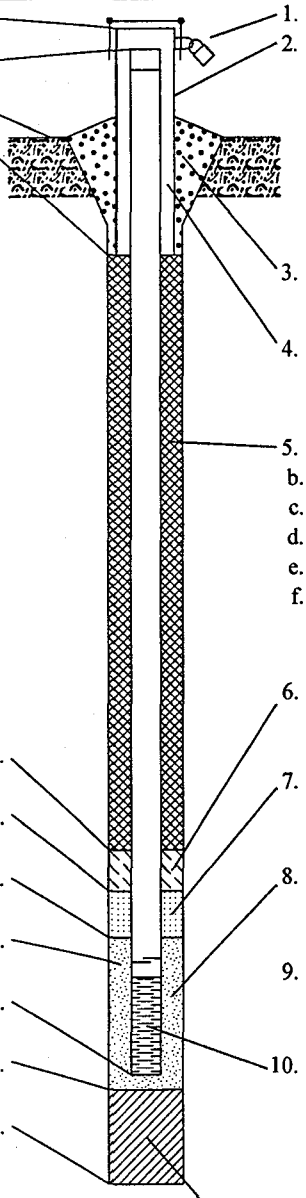
14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☒ 4 1
____ Other ☐ __

15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No
Describe ____

17. Source of water (attach analysis):
____

E. Bentonite seal, top 96.7 ft. MSL or 1.0 ft.
F. Fine sand, top ____ ft. MSL or ____ ft.
G. Filter pack, top 95.2 ft. MSL or 2.5 ft.
H. Screen joint, top 94.7 ft. MSL or 3.0 ft.
I. Well bottom 84.7 ft. MSL or 13.0 ft.
J. Filter pack, bottom 84.2 ft. MSL or 13.5 ft.
K. Borehole, bottom 84.2 ft. MSL or 13.5 ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.37 in.
N. I.D. well casing 2.06 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 9.0 in.
b. Length: 1.0 ft.
c. Material: Steel ☒ 0 4
____ Other ☐ __
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____
3. Surface seal: Bentonite ☐ 3 0
Concrete ☒ 0 1
____ Other ☐ __
4. Material between well casing and protective pipe:
Bentonite ☐ 3 0
NA Other ☒ __
5. Annular space seal: a. Granular Bentonite ☒ 3 3
b. ____Lbs/gal mud weight . Bentonite-sand slurry ☐ 3 5
c. ____Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
d. ____% Bentonite . . . Bentonite-cement grout ☐ 5 0
e. ____Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 0 1
Tremie pumped ☐ 0 2
Gravity ☒ 0 8
6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ 3 2
c. ____ Other ☐ __
7. Fine sand material: Manufacturer, product name and mesh siz
a. NA __
b. Volume added ____ ft^3
8. Filter pack material: Manufacturer, product name and mesh si:
a. 20/40 Badger Sand __
b. Volume added ____ ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3
Flush threaded PVC schedule 80 ☐ 2 4
____ Other ☐ __
10. Screen material: PVC __
a. Screen Type: Factory cut ☒ 1 1
Continuous slot ☐ 0 1
____ Other ☐ __
b. Manufacturer Boart Longyear
c. Slot size: 0.006 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☒ 1 4
____ Other ☐ __

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature [signature] Firm STS Consultants Ltd.
1035 Kepler Drive, Green Bay, Wisconsin
Tel: 920-468-1978
Fax: 920-468-3312

Please complete both Forms 4400-113A and 4400-113B and return to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 6-97

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	County	Well Name
One Hour Martinizing Dry Cleaning Service	Brown	MW-5

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	5		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☒	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☐	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well 34.0 min.

4. Depth of well (from top of well casing) 12.5 ft.

5. Inside diameter of well 2.06 in.

6. Volume of water in filter pack and well casing 4.0 gal.

7. Volume of water removed from well 4.0 gal.

8. Volume of water added (if any) gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	7.77 ft.	11.52 ft.
Date	b.	12/28/1999	12/28/1999
Time	c.	12:24 pm	12:58 pm
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe)	Clear ☒ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Kent Christen
STS Consultants Ltd.

17. Additional comments on development:
Groundwater monitoring well was surged and purged dry three times.

Facility Address or Owner/Responsible Party Address

Name: _____

Firm: One Hour Martinizing Dry Cleaning Service

Street: 1233 Military Avenue

City/State/Zip: Green Bay, Wisconsin

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Paul M. Garvey

Print Name: PAUL M. GARVEY

Firm: STS Consultants Ltd.

NOTE: See instructions for more information including a list of county codes and well type codes.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 5-97

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
One Hour Martinizing Dry Cleaning Service		MW-6

Boring Drilled By (Firm name and name of crew chief)	Date Drilling Started	Date Drilling Completed	Drilling Method
Boart Longyear - J. Flaminio - STS Project No. 24871XF	12/14/1999	12/14/1999	Hollow-stem Auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		MW-6	Feet MSL	96.9 Feet MSL	8.0 Inches

Boring Location or Local Grid Origin (Check if estimated: ☐)
State Plane P.C. 2-9 West Side-Fox River S/C/N
1/4 of 1/4 of Section , T N, R
Lat. ° ' "
Long. ° ' "
Local Grid Location (If applicable)
☐ N ☐ E
Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Brown	5	Green Bay

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
S-1 SS	24 / 6		0					<1						
			1.5	Fill: Grass - dark brown organic silt - topsoil										
S-2 SS	24 / 24	12						1						
			3.0	Fill: Dark brown silty clay and brown fine silty sand										
	12		4.5											
S-3 SS	24 / 12	9						1						
			6.0											
	6													
S-4 SS	24 / 24	8	7.5					1						
			9.0	Light brown to brown silty clay - little gray mottling - moist to wet - lacustrine	CL									
	48		10.5											
			12.0											
			13.5	End of Boring Boring advanced from 0.0 feet to 13.5 feet by hollow-stem auger Installed 2-inch diameter Schedule 40 PVC groundwater monitoring well at 13.0 feet										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel: 920-468-1978
	STS Consultants Ltd. 1035 Kepler Drive, Green Bay, WI 54311	Fax: 920-468-3312

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completions of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 6-97

Facility/Project Name One Hour Martinizing Dry Cleaning Service	Local Grid Location of Well ____ ft. ☐N. ☐S. ____ ft. ☐E. ☐W.	Well Name MW-6
Facility License, Permit or Monitoring No.	Grid Origin Location (Check if estimated: ☐) Lat. __° __' __" Long. __° __' __" or	Wis. Unique Well No / DNR Well Number
Facility ID	St. Plane P.C. 2-9 West ft. N, Side-Fox River ft. E. S/C/N	Date Well Installed 12/14/1999
Type of Well Well Code 11/mw	Section Location of Waste/Source __ 1/4 of __ 1/4 of Sec. __, T. __ N, R. __ ☐E ☐W	Well Installed By: (Person's Name and Firm J. Flaminio
Distance Well Is From Waste/Source Boundary ft.	Location of Well Relative to Waste/Source u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Boart Longyear

A. Protective pipe, top elevation ____ ft. MSL
B. Well casing, top elevation 96.65 ft. MSL
C. Land surface elevation 96.9 ft. MSL
D. Surface seal, bottom 95.9 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

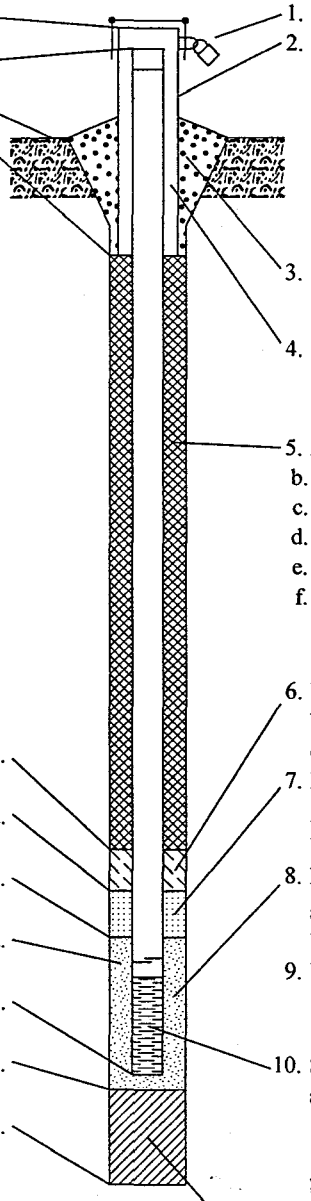
14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☒ 4 1
____ Other ☐ __

15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No
Describe ____

17. Source of water (attach analysis):
____

E. Bentonite seal, top 95.9 ft. MSL or 1.0 ft.
F. Fine sand, top ____ ft. MSL or ____ ft.
G. Filter pack, top 94.4 ft. MSL or 2.5 ft.
H. Screen joint, top 93.9 ft. MSL or 3.0 ft.
I. Well bottom 83.9 ft. MSL or 13.0 ft.
J. Filter pack, bottom 83.4 ft. MSL or 13.5 ft.
K. Borehole, bottom 83.4 ft. MSL or 13.5 ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.37 in.
N. I.D. well casing 2.06 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 9.0 in.
b. Length: 1.0 ft.
c. Material: Steel ☒ 0 4
____ Other ☐ __
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____
3. Surface seal: Bentonite ☐ 3 0
Concrete ☒ 0 1
____ Other ☐ __
4. Material between well casing and protective pipe:
Bentonite ☐ 3 0
NA Other ☒ __
5. Annular space seal: a. Granular Bentonite ☒ 3 3
b. ____ Lbs/gal mud weight . Bentonite-sand slurry ☐ 3 5
c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 5 0
e. ____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 0 1
Tremie pumped ☐ 0 2
Gravity ☒ 0 8
6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ 3 2
c. ____ Other ☐ __
7. Fine sand material: Manufacturer, product name and mesh siz
a. NA __
b. Volume added ____ ft^3
8. Filter pack material: Manufacturer, product name and mesh si:
a. 20/40 Badger Sand __
b. Volume added ____ ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3
Flush threaded PVC schedule 80 ☐ 2 4
____ Other ☐ __
10. Screen material: PVC __
a. Screen Type: Factory cut ☒ 1 1
Continuous slot ☐ 0 1
____ Other ☐ __
b. Manufacturer Boart Longyear
c. Slot size: 0.006 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☒ 1 4
____ Other ☐ __

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature ____ Firm STS Consultants Ltd.
1035 Kepler Drive, Green Bay, Wisconsin
Tel: 920-468-1978
Fax: 920-468-3312

Please complete both Forms 4400-113A and 4400-113B and return to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 6-97

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	County	Well Name
One Hour Martinizing Dry Cleaning Service	Brown	MW-6

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	5		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☒	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☐	51
pumped slowly	☐	50
other _____	☐	__

3. Time spent developing well 31.0 min.

4. Depth of well (from top of well casing) 12.5 ft.

5. Inside diameter of well 2.06 in.

6. Volume of water in filter pack and well casing 4.0 gal.

7. Volume of water removed from well 4.0 gal.

8. Volume of water added (if any) gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	7.45 ft.	11.55 ft.
Date	b.	12/28/1999	12/28/1999
Time	c.	12:33 pm	01:04 pm
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15	Clear ☒ 20 Turbid ☐ 25
		(Describe)	(Describe)
14. Total suspended solids		mg/l	mg/l
15. COD		mg/l	mg/l

Fill in if drilling fluids were used and well is at solid waste facility:

16. Well developed by: Person's Name and Firm
Kent Christen
STS Consultants Ltd.

17. Additional comments on development:
Groundwater monitoring well was surged and purged dry three times.

Facility Address or Owner/Responsible Party Address

Name: _____

Firm: One Hour Martinizing Dry Cleaning Service

Street: 1233 Military Avenue

City/State/Zip: Green Bay, Wisconsin

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Paul M. Garvey

Print Name: PAUL M. GARVEY

Firm: STS Consultants Ltd.

NOTE: See instructions for more information including a list of county codes and well type codes.

APPENDIX B

Robert E. Lee & Associates, Inc. Laboratory Reports

Robert E. Lee & Associates, Inc.

Engineering, Surveying, Laboratory Services
2825 S. Webster Ave.
P.O. Box 2100
Green Bay, WI 54306-2100
Phone: (920) 336-6338
Fax: (920) 336-9141
E-Mail: rel@releeinc.com

Milwaukee Area
830 Armour Rd.
Oconomowoc, WI 53066
Phone: (262)569-8893 1-800-775-8893
Fax: (262)569-7995
Wisconsin Certification Number: 405043870

PAUL GARVEY
STS CONSULTANTS LTD - GREEN BAY
1035 KEPLER DR
GREEN BAY WI 54311

Phone:	(920)468-1978
Fax:	(920)468-3312
Client ID:	000875100
Contact ID:	3487

Sample Information		Number of pages attached	
Report Date:	1/28/2000	Coversheet:	1
Chain Number:	75681	Analyst generated narratives:	3
Project No:	24871XF	Certificate of Analysis:	12
Project Name:	MILITARY-1 HR MARTINIZING	Flag description:	1
Receive Date:	1/04/2000	Invoice:	2
Sample Date:	1/04/2000	Chain of Custody:	1
		DNR Form:	0
		Sample non-compliance Report	0
		Subcontracted Lab Report:	0
		Miscellaneous:	0
		Total pages:	**20**

Attest: Steve Heraf

Please visit our new Internet homepage at
www.releeinc.com

Solid sample results are reported on a dry weight basis.

ROBERT E. LEE & ASSOCIATES, INC

CLIENT: STS CONSULTANTS LTD - GREEN BAY
PROJECT: 24871XF/MILITARY-1 HR MARTINIZING
CHAIN NUMBER: 75681

NARRATIVE

This narrative is relevant to samples MW-1, MW-2, MW-3, MW-4, MW-5, MW-6 and PZ-1.

The samples were prepared by SW-846 Method 3810 and analyzed for light hydrocarbons following SW-846 Method 8015.

The sample used for the matrix spikes is not listed above. The following is a summary of the quality control results:

1. The reported compounds were not detected in the method blank.

2. The precision between the matrix spike recovery and the matrix spike duplicate recovery was within laboratory limits for each of the reported compounds.

3. The matrix spike recovery was within laboratory limits for each of the reported compounds.

4. The matrix spike duplicate recovery was within laboratory limits for each of the reported compounds.

5. The initial and final check standards verified the calibration curve for each of the reported compounds.

Steve Heraly
Laboratory Coordinator
Ivy

ROBERT E. LEE & ASSOCIATES, INC.

CLIENT:	STS CONSULTANTS LTD - GREEN BAY
PROJECT:	24871XF / MILITARY-1 HR MARTINIZING
CHAIN NUMBER:	75681

NARRATIVE

This narrative is relevant to sample MW-1.

The sample was analyzed for volatile organic compounds following SW-846 Method 8260.

The following is a summary of the quality control results:

1. The reported compounds were not detected in the method blank.

2. The precision between the matrix spike recovery and the matrix spike duplicate recovery was within laboratory limits for each of the reported compounds.

3. The matrix spike recovery was within laboratory limits for each of the reported compounds.

4. The matrix spike duplicate recovery was within laboratory limits for each of the reported compounds.

5. The surrogate recovery was within laboratory limits for each of the three surrogates spiked.

6. The initial and final calibration check standards verified the calibration curve for each of the reported compounds.

7. The result for trichloroethene was diluted 1 to 50. The result for tetrachloroethene was diluted 1 to 5000. The tetrachloroethene result was analyzed over the hold date. The sample was analyzed twice within the hold time. On January 13, 2000 the sample was not diluted and the tetrachloroethene result was 1650 ug/L. This result was above the calibration limits and looked to have flooded the detector. On January 15, 2000 the tetrachloroethene result was 116000 ug/L which was diluted 1 to 50 and this result was also above the calibration limit. It is believed that the January 15 result was too high due to a linearity problem at that high of a concentration.

Steve Heraly
Laboratory Coordinator
JF

ROBERT E. LEE & ASSOCIATES, INC.

CLIENT:	STS CONSULTANTS LTD - GREEN BAY
PROJECT:	24871XF / MILITARY - 1 HR MARTINIZING
CHAIN NUMBER:	75681

NARRATIVE

This narrative is relevant to samples MW-2, MW-3, MW-4, MW-6, PZ-1, TRIP BLANK and MW-5.

The samples were analyzed for volatile organic compounds following SW-846 Method 8260.

The following is a summary of the quality control results:

1. The reported compounds were not detected in the method blank.

2. The precision between the matrix spike recovery and the matrix spike duplicate recovery was within laboratory limits for each of the reported compounds.

3. The matrix spike recovery was within laboratory limits for each of the reported compounds.

4. The matrix spike duplicate recovery was within laboratory limits for each of the reported compounds.

5. The surrogate recovery for all samples was within laboratory limits for each of the three surrogates spiked.

6. The initial and final calibration check standards verified the calibration curve for each of the reported compounds.

7. The result for tetrachloroethene in sample MW-6 was diluted 1 to 50.

Steve Heraly
Laboratory Coordinator
JF

Robert E. Lee & Associates, Inc

Wisconsin Certification Number: 405043870
Certificate of Analysis Report

STS Consultants Ltd - Green Bay
1035 Kepler Dr

Green Bay, WI 54311
Project Number: 24871XF
Project Name: MILITARY-1 HR MARTINIZING

Attn: Paul Garvey
Phone: (920)468-1978
Fax: (920)468-3312
Client ID: 000875100
Chain: 75681
Report Date: 1/28/2000

Method	Parameter Name	Result	Units	Flag	MDL	PQL	Anl Date	Analyst
Lab No.	**Collect Date**	**Sample ID**						
00REL000108	**1/04/2000**	**MW-1**						
EPA-353.2	Nitrogen-Nitrate/Nitrite	11	mg/L		0.28	0.93	1/07/2000	CLS
SW-846-8015B	Ethane	<14	ug/L		14	47	1/07/2000	JHI
SW-846-8015B	Ethene	<14	ug/L		14	47	1/07/2000	JHI
SW-846-8015B	Methane	1100	ug/L		7.2	24	1/07/2000	JHI
SW-846-8260B	1,1,1,2-Tetrachloroethane	<0.19	ug/L		0.19	0.63	1/13/2000	JF
SW-846-8260B	1,1,1-Trichloroethane	<0.3	ug/L		0.3	1.0	1/13/2000	JF
SW-846-8260B	1,1,2,2-Tetrachloroethane	<0.52	ug/L		0.52	1.7	1/13/2000	JF
SW-846-8260B	1,1,2-Trichloroethane	<0.2	ug/L		0.2	0.67	1/13/2000	JF
SW-846-8260B	1,1-Dichloroethane	<0.15	ug/L		0.15	0.49	1/13/2000	JF
SW-846-8260B	1,1-Dichloroethene	0.38	ug/L		0.11	0.37	1/13/2000	JF
SW-846-8260B	1,1-Dichloropropene	<0.25	ug/L		0.25	0.84	1/13/2000	JF
SW-846-8260B	1,2,3-Trichlorobenzene	<0.052	ug/L		0.052	0.17	1/13/2000	JF
SW-846-8260B	1,2,3-Trichloropropane	<0.99	ug/L		0.99	3.3	1/13/2000	JF
SW-846-8260B	1,2,4-Trichlorobenzene	<0.050	ug/L		0.050	0.17	1/13/2000	JF
SW-846-8260B	1,2,4-Trimethylbenzene	<0.46	ug/L		0.46	1.5	1/13/2000	JF
SW-846-8260B	1,2-Dibromo-3-chloropropane	<0.23	ug/L		0.23	0.77	1/13/2000	JF
SW-846-8260B	1,2-Dibromoethane	<0.4	ug/L		0.4	1.3	1/13/2000	JF
SW-846-8260B	1,2-Dichlorobenzene	<0.036	ug/L		0.036	0.12	1/13/2000	JF
SW-846-8260B	1,2-Dichloroethane	<0.35	ug/L		0.35	1.2	1/13/2000	JF
SW-846-8260B	1,2-Dichloropropane	<0.094	ug/L		0.094	0.31	1/13/2000	JF
SW-846-8260B	1,3,5-Trimethylbenzene	<0.35	ug/L		0.35	1.2	1/13/2000	JF
SW-846-8260B	1,3-Dichlorobenzene	<0.49	ug/L		0.49	1.6	1/13/2000	JF
SW-846-8260B	1,3-Dichloropropane	<0.26	ug/L		0.26	0.87	1/13/2000	JF
SW-846-8260B	1,4-Dichlorobenzene	<0.45	ug/L		0.45	1.5	1/13/2000	JF
SW-846-8260B	2,2-Dichloropropane	<0.78	ug/L		0.78	2.6	1/13/2000	JF
SW-846-8260B	2-Chlorotoluene	<0.25	ug/L		0.25	0.83	1/13/2000	JF
SW-846-8260B	4-Chlorotoluene	<0.65	ug/L		0.65	2.2	1/13/2000	JF
SW-846-8260B	Benzene	<0.19	ug/L		0.19	0.63	1/13/2000	JF
SW-846-8260B	Bromobenzene	<0.34	ug/L		0.34	1.1	1/13/2000	JF
SW-846-8260B	Bromochloromethane	<0.17	ug/L		0.17	0.55	1/13/2000	JF
SW-846-8260B	Bromodichloromethane	2.4	ug/L		0.25	0.83	1/13/2000	JF
SW-846-8260B	Bromofluorobenzene-Surrogate	89	% Rec				1/13/2000	JF
SW-846-8260B	Bromoform	<0.45	ug/L		0.45	1.5	1/13/2000	JF
SW-846-8260B	Bromomethane	<0.34	ug/L		0.34	1.1	1/13/2000	JF
SW-846-8260B	Carbon tetrachloride	<0.23	ug/L		0.23	0.76	1/13/2000	JF
SW-846-8260B	Chlorobenzene	<0.096	ug/L		0.096	0.32	1/13/2000	JF
SW-846-8260B	Chloroethane	<0.5	ug/L		0.5	1.7	1/13/2000	JF
SW-846-8260B	Chloroform	<0.18	ug/L		0.18	0.59	1/13/2000	JF
SW-846-8260B	Chloromethane	<0.21	ug/L		0.21	0.71	1/13/2000	JF
SW-846-8260B	cis-1,2-Dichloroethene	62	ug/L		0.19	0.62	1/13/2000	JF
SW-846-8260B	cis-1,3-Dichloropropene	<0.096	ug/L		0.096	0.32	1/13/2000	JF
SW-846-8260B	Dibromochloromethane	<0.19	ug/L		0.19	0.64	1/13/2000	JF
SW-846-8260B	Dibromofluoromethane-Surrogate	89	% Rec				1/13/2000	JF
SW-846-8260B	Dibromomethane	<0.33	ug/L		0.33	1.1	1/13/2000	JF
SW-846-8260B	Dichlorodifluoromethane	<0.27	ug/L		0.27	0.91	1/13/2000	JF

Wisconsin Certification Number: 405043870
Certificate of Analysis Report

STS Consultants Ltd - Green Bay
1035 Kepler Dr

Green Bay, WI 54311
Project Number: 24871XF
Project Name: MILITARY-1 HR MARTINIZING

Attn: Paul Garvey
Phone: (920)468-1978
Fax: (920)468-3312
Client ID: 000875100
Chain: 75681
Report Date: 1/28/2000

Method	Parameter Name	Result	Units	Flag	MDL	PQL	Anl Date	Analyst
Lab No.	**Collect Date** **Sample ID**							
SW-846-8260B	Ethylbenzene	<0.19	ug/L		0.19	0.65	1/13/2000	JF
SW-846-8260B	Hexachlorobutadiene	<0.074	ug/L		0.074	0.25	1/13/2000	JF
SW-846-8260B	Isopropylbenzene	<0.23	ug/L		0.23	0.77	1/13/2000	JF
SW-846-8260B	Methylene chloride	<0.25	ug/L		0.25	0.85	1/13/2000	JF
SW-846-8260B	n-Butylbenzene	<0.040	ug/L		0.040	0.13	1/13/2000	JF
SW-846-8260B	n-Propylbenzene	<0.36	ug/L		0.36	1.2	1/13/2000	JF
SW-846-8260B	Naphthalene	<0.082	ug/L		0.082	0.27	1/13/2000	JF
SW-846-8260B	p-Isopropyltoluene	<0.12	ug/L		0.12	0.41	1/13/2000	JF
SW-846-8260B	sec-Butylbenzene	<0.35	ug/L		0.35	1.2	1/13/2000	JF
SW-846-8260B	Styrene	<0.084	ug/L		0.084	0.28	1/13/2000	JF
SW-846-8260B	tert-Butylbenzene	<0.28	ug/L		0.28	0.94	1/13/2000	JF
SW-846-8260B	Tetrachloroethene	13400	ug/L		1680	5600	1/19/2000	JF
SW-846-8260B	Toluene	0.13	ug/L	13	0.11	0.37	1/13/2000	JF
SW-846-8260B	Toluene-d8-Surrogate	107	% Rec				1/13/2000	JF
SW-846-8260B	trans-1,2-Dichloroethene	0.33	ug/L	13	0.21	0.7	1/13/2000	JF
SW-846-8260B	trans-1,3-Dichloropropene	<0.14	ug/L		0.14	0.45	1/13/2000	JF
SW-846-8260B	Trichloroethene	85	ug/L		11	35	1/15/2000	JF
SW-846-8260B	Trichlorofluoromethane	<0.49	ug/L		0.49	1.6	1/13/2000	JF
SW-846-8260B	Vinyl chloride	<0.14	ug/L		0.14	0.47	1/13/2000	JF
SW-846-8260B	Xylenes-Total	<0.39	ug/L		0.39	1.3	1/13/2000	JF
SW-846-9038	Sulfate	40	mg/L		1.0	3.3	1/07/2000	DEY
SW-846-9251	Chloride	72	mg/L		0.75	2.5	1/05/1999	CLS
00REL000109	**1/04/2000** **MW-2**							
EPA-353.2	Nitrogen-Nitrate/Nitrite	<0.14	mg/L		0.14	0.47	1/07/2000	CLS
SW-846-8015B	Ethane	<14	ug/L		14	47	1/07/2000	JHI
SW-846-8015B	Ethene	<14	ug/L		14	47	1/07/2000	JHI
SW-846-8015B	Methane	11	ug/L	13	7.2	24	1/07/2000	JHI
SW-846-8260B	1,1,1,2-Tetrachloroethane	<0.19	ug/L		0.19	0.63	1/13/2000	JF
SW-846-8260B	1,1,1-Trichloroethane	<0.3	ug/L		0.3	1.0	1/13/2000	JF
SW-846-8260B	1,1,2,2-Tetrachloroethane	<0.52	ug/L		0.52	1.7	1/13/2000	JF
SW-846-8260B	1,1,2-Trichloroethane	<0.2	ug/L		0.2	0.67	1/13/2000	JF
SW-846-8260B	1,1-Dichloroethane	<0.15	ug/L		0.15	0.49	1/13/2000	JF
SW-846-8260B	1,1-Dichloroethene	<0.11	ug/L		0.11	0.37	1/13/2000	JF
SW-846-8260B	1,1-Dichloropropene	<0.25	ug/L		0.25	0.84	1/13/2000	JF
SW-846-8260B	1,2,3-Trichlorobenzene	<0.052	ug/L		0.052	0.17	1/13/2000	JF
SW-846-8260B	1,2,3-Trichloropropane	<0.99	ug/L		0.99	3.3	1/13/2000	JF
SW-846-8260B	1,2,4-Trichlorobenzene	<0.050	ug/L		0.050	0.17	1/13/2000	JF
SW-846-8260B	1,2,4-Trimethylbenzene	<0.46	ug/L		0.46	1.5	1/13/2000	JF
SW-846-8260B	1,2-Dibromo-3-chloropropane	<0.23	ug/L		0.23	0.77	1/13/2000	JF
SW-846-8260B	1,2-Dibromoethane	<0.4	ug/L		0.4	1.3	1/13/2000	JF
SW-846-8260B	1,2-Dichlorobenzene	<0.036	ug/L		0.036	0.12	1/13/2000	JF
SW-846-8260B	1,2-Dichloroethane	<0.35	ug/L		0.35	1.2	1/13/2000	JF
SW-846-8260B	1,2-Dichloropropane	<0.094	ug/L		0.094	0.31	1/13/2000	JF
SW-846-8260B	1,3,5-Trimethylbenzene	<0.35	ug/L		0.35	1.2	1/13/2000	JF
SW-846-8260B	1,3-Dichlorobenzene	<0.49	ug/L		0.49	1.6	1/13/2000	JF

Wisconsin Certification Number: 405043870
Certificate of Analysis Report

STS Consultants Ltd - Green Bay
1035 Kepler Dr

Green Bay, WI 54311
Project Number: 24871XF
Project Name: MILITARY-1 HR MARTINIZING

Attn: Paul Garvey
Phone: (920)468-1978
Fax: (920)468-3312
Client ID: 000875100
Chain: 75681
Report Date: 1/28/2000

Method	Parameter Name	Result	Units	Flag	MDL	PQL	Anl.Date	Analyst
Lab No.	**Collect Date** **Sample ID**							
SW-846-8260B	1,3-Dichloropropane	<0.26	ug/L		0.26	0.87	1/13/2000	JF
SW-846-8260B	1,4-Dichlorobenzene	<0.45	ug/L		0.45	1.5	1/13/2000	JF
SW-846-8260B	2,2-Dichloropropane	<0.78	ug/L		0.78	2.6	1/13/2000	JF
SW-846-8260B	2-Chlorotoluene	<0.25	ug/L		0.25	0.83	1/13/2000	JF
SW-846-8260B	4-Chlorotoluene	<0.65	ug/L		0.65	2.2	1/13/2000	JF
SW-846-8260B	Benzene	<0.19	ug/L		0.19	0.63	1/13/2000	JF
SW-846-8260B	Bromobenzene	<0.34	ug/L		0.34	1.1	1/13/2000	JF
SW-846-8260B	Bromochloromethane	<0.17	ug/L		0.17	0.55	1/13/2000	JF
SW-846-8260B	Bromodichloromethane	<0.25	ug/L		0.25	0.83	1/13/2000	JF
SW-846-8260B	Bromofluorobenzene-Surrogate	94	% Rec				1/13/2000	JF
SW-846-8260B	Bromoform	<0.45	ug/L		0.45	1.5	1/13/2000	JF
SW-846-8260B	Bromomethane	<0.34	ug/L		0.34	1.1	1/13/2000	JF
SW-846-8260B	Carbon tetrachloride	<0.23	ug/L		0.23	0.76	1/13/2000	JF
SW-846-8260B	Chlorobenzene	<0.096	ug/L		0.096	0.32	1/13/2000	JF
SW-846-8260B	Chloroethane	<0.5	ug/L		0.5	1.7	1/13/2000	JF
SW-846-8260B	Chloroform	<0.18	ug/L		0.18	0.59	1/13/2000	JF
SW-846-8260B	Chloromethane	<0.21	ug/L		0.21	0.71	1/13/2000	JF
SW-846-8260B	cis-1,2-Dichloroethene	<0.19	ug/L		0.19	0.62	1/13/2000	JF
SW-846-8260B	cis-1,3-Dichloropropene	<0.096	ug/L		0.096	0.32	1/13/2000	JF
SW-846-8260B	Dibromochloromethane	<0.19	ug/L		0.19	0.64	1/13/2000	JF
SW-846-8260B	Dibromofluoromethane-Surrogate	90	% Rec				1/13/2000	JF
SW-846-8260B	Dibromomethane	<0.33	ug/L		0.33	1.1	1/13/2000	JF
SW-846-8260B	Dichlorodifluoromethane	<0.27	ug/L		0.27	0.91	1/13/2000	JF
SW-846-8260B	Ethylbenzene	<0.19	ug/L		0.19	0.65	1/13/2000	JF
SW-846-8260B	Hexachlorobutadiene	<0.074	ug/L		0.074	0.25	1/13/2000	JF
SW-846-8260B	Isopropylbenzene	<0.23	ug/L		0.23	0.77	1/13/2000	JF
SW-846-8260B	Methylene chloride	<0.25	ug/L		0.25	0.85	1/13/2000	JF
SW-846-8260B	n-Butylbenzene	<0.040	ug/L		0.040	0.13	1/13/2000	JF
SW-846-8260B	n-Propylbenzene	<0.36	ug/L		0.36	1.2	1/13/2000	JF
SW-846-8260B	Naphthalene	<0.082	ug/L		0.082	0.27	1/13/2000	JF
SW-846-8260B	p-Isopropyltoluene	<0.12	ug/L		0.12	0.41	1/13/2000	JF
SW-846-8260B	sec-Butylbenzene	<0.35	ug/L		0.35	1.2	1/13/2000	JF
SW-846-8260B	Styrene	<0.084	ug/L		0.084	0.28	1/13/2000	JF
SW-846-8260B	tert-Butylbenzene	<0.28	ug/L		0.28	0.94	1/13/2000	JF
SW-846-8260B	Tetrachloroethene	<0.34	ug/L		0.34	1.1	1/13/2000	JF
SW-846-8260B	Toluene	<0.11	ug/L		0.11	0.37	1/13/2000	JF
SW-846-8260B	Toluene-d8-Surrogate	109	% Rec				1/13/2000	JF
SW-846-8260B	trans-1,2-Dichloroethene	<0.21	ug/L		0.21	0.7	1/13/2000	JF
SW-846-8260B	trans-1,3-Dichloropropene	<0.14	ug/L		0.14	0.45	1/13/2000	JF
SW-846-8260B	Trichloroethene	<0.21	ug/L		0.21	0.71	1/13/2000	JF
SW-846-8260B	Trichlorofluoromethane	<0.49	ug/L		0.49	1.6	1/13/2000	JF
SW-846-8260B	Vinyl chloride	<0.14	ug/L		0.14	0.47	1/13/2000	JF
SW-846-8260B	Xylenes-Total	<0.39	ug/L		0.39	1.3	1/13/2000	JF
SW-846-9038	Sulfate	32	mg/L		0.52	1.7	1/10/2000	DEY
SW-846-9251	Chloride	17	mg/L		0.75	2.5	1/05/1999	CLS

Wisconsin Certification Number: 405043870
Certificate of Analysis Report

STS Consultants Ltd - Green Bay
1035 Kepler Dr

Green Bay, WI 54311
Project Number: 24871XF
Project Name: MILITARY-1 HR MARTINIZING

Attn: Paul Garvey
Phone: (920)468-1978
Fax: (920)468-3312
Client ID: 000875100
Chain: 75681
Report Date: 1/28/2000

Method	Parameter Name	Result	Units	Flag	MDL	PQL	Anl.Date	Analyst
Lab No.	**Collect Date** **Sample ID**							
00REL000110	**1/04/2000** **MW-3**							
EPA-353.2	Nitrogen-Nitrate/Nitrite	16	mg/L		0.42	1.4	1/07/2000	CLS
SW-846-8015B	Ethane	<14	ug/L		14	47	1/07/2000	JHI
SW-846-8015B	Ethene	<14	ug/L		14	47	1/07/2000	JHI
SW-846-8015B	Methane	<7.2	ug/L		7.2	24	1/07/2000	JHI
SW-846-8260B	1,1,1,2-Tetrachloroethane	<0.19	ug/L		0.19	0.63	1/13/2000	JF
SW-846-8260B	1,1,1-Trichloroethane	<0.3	ug/L		0.3	1.0	1/13/2000	JF
SW-846-8260B	1,1,2,2-Tetrachloroethane	<0.52	ug/L		0.52	1.7	1/13/2000	JF
SW-846-8260B	1,1,2-Trichloroethane	<0.2	ug/L		0.2	0.67	1/13/2000	JF
SW-846-8260B	1,1-Dichloroethane	<0.15	ug/L		0.15	0.49	1/13/2000	JF
SW-846-8260B	1,1-Dichloroethene	<0.11	ug/L		0.11	0.37	1/13/2000	JF
SW-846-8260B	1,1-Dichloropropene	<0.25	ug/L		0.25	0.84	1/13/2000	JF
SW-846-8260B	1,2,3-Trichlorobenzene	<0.052	ug/L		0.052	0.17	1/13/2000	JF
SW-846-8260B	1,2,3-Trichloropropane	<0.99	ug/L		0.99	3.3	1/13/2000	JF
SW-846-8260B	1,2,4-Trichlorobenzene	<0.050	ug/L		0.050	0.17	1/13/2000	JF
SW-846-8260B	1,2,4-Trimethylbenzene	<0.46	ug/L		0.46	1.5	1/13/2000	JF
SW-846-8260B	1,2-Dibromo-3-chloropropane	<0.23	ug/L		0.23	0.77	1/13/2000	JF
SW-846-8260B	1,2-Dibromoethane	<0.4	ug/L		0.4	1.3	1/13/2000	JF
SW-846-8260B	1,2-Dichlorobenzene	<0.036	ug/L		0.036	0.12	1/13/2000	JF
SW-846-8260B	1,2-Dichloroethane	<0.35	ug/L		0.35	1.2	1/13/2000	JF
SW-846-8260B	1,2-Dichloropropane	<0.094	ug/L		0.094	0.31	1/13/2000	JF
SW-846-8260B	1,3,5-Trimethylbenzene	<0.35	ug/L		0.35	1.2	1/13/2000	JF
SW-846-8260B	1,3-Dichlorobenzene	<0.49	ug/L		0.49	1.6	1/13/2000	JF
SW-846-8260B	1,3-Dichloropropane	<0.26	ug/L		0.26	0.87	1/13/2000	JF
SW-846-8260B	1,4-Dichlorobenzene	<0.45	ug/L		0.45	1.5	1/13/2000	JF
SW-846-8260B	2,2-Dichloropropane	<0.78	ug/L		0.78	2.6	1/13/2000	JF
SW-846-8260B	2-Chlorotoluene	<0.25	ug/L		0.25	0.83	1/13/2000	JF
SW-846-8260B	4-Chlorotoluene	<0.65	ug/L		0.65	2.2	1/13/2000	JF
SW-846-8260B	Benzene	<0.19	ug/L		0.19	0.63	1/13/2000	JF
SW-846-8260B	Bromobenzene	<0.34	ug/L		0.34	1.1	1/13/2000	JF
SW-846-8260B	Bromochloromethane	<0.17	ug/L		0.17	0.55	1/13/2000	JF
SW-846-8260B	Bromodichloromethane	<0.25	ug/L		0.25	0.83	1/13/2000	JF
SW-846-8260B	Bromofluorobenzene-Surrogate	93	% Rec				1/13/2000	JF
SW-846-8260B	Bromoform	<0.45	ug/L		0.45	1.5	1/13/2000	JF
SW-846-8260B	Bromomethane	<0.34	ug/L		0.34	1.1	1/13/2000	JF
SW-846-8260B	Carbon tetrachloride	<0.23	ug/L		0.23	0.76	1/13/2000	JF
SW-846-8260B	Chlorobenzene	<0.096	ug/L		0.096	0.32	1/13/2000	JF
SW-846-8260B	Chloroethane	<0.5	ug/L		0.5	1.7	1/13/2000	JF
SW-846-8260B	Chloroform	<0.18	ug/L		0.18	0.59	1/13/2000	JF
SW-846-8260B	Chloromethane	<0.21	ug/L		0.21	0.71	1/13/2000	JF
SW-846-8260B	cis-1,2-Dichloroethene	1.8	ug/L		0.19	0.62	1/13/2000	JF
SW-846-8260B	cis-1,3-Dichloropropene	<0.096	ug/L		0.096	0.32	1/13/2000	JF
SW-846-8260B	Dibromochloromethane	<0.19	ug/L		0.19	0.64	1/13/2000	JF
SW-846-8260B	Dibromofluoromethane-Surrogate	89	% Rec				1/13/2000	JF
SW-846-8260B	Dibromomethane	<0.33	ug/L		0.33	1.1	1/13/2000	JF
SW-846-8260B	Dichlorodifluoromethane	<0.27	ug/L		0.27	0.91	1/13/2000	JF

Robert E. Lee & Associates, Inc
Wisconsin Certification Number: 405043870
Certificate of Analysis Report

STS Consultants Ltd - Green Bay
1035 Kepler Dr

Green Bay, WI 54311
Project Number: 24871XF
Project Name: MILITARY-1 HR MARTINIZING

Attn: Paul Garvey
Phone: (920)468-1978
Fax: (920)468-3312
Client ID: 000875100
Chain: 75681
Report Date: 1/28/2000

Method	Parameter Name	Result	Units	Flag	MDL	PQL	Anl.Date	Analyst
Lab No.	**Collect Date** **Sample ID**							
SW-846-8260B	Ethylbenzene	<0.19	ug/L		0.19	0.65	1/13/2000	JF
SW-846-8260B	Hexachlorobutadiene	<0.074	ug/L		0.074	0.25	1/13/2000	JF
SW-846-8260B	Isopropylbenzene	<0.23	ug/L		0.23	0.77	1/13/2000	JF
SW-846-8260B	Methylene chloride	<0.25	ug/L		0.25	0.85	1/13/2000	JF
SW-846-8260B	n-Butylbenzene	<0.040	ug/L		0.040	0.13	1/13/2000	JF
SW-846-8260B	n-Propylbenzene	<0.36	ug/L		0.36	1.2	1/13/2000	JF
SW-846-8260B	Naphthalene	<0.082	ug/L		0.082	0.27	1/13/2000	JF
SW-846-8260B	p-Isopropyltoluene	<0.12	ug/L		0.12	0.41	1/13/2000	JF
SW-846-8260B	sec-Butylbenzene	<0.35	ug/L		0.35	1.2	1/13/2000	JF
SW-846-8260B	Styrene	<0.084	ug/L		0.084	0.28	1/13/2000	JF
SW-846-8260B	tert-Butylbenzene	<0.28	ug/L		0.28	0.94	1/13/2000	JF
SW-846-8260B	Tetrachloroethene	489	ug/L		0.34	1.1	1/13/2000	JF
SW-846-8260B	Toluene	<0.11	ug/L		0.11	0.37	1/13/2000	JF
SW-846-8260B	Toluene-d8-Surrogate	108	% Rec				1/13/2000	JF
SW-846-8260B	trans-1,2-Dichloroethene	<0.21	ug/L		0.21	0.7	1/13/2000	JF
SW-846-8260B	trans-1,3-Dichloropropene	<0.14	ug/L		0.14	0.45	1/13/2000	JF
SW-846-8260B	Trichloroethene	5.9	ug/L		0.21	0.71	1/13/2000	JF
SW-846-8260B	Trichlorofluoromethane	<0.49	ug/L		0.49	1.6	1/13/2000	JF
SW-846-8260B	Vinyl chloride	<0.14	ug/L		0.14	0.47	1/13/2000	JF
SW-846-8260B	Xylenes-Total	<0.39	ug/L		0.39	1.3	1/13/2000	JF
SW-846-9038	Sulfate	38	mg/L		0.52	1.7	1/10/2000	DEY
SW-846-9251	Chloride	47	mg/L		0.75	2.5	1/05/1999	CLS
00REL000111	**1/04/2000** **MW-4**							
EPA-353.2	Nitrogen-Nitrate/Nitrite	<0.14	mg/L		0.14	0.47	1/07/2000	CLS
SW-846-8015B	Ethane	<14	ug/L		14	47	1/07/2000	JHI
SW-846-8015B	Ethene	<14	ug/L		14	47	1/07/2000	JHI
SW-846-8015B	Methane	11	ug/L	13	7.2	24	1/07/2000	JHI
SW-846-8260B	1,1,1,2-Tetrachloroethane	<0.19	ug/L		0.19	0.63	1/14/2000	JF
SW-846-8260B	1,1,1-Trichloroethane	<0.3	ug/L		0.3	1.0	1/14/2000	JF
SW-846-8260B	1,1,2,2-Tetrachloroethane	<0.52	ug/L		0.52	1.7	1/14/2000	JF
SW-846-8260B	1,1,2-Trichloroethane	<0.2	ug/L		0.2	0.67	1/14/2000	JF
SW-846-8260B	1,1-Dichloroethane	<0.15	ug/L		0.15	0.49	1/14/2000	JF
SW-846-8260B	1,1-Dichloroethene	<0.11	ug/L		0.11	0.37	1/14/2000	JF
SW-846-8260B	1,1-Dichloropropene	<0.25	ug/L		0.25	0.84	1/14/2000	JF
SW-846-8260B	1,2,3-Trichlorobenzene	<0.052	ug/L		0.052	0.17	1/14/2000	JF
SW-846-8260B	1,2,3-Trichloropropane	<0.99	ug/L		0.99	3.3	1/14/2000	JF
SW-846-8260B	1,2,4-Trichlorobenzene	<0.050	ug/L		0.050	0.17	1/14/2000	JF
SW-846-8260B	1,2,4-Trimethylbenzene	<0.46	ug/L		0.46	1.5	1/14/2000	JF
SW-846-8260B	1,2-Dibromo-3-chloropropane	<0.23	ug/L		0.23	0.77	1/14/2000	JF
SW-846-8260B	1,2-Dibromoethane	<0.4	ug/L		0.4	1.3	1/14/2000	JF
SW-846-8260B	1,2-Dichlorobenzene	<0.036	ug/L		0.036	0.12	1/14/2000	JF
SW-846-8260B	1,2-Dichloroethane	<0.35	ug/L		0.35	1.2	1/14/2000	JF
SW-846-8260B	1,2-Dichloropropane	<0.094	ug/L		0.094	0.31	1/14/2000	JF
SW-846-8260B	1,3,5-Trimethylbenzene	<0.35	ug/L		0.35	1.2	1/14/2000	JF
SW-846-8260B	1,3-Dichlorobenzene	<0.49	ug/L		0.49	1.6	1/14/2000	JF

Wisconsin Certification Number: 405043870
Certificate of Analysis Report

STS Consultants Ltd - Green Bay
1035 Kepler Dr

Green Bay, WI 54311
Project Number: 24871XF
Project Name: MILITARY-1 HR MARTINIZING

Attn: Paul Garvey
Phone: (920)468-1978
Fax: (920)468-3312
Client ID: 000875100
Chain: 75681
Report Date: 1/28/2000

Method	Parameter Name	Result	Units	Flag	MDL	PQL	Anl Date	Analyst
Lab No.	**Collect Date** **Sample ID**							
SW-846-8260B	1,3-Dichloropropane	<0.26	ug/L		0.26	0.87	1/14/2000	JF
SW-846-8260B	1,4-Dichlorobenzene	<0.45	ug/L		0.45	1.5	1/14/2000	JF
SW-846-8260B	2,2-Dichloropropane	<0.78	ug/L		0.78	2.6	1/14/2000	JF
SW-846-8260B	2-Chlorotoluene	<0.25	ug/L		0.25	0.83	1/14/2000	JF
SW-846-8260B	4-Chlorotoluene	<0.65	ug/L		0.65	2.2	1/14/2000	JF
SW-846-8260B	Benzene	<0.19	ug/L		0.19	0.63	1/14/2000	JF
SW-846-8260B	Bromobenzene	<0.34	ug/L		0.34	1.1	1/14/2000	JF
SW-846-8260B	Bromochloromethane	<0.17	ug/L		0.17	0.55	1/14/2000	JF
SW-846-8260B	Bromodichloromethane	<0.25	ug/L		0.25	0.83	1/14/2000	JF
SW-846-8260B	Bromofluorobenzene-Surrogate	90	% Rec				1/14/2000	JF
SW-846-8260B	Bromoform	<0.45	ug/L		0.45	1.5	1/14/2000	JF
SW-846-8260B	Bromomethane	<0.34	ug/L		0.34	1.1	1/14/2000	JF
SW-846-8260B	Carbon tetrachloride	<0.23	ug/L		0.23	0.76	1/14/2000	JF
SW-846-8260B	Chlorobenzene	<0.096	ug/L		0.096	0.32	1/14/2000	JF
SW-846-8260B	Chloroethane	<0.5	ug/L		0.5	1.7	1/14/2000	JF
SW-846-8260B	Chloroform	<0.18	ug/L		0.18	0.59	1/14/2000	JF
SW-846-8260B	Chloromethane	<0.21	ug/L		0.21	0.71	1/14/2000	JF
SW-846-8260B	cis-1,2-Dichloroethene	<0.19	ug/L		0.19	0.62	1/14/2000	JF
SW-846-8260B	cis-1,3-Dichloropropene	<0.096	ug/L		0.096	0.32	1/14/2000	JF
SW-846-8260B	Dibromochloromethane	<0.19	ug/L		0.19	0.64	1/14/2000	JF
SW-846-8260B	Dibromofluoromethane-Surrogate	89	% Rec				1/14/2000	JF
SW-846-8260B	Dibromomethane	<0.33	ug/L		0.33	1.1	1/14/2000	JF
SW-846-8260B	Dichlorodifluoromethane	<0.27	ug/L		0.27	0.91	1/14/2000	JF
SW-846-8260B	Ethylbenzene	<0.19	ug/L		0.19	0.65	1/14/2000	JF
SW-846-8260B	Hexachlorobutadiene	<0.074	ug/L		0.074	0.25	1/14/2000	JF
SW-846-8260B	Isopropylbenzene	<0.23	ug/L		0.23	0.77	1/14/2000	JF
SW-846-8260B	Methylene chloride	<0.25	ug/L		0.25	0.85	1/14/2000	JF
SW-846-8260B	n-Butylbenzene	<0.040	ug/L		0.040	0.13	1/14/2000	JF
SW-846-8260B	n-Propylbenzene	<0.36	ug/L		0.36	1.2	1/14/2000	JF
SW-846-8260B	Naphthalene	<0.082	ug/L		0.082	0.27	1/14/2000	JF
SW-846-8260B	p-Isopropyltoluene	<0.12	ug/L		0.12	0.41	1/14/2000	JF
SW-846-8260B	sec-Butylbenzene	<0.35	ug/L		0.35	1.2	1/14/2000	JF
SW-846-8260B	Styrene	<0.084	ug/L		0.084	0.28	1/14/2000	JF
SW-846-8260B	tert-Butylbenzene	<0.28	ug/L		0.28	0.94	1/14/2000	JF
SW-846-8260B	Tetrachloroethene	<0.34	ug/L		0.34	1.1	1/14/2000	JF
SW-846-8260B	Toluene	<0.11	ug/L		0.11	0.37	1/14/2000	JF
SW-846-8260B	Toluene-d8-Surrogate	103	% Rec				1/14/2000	JF
SW-846-8260B	trans-1,2-Dichloroethene	<0.21	ug/L		0.21	0.7	1/14/2000	JF
SW-846-8260B	trans-1,3-Dichloropropene	<0.14	ug/L		0.14	0.45	1/14/2000	JF
SW-846-8260B	Trichloroethene	<0.21	ug/L		0.21	0.71	1/14/2000	JF
SW-846-8260B	Trichlorofluoromethane	<0.49	ug/L		0.49	1.6	1/14/2000	JF
SW-846-8260B	Vinyl chloride	<0.14	ug/L		0.14	0.47	1/14/2000	JF
SW-846-8260B	Xylenes-Total	<0.39	ug/L		0.39	1.3	1/14/2000	JF
SW-846-9038	Sulfate	339	mg/L		2.6	8.7	1/10/2000	DEY
SW-846-9251	Chloride	365	mg/L		7.5	25	1/05/1999	CLS

Wisconsin Certification Number: 405043870
Certificate of Analysis Report

STS Consultants Ltd - Green Bay
1035 Kepler Dr

Green Bay, WI 54311
Project Number: 24871XF
Project Name: MILITARY-1 HR MARTINIZING

Attn: Paul Garvey
Phone: (920)468-1978
Fax: (920)468-3312
Client ID: 000875100
Chain: 75681
Report Date: 1/28/2000

Method	Parameter Name	Result	Units	Flag	MDL	PQL	Anl Date	Analyst
Lab No.	**Collect Date** **Sample ID**							
00REL000112	**1/04/2000** **MW-5**							
EPA-353.2	Nitrogen-Nitrate/Nitrite	1.2	mg/L		0.14	0.47	1/07/2000	CLS
SW-846-8015B	Ethane	<14	ug/L		14	47	1/07/2000	JHI
SW-846-8015B	Ethene	<14	ug/L		14	47	1/07/2000	JHI
SW-846-8015B	Methane	<7.2	ug/L		7.2	24	1/07/2000	JHI
SW-846-8260B	1,1,1,2-Tetrachloroethane	<0.19	ug/L		0.19	0.63	1/14/2000	JF
SW-846-8260B	1,1,1-Trichloroethane	<0.3	ug/L		0.3	1.0	1/14/2000	JF
SW-846-8260B	1,1,2,2-Tetrachloroethane	<0.52	ug/L		0.52	1.7	1/14/2000	JF
SW-846-8260B	1,1,2-Trichloroethane	<0.2	ug/L		0.2	0.67	1/14/2000	JF
SW-846-8260B	1,1-Dichloroethane	<0.15	ug/L		0.15	0.49	1/14/2000	JF
SW-846-8260B	1,1-Dichloroethene	<0.11	ug/L		0.11	0.37	1/14/2000	JF
SW-846-8260B	1,1-Dichloropropene	<0.25	ug/L		0.25	0.84	1/14/2000	JF
SW-846-8260B	1,2,3-Trichlorobenzene	<0.052	ug/L		0.052	0.17	1/14/2000	JF
SW-846-8260B	1,2,3-Trichloropropane	<0.99	ug/L		0.99	3.3	1/14/2000	JF
SW-846-8260B	1,2,4-Trichlorobenzene	<0.050	ug/L		0.050	0.17	1/14/2000	JF
SW-846-8260B	1,2,4-Trimethylbenzene	<0.46	ug/L		0.46	1.5	1/14/2000	JF
SW-846-8260B	1,2-Dibromo-3-chloropropane	<0.23	ug/L		0.23	0.77	1/14/2000	JF
SW-846-8260B	1,2-Dibromoethane	<0.4	ug/L		0.4	1.3	1/14/2000	JF
SW-846-8260B	1,2-Dichlorobenzene	<0.036	ug/L		0.036	0.12	1/14/2000	JF
SW-846-8260B	1,2-Dichloroethane	<0.35	ug/L		0.35	1.2	1/14/2000	JF
SW-846-8260B	1,2-Dichloropropane	<0.094	ug/L		0.094	0.31	1/14/2000	JF
SW-846-8260B	1,3,5-Trimethylbenzene	<0.35	ug/L		0.35	1.2	1/14/2000	JF
SW-846-8260B	1,3-Dichlorobenzene	<0.49	ug/L		0.49	1.6	1/14/2000	JF
SW-846-8260B	1,3-Dichloropropane	<0.26	ug/L		0.26	0.87	1/14/2000	JF
SW-846-8260B	1,4-Dichlorobenzene	<0.45	ug/L		0.45	1.5	1/14/2000	JF
SW-846-8260B	2,2-Dichloropropane	<0.78	ug/L		0.78	2.6	1/14/2000	JF
SW-846-8260B	2-Chlorotoluene	<0.25	ug/L		0.25	0.83	1/14/2000	JF
SW-846-8260B	4-Chlorotoluene	<0.65	ug/L		0.65	2.2	1/14/2000	JF
SW-846-8260B	Benzene	<0.19	ug/L		0.19	0.63	1/14/2000	JF
SW-846-8260B	Bromobenzene	<0.34	ug/L		0.34	1.1	1/14/2000	JF
SW-846-8260B	Bromochloromethane	<0.17	ug/L		0.17	0.55	1/14/2000	JF
SW-846-8260B	Bromodichloromethane	<0.25	ug/L		0.25	0.83	1/14/2000	JF
SW-846-8260B	Bromofluorobenzene-Surrogate	90	% Rec				1/14/2000	JF
SW-846-8260B	Bromoform	<0.45	ug/L		0.45	1.5	1/14/2000	JF
SW-846-8260B	Bromomethane	<0.34	ug/L		0.34	1.1	1/14/2000	JF
SW-846-8260B	Carbon tetrachloride	<0.23	ug/L		0.23	0.76	1/14/2000	JF
SW-846-8260B	Chlorobenzene	<0.096	ug/L		0.096	0.32	1/14/2000	JF
SW-846-8260B	Chloroethane	<0.5	ug/L		0.5	1.7	1/14/2000	JF
SW-846-8260B	Chloroform	<0.18	ug/L		0.18	0.59	1/14/2000	JF
SW-846-8260B	Chloromethane	<0.21	ug/L		0.21	0.71	1/14/2000	JF
SW-846-8260B	cis-1,2-Dichloroethene	<0.19	ug/L		0.19	0.62	1/14/2000	JF
SW-846-8260B	cis-1,3-Dichloropropene	<0.096	ug/L		0.096	0.32	1/14/2000	JF
SW-846-8260B	Dibromochloromethane	<0.19	ug/L		0.19	0.64	1/14/2000	JF
SW-846-8260B	Dibromofluoromethane-Surrogate	89	% Rec				1/14/2000	JF
SW-846-8260B	Dibromomethane	<0.33	ug/L		0.33	1.1	1/14/2000	JF
SW-846-8260B	Dichlorodifluoromethane	<0.27	ug/L		0.27	0.91	1/14/2000	JF

Wisconsin Certification Number: 405043870
Certificate of Analysis Report

STS Consultants Ltd - Green Bay
1035 Kepler Dr

Green Bay, WI 54311
Project Number: 24871XF
Project Name: MILITARY-1 HR MARTINIZING

Attn: Paul Garvey
Phone: (920)468-1978
Fax: (920)468-3312
Client ID: 000875100
Chain: 75681
Report Date: 1/28/2000

Method	Parameter Name	Result	Units	Flag	MDL	PQL	Anl Date	Analyst
Lab No.	**Collect Date** **Sample ID**							
SW-846-8260B	Ethylbenzene	<0.19	ug/L		0.19	0.65	1/14/2000	JF
SW-846-8260B	Hexachlorobutadiene	<0.074	ug/L		0.074	0.25	1/14/2000	JF
SW-846-8260B	Isopropylbenzene	<0.23	ug/L		0.23	0.77	1/14/2000	JF
SW-846-8260B	Methylene chloride	<0.25	ug/L		0.25	0.85	1/14/2000	JF
SW-846-8260B	n-Butylbenzene	<0.040	ug/L		0.040	0.13	1/14/2000	JF
SW-846-8260B	n-Propylbenzene	<0.36	ug/L		0.36	1.2	1/14/2000	JF
SW-846-8260B	Naphthalene	<0.082	ug/L		0.082	0.27	1/14/2000	JF
SW-846-8260B	p-Isopropyltoluene	<0.12	ug/L		0.12	0.41	1/14/2000	JF
SW-846-8260B	sec-Butylbenzene	<0.35	ug/L		0.35	1.2	1/14/2000	JF
SW-846-8260B	Styrene	<0.084	ug/L		0.084	0.28	1/14/2000	JF
SW-846-8260B	tert-Butylbenzene	<0.28	ug/L		0.28	0.94	1/14/2000	JF
SW-846-8260B	Tetrachloroethene	<0.34	ug/L		0.34	1.1	1/14/2000	JF
SW-846-8260B	Toluene	<0.11	ug/L		0.11	0.37	1/14/2000	JF
SW-846-8260B	Toluene-d8-Surrogate	103	% Rec				1/14/2000	JF
SW-846-8260B	trans-1,2-Dichloroethene	<0.21	ug/L		0.21	0.7	1/14/2000	JF
SW-846-8260B	trans-1,3-Dichloropropene	<0.14	ug/L		0.14	0.45	1/14/2000	JF
SW-846-8260B	Trichloroethene	<0.21	ug/L		0.21	0.71	1/14/2000	JF
SW-846-8260B	Trichlorofluoromethane	<0.49	ug/L		0.49	1.6	1/14/2000	JF
SW-846-8260B	Vinyl chloride	<0.14	ug/L		0.14	0.47	1/14/2000	JF
SW-846-8260B	Xylenes-Total	<0.39	ug/L		0.39	1.3	1/14/2000	JF
SW-846-9038	Sulfate	258	mg/L		2.6	8.7	1/10/2000	DEY
SW-846-9251	Chloride	1200	mg/L		7.5	25	1/05/1999	CLS
00REL000113	**1/04/2000** **MW-6**							
EPA-353.2	Nitrogen-Nitrate/Nitrite	2.7	mg/L		0.14	0.47	1/07/2000	CLS
SW-846-8015B	Ethane	<14	ug/L		14	47	1/07/2000	JHI
SW-846-8015B	Ethene	<14	ug/L		14	47	1/07/2000	JHI
SW-846-8015B	Methane	12	ug/L	13	7.2	24	1/07/2000	JHI
SW-846-8260B	1,1,1,2-Tetrachloroethane	<0.19	ug/L		0.19	0.63	1/14/2000	JF
SW-846-8260B	1,1,1-Trichloroethane	<0.3	ug/L		0.3	1.0	1/14/2000	JF
SW-846-8260B	1,1,2,2-Tetrachloroethane	<0.52	ug/L		0.52	1.7	1/14/2000	JF
SW-846-8260B	1,1,2-Trichloroethane	<0.2	ug/L		0.2	0.67	1/14/2000	JF
SW-846-8260B	1,1-Dichloroethane	<0.15	ug/L		0.15	0.49	1/14/2000	JF
SW-846-8260B	1,1-Dichloroethene	<0.11	ug/L		0.11	0.37	1/14/2000	JF
SW-846-8260B	1,1-Dichloropropene	<0.25	ug/L		0.25	0.84	1/14/2000	JF
SW-846-8260B	1,2,3-Trichlorobenzene	<0.052	ug/L		0.052	0.17	1/14/2000	JF
SW-846-8260B	1,2,3-Trichloropropane	<0.99	ug/L		0.99	3.3	1/14/2000	JF
SW-846-8260B	1,2,4-Trichlorobenzene	<0.050	ug/L		0.050	0.17	1/14/2000	JF
SW-846-8260B	1,2,4-Trimethylbenzene	<0.46	ug/L		0.46	1.5	1/14/2000	JF
SW-846-8260B	1,2-Dibromo-3-chloropropane	<0.23	ug/L		0.23	0.77	1/14/2000	JF
SW-846-8260B	1,2-Dibromoethane	<0.4	ug/L		0.4	1.3	1/14/2000	JF
SW-846-8260B	1,2-Dichlorobenzene	<0.036	ug/L		0.036	0.12	1/14/2000	JF
SW-846-8260B	1,2-Dichloroethane	<0.35	ug/L		0.35	1.2	1/14/2000	JF
SW-846-8260B	1,2-Dichloropropane	<0.094	ug/L		0.094	0.31	1/14/2000	JF
SW-846-8260B	1,3,5-Trimethylbenzene	<0.35	ug/L		0.35	1.2	1/14/2000	JF
SW-846-8260B	1,3-Dichlorobenzene	<0.49	ug/L		0.49	1.6	1/14/2000	JF

Wisconsin Certification Number: 405043870
Certificate of Analysis Report

STS Consultants Ltd - Green Bay
1035 Kepler Dr

Green Bay, WI 54311
Project Number: 24871XF
Project Name: MILITARY-1 HR MARTINIZING

Attn: Paul Garvey
Phone: (920)468-1978
Fax: (920)468-3312
Client ID: 000875100
Chain: 75681
Report Date: 1/28/2000

Method	Parameter Name	Result	Units	Flag	MDL	PQL	Anl Date	Analyst
Lab No.	**Collect Date** **Sample ID**							
SW-846-8260B	1,3-Dichloropropane	<0.26	ug/L		0.26	0.87	1/14/2000	JF
SW-846-8260B	1,4-Dichlorobenzene	<0.45	ug/L		0.45	1.5	1/14/2000	JF
SW-846-8260B	2,2-Dichloropropane	<0.78	ug/L		0.78	2.6	1/14/2000	JF
SW-846-8260B	2-Chlorotoluene	<0.25	ug/L		0.25	0.83	1/14/2000	JF
SW-846-8260B	4-Chlorotoluene	<0.65	ug/L		0.65	2.2	1/14/2000	JF
SW-846-8260B	Benzene	<0.19	ug/L		0.19	0.63	1/14/2000	JF
SW-846-8260B	Bromobenzene	<0.34	ug/L		0.34	1.1	1/14/2000	JF
SW-846-8260B	Bromochloromethane	<0.17	ug/L		0.17	0.55	1/14/2000	JF
SW-846-8260B	Bromodichloromethane	0.61	ug/L	13	0.25	0.83	1/14/2000	JF
SW-846-8260B	Bromofluorobenzene-Surrogate	92	% Rec				1/14/2000	JF
SW-846-8260B	Bromoform	<0.45	ug/L		0.45	1.5	1/14/2000	JF
SW-846-8260B	Bromomethane	<0.34	ug/L		0.34	1.1	1/14/2000	JF
SW-846-8260B	Carbon tetrachloride	<0.23	ug/L		0.23	0.76	1/14/2000	JF
SW-846-8260B	Chlorobenzene	<0.096	ug/L		0.096	0.32	1/14/2000	JF
SW-846-8260B	Chloroethane	<0.5	ug/L		0.5	1.7	1/14/2000	JF
SW-846-8260B	Chloroform	<0.18	ug/L		0.18	0.59	1/14/2000	JF
SW-846-8260B	Chloromethane	<0.21	ug/L		0.21	0.71	1/14/2000	JF
SW-846-8260B	cis-1,2-Dichloroethene	8.7	ug/L		0.19	0.62	1/14/2000	JF
SW-846-8260B	cis-1,3-Dichloropropene	<0.096	ug/L		0.096	0.32	1/14/2000	JF
SW-846-8260B	Dibromochloromethane	<0.19	ug/L		0.19	0.64	1/14/2000	JF
SW-846-8260B	Dibromofluoromethane-Surrogate	89	% Rec				1/14/2000	JF
SW-846-8260B	Dibromomethane	<0.33	ug/L		0.33	1.1	1/14/2000	JF
SW-846-8260B	Dichlorodifluoromethane	<0.27	ug/L		0.27	0.91	1/14/2000	JF
SW-846-8260B	Ethylbenzene	<0.19	ug/L		0.19	0.65	1/14/2000	JF
SW-846-8260B	Hexachlorobutadiene	<0.074	ug/L		0.074	0.25	1/14/2000	JF
SW-846-8260B	Isopropylbenzene	<0.23	ug/L		0.23	0.77	1/14/2000	JF
SW-846-8260B	Methylene chloride	<0.25	ug/L		0.25	0.85	1/14/2000	JF
SW-846-8260B	n-Butylbenzene	<0.040	ug/L		0.040	0.13	1/14/2000	JF
SW-846-8260B	n-Propylbenzene	<0.36	ug/L		0.36	1.2	1/14/2000	JF
SW-846-8260B	Naphthalene	<0.082	ug/L		0.082	0.27	1/14/2000	JF
SW-846-8260B	p-Isopropyltoluene	<0.12	ug/L		0.12	0.41	1/14/2000	JF
SW-846-8260B	sec-Butylbenzene	<0.35	ug/L		0.35	1.2	1/14/2000	JF
SW-846-8260B	Styrene	<0.084	ug/L		0.084	0.28	1/14/2000	JF
SW-846-8260B	tert-Butylbenzene	<0.28	ug/L		0.28	0.94	1/14/2000	JF
SW-846-8260B	Tetrachloroethene	124	ug/L		17	56	1/15/2000	JF
SW-846-8260B	Toluene	<0.11	ug/L		0.11	0.37	1/14/2000	JF
SW-846-8260B	Toluene-d8-Surrogate	105	% Rec				1/14/2000	JF
SW-846-8260B	trans-1,2-Dichloroethene	<0.21	ug/L		0.21	0.7	1/14/2000	JF
SW-846-8260B	trans-1,3-Dichloropropene	<0.14	ug/L		0.14	0.45	1/14/2000	JF
SW-846-8260B	Trichloroethene	62	ug/L		0.21	0.71	1/14/2000	JF
SW-846-8260B	Trichlorofluoromethane	<0.49	ug/L		0.49	1.6	1/14/2000	JF
SW-846-8260B	Vinyl chloride	<0.14	ug/L		0.14	0.47	1/14/2000	JF
SW-846-8260B	Xylenes-Total	<0.39	ug/L		0.39	1.3	1/14/2000	JF
SW-846-9038	Sulfate	76	mg/L		1.3	4.3	1/10/2000	DEY
SW-846-9251	Chloride	193	mg/L		0.75	2.5	1/05/1999	CLS

Wisconsin Certification Number: 405043870
Certificate of Analysis Report

STS Consultants Ltd - Green Bay
1035 Kepler Dr

Green Bay, WI 54311
Project Number: 24871XF
Project Name: MILITARY-1 HR MARTINIZING

Attn: Paul Garvey
Phone: (920)468-1978
Fax: (920)468-3312
Client ID: 000875100
Chain: 75681
Report Date: 1/28/2000

Method	Parameter Name	Result	Units	Flag	MDL	PQL	Ani.Date	Analyst
Lab No.	**Collect Date** **Sample ID**							
00REL000114	**1/04/2000** **PZ-1**							
EPA-353.2	Nitrogen-Nitrate/Nitrite	<0.14	mg/L		0.14	0.47	1/07/2000	CLS
SW-846-8015B	Ethane	<14	ug/L		14	47	1/07/2000	JHI
SW-846-8015B	Ethene	<14	ug/L		14	47	1/07/2000	JHI
SW-846-8015B	Methane	136	ug/L		7.2	24	1/07/2000	JHI
SW-846-8260B	1,1,1,2-Tetrachloroethane	<0.19	ug/L		0.19	0.63	1/14/2000	JF
SW-846-8260B	1,1,1-Trichloroethane	<0.3	ug/L		0.3	1.0	1/14/2000	JF
SW-846-8260B	1,1,2,2-Tetrachloroethane	<0.52	ug/L		0.52	1.7	1/14/2000	JF
SW-846-8260B	1,1,2-Trichloroethane	<0.2	ug/L		0.2	0.67	1/14/2000	JF
SW-846-8260B	1,1-Dichloroethane	<0.15	ug/L		0.15	0.49	1/14/2000	JF
SW-846-8260B	1,1-Dichloroethene	<0.11	ug/L		0.11	0.37	1/14/2000	JF
SW-846-8260B	1,1-Dichloropropene	<0.25	ug/L		0.25	0.84	1/14/2000	JF
SW-846-8260B	1,2,3-Trichlorobenzene	<0.052	ug/L		0.052	0.17	1/14/2000	JF
SW-846-8260B	1,2,3-Trichloropropane	<0.99	ug/L		0.99	3.3	1/14/2000	JF
SW-846-8260B	1,2,4-Trichlorobenzene	<0.050	ug/L		0.050	0.17	1/14/2000	JF
SW-846-8260B	1,2,4-Trimethylbenzene	<0.46	ug/L		0.46	1.5	1/14/2000	JF
SW-846-8260B	1,2-Dibromo-3-chloropropane	<0.23	ug/L		0.23	0.77	1/14/2000	JF
SW-846-8260B	1,2-Dibromoethane	<0.4	ug/L		0.4	1.3	1/14/2000	JF
SW-846-8260B	1,2-Dichlorobenzene	<0.036	ug/L		0.036	0.12	1/14/2000	JF
SW-846-8260B	1,2-Dichloroethane	<0.35	ug/L		0.35	1.2	1/14/2000	JF
SW-846-8260B	1,2-Dichloropropane	<0.094	ug/L		0.094	0.31	1/14/2000	JF
SW-846-8260B	1,3,5-Trimethylbenzene	<0.35	ug/L		0.35	1.2	1/14/2000	JF
SW-846-8260B	1,3-Dichlorobenzene	<0.49	ug/L		0.49	1.6	1/14/2000	JF
SW-846-8260B	1,3-Dichloropropane	<0.26	ug/L		0.26	0.87	1/14/2000	JF
SW-846-8260B	1,4-Dichlorobenzene	<0.45	ug/L		0.45	1.5	1/14/2000	JF
SW-846-8260B	2,2-Dichloropropane	<0.78	ug/L		0.78	2.6	1/14/2000	JF
SW-846-8260B	2-Chlorotoluene	<0.25	ug/L		0.25	0.83	1/14/2000	JF
SW-846-8260B	4-Chlorotoluene	<0.65	ug/L		0.65	2.2	1/14/2000	JF
SW-846-8260B	Benzene	<0.19	ug/L		0.19	0.63	1/14/2000	JF
SW-846-8260B	Bromobenzene	<0.34	ug/L		0.34	1.1	1/14/2000	JF
SW-846-8260B	Bromochloromethane	<0.17	ug/L		0.17	0.55	1/14/2000	JF
SW-846-8260B	Bromodichloromethane	<0.25	ug/L		0.25	0.83	1/14/2000	JF
SW-846-8260B	Bromofluorobenzene-Surrogate	94	% Rec				1/14/2000	JF
SW-846-8260B	Bromoform	<0.45	ug/L		0.45	1.5	1/14/2000	JF
SW-846-8260B	Bromomethane	<0.34	ug/L		0.34	1.1	1/14/2000	JF
SW-846-8260B	Carbon tetrachloride	<0.23	ug/L		0.23	0.76	1/14/2000	JF
SW-846-8260B	Chlorobenzene	<0.096	ug/L		0.096	0.32	1/14/2000	JF
SW-846-8260B	Chloroethane	<0.5	ug/L		0.5	1.7	1/14/2000	JF
SW-846-8260B	Chloroform	<0.18	ug/L		0.18	0.59	1/14/2000	JF
SW-846-8260B	Chloromethane	<0.21	ug/L		0.21	0.71	1/14/2000	JF
SW-846-8260B	cis-1,2-Dichloroethene	1.2	ug/L		0.19	0.62	1/14/2000	JF
SW-846-8260B	cis-1,3-Dichloropropene	<0.096	ug/L		0.096	0.32	1/14/2000	JF
SW-846-8260B	Dibromochloromethane	<0.19	ug/L		0.19	0.64	1/14/2000	JF
SW-846-8260B	Dibromofluoromethane-Surrogate	90	% Rec				1/14/2000	JF
SW-846-8260B	Dibromomethane	<0.33	ug/L		0.33	1.1	1/14/2000	JF
SW-846-8260B	Dichlorodifluoromethane	<0.27	ug/L		0.27	0.91	1/14/2000	JF

Wisconsin Certification Number: 405043870
Certificate of Analysis Report

STS Consultants Ltd - Green Bay
1035 Kepler Dr

Green Bay, WI 54311
Project Number: 24871XF
Project Name: MILITARY-1 HR MARTINIZING

Attn: Paul Garvey
Phone: (920)468-1978
Fax: (920)468-3312
Client ID: 000875100
Chain: 75681
Report Date: 1/28/2000

Method	Parameter Name	Result	Units	Flag	MDL	PQL	Anl.Date	Analyst
Lab No.	**Collect Date** **Sample ID**							
SW-846-8260B	Ethylbenzene	<0.19	ug/L		0.19	0.65	1/14/2000	JF
SW-846-8260B	Hexachlorobutadiene	<0.074	ug/L		0.074	0.25	1/14/2000	JF
SW-846-8260B	Isopropylbenzene	<0.23	ug/L		0.23	0.77	1/14/2000	JF
SW-846-8260B	Methylene chloride	<0.25	ug/L		0.25	0.85	1/14/2000	JF
SW-846-8260B	n-Butylbenzene	<0.040	ug/L		0.040	0.13	1/14/2000	JF
SW-846-8260B	n-Propylbenzene	<0.36	ug/L		0.36	1.2	1/14/2000	JF
SW-846-8260B	Naphthalene	<0.082	ug/L		0.082	0.27	1/14/2000	JF
SW-846-8260B	p-Isopropyltoluene	<0.12	ug/L		0.12	0.41	1/14/2000	JF
SW-846-8260B	sec-Butylbenzene	<0.35	ug/L		0.35	1.2	1/14/2000	JF
SW-846-8260B	Styrene	<0.084	ug/L		0.084	0.28	1/14/2000	JF
SW-846-8260B	tert-Butylbenzene	<0.28	ug/L		0.28	0.94	1/14/2000	JF
SW-846-8260B	Tetrachloroethene	27	ug/L		0.34	1.1	1/14/2000	JF
SW-846-8260B	Toluene	<0.11	ug/L		0.11	0.37	1/14/2000	JF
SW-846-8260B	Toluene-d8-Surrogate	103	% Rec				1/14/2000	JF
SW-846-8260B	trans-1,2-Dichloroethene	<0.21	ug/L		0.21	0.7	1/14/2000	JF
SW-846-8260B	trans-1,3-Dichloropropene	<0.14	ug/L		0.14	0.45	1/14/2000	JF
SW-846-8260B	Trichloroethene	3.9	ug/L		0.21	0.71	1/14/2000	JF
SW-846-8260B	Trichlorofluoromethane	<0.49	ug/L		0.49	1.6	1/14/2000	JF
SW-846-8260B	Vinyl chloride	<0.14	ug/L		0.14	0.47	1/14/2000	JF
SW-846-8260B	Xylenes-Total	<0.39	ug/L		0.39	1.3	1/14/2000	JF
SW-846-9038	Sulfate	50	mg/L		1.3	4.3	1/10/2000	DEY
SW-846-9251	Chloride	42	mg/L		0.75	2.5	1/05/1999	CLS
00REL000115	**1/04/2000** **TRIP BLANK**							
SW-846-8260B	1,1,1,2-Tetrachloroethane	<0.19	ug/L		0.19	0.63	1/14/2000	JF
SW-846-8260B	1,1,1-Trichloroethane	<0.3	ug/L		0.3	1.0	1/14/2000	JF
SW-846-8260B	1,1,2,2-Tetrachloroethane	<0.52	ug/L		0.52	1.7	1/14/2000	JF
SW-846-8260B	1,1,2-Trichloroethane	<0.2	ug/L		0.2	0.67	1/14/2000	JF
SW-846-8260B	1,1-Dichloroethane	<0.15	ug/L		0.15	0.49	1/14/2000	JF
SW-846-8260B	1,1-Dichloroethene	<0.11	ug/L		0.11	0.37	1/14/2000	JF
SW-846-8260B	1,1-Dichloropropene	<0.25	ug/L		0.25	0.84	1/14/2000	JF
SW-846-8260B	1,2,3-Trichlorobenzene	<0.052	ug/L		0.052	0.17	1/14/2000	JF
SW-846-8260B	1,2,3-Trichloropropane	<0.99	ug/L		0.99	3.3	1/14/2000	JF
SW-846-8260B	1,2,4-Trichlorobenzene	<0.050	ug/L		0.050	0.17	1/14/2000	JF
SW-846-8260B	1,2,4-Trimethylbenzene	<0.46	ug/L		0.46	1.5	1/14/2000	JF
SW-846-8260B	1,2-Dibromo-3-chloropropane	<0.23	ug/L		0.23	0.77	1/14/2000	JF
SW-846-8260B	1,2-Dibromoethane	<0.4	ug/L		0.4	1.3	1/14/2000	JF
SW-846-8260B	1,2-Dichlorobenzene	<0.036	ug/L		0.036	0.12	1/14/2000	JF
SW-846-8260B	1,2-Dichloroethane	<0.35	ug/L		0.35	1.2	1/14/2000	JF
SW-846-8260B	1,2-Dichloropropane	<0.094	ug/L		0.094	0.31	1/14/2000	JF
SW-846-8260B	1,3,5-Trimethylbenzene	<0.35	ug/L		0.35	1.2	1/14/2000	JF
SW-846-8260B	1,3-Dichlorobenzene	<0.49	ug/L		0.49	1.6	1/14/2000	JF
SW-846-8260B	1,3-Dichloropropane	<0.26	ug/L		0.26	0.87	1/14/2000	JF
SW-846-8260B	1,4-Dichlorobenzene	<0.45	ug/L		0.45	1.5	1/14/2000	JF
SW-846-8260B	2,2-Dichloropropane	<0.78	ug/L		0.78	2.6	1/14/2000	JF
SW-846-8260B	2-Chlorotoluene	<0.25	ug/L		0.25	0.83	1/14/2000	JF

Wisconsin Certification Number: 405043870
Certificate of Analysis Report

STS Consultants Ltd - Green Bay
1035 Kepler Dr

Green Bay, WI 54311
Project Number: 24871XF
Project Name: MILITARY-1 HR MARTINIZING

Attn: Paul Garvey
Phone: (920)468-1978
Fax: (920)468-3312
Client ID: 000875100
Chain: 75681
Report Date: 1/28/2000

Method	Parameter Name	Result	Units	Flag	MDL	PQL	Anl.Date	Analyst
Lab No.	**Collect Date** **Sample ID**							
SW-846-8260B	4-Chlorotoluene	<0.65	ug/L		0.65	2.2	1/14/2000	JF
SW-846-8260B	Benzene	<0.19	ug/L		0.19	0.63	1/14/2000	JF
SW-846-8260B	Bromobenzene	<0.34	ug/L		0.34	1.1	1/14/2000	JF
SW-846-8260B	Bromochloromethane	<0.17	ug/L		0.17	0.55	1/14/2000	JF
SW-846-8260B	Bromodichloromethane	<0.25	ug/L		0.25	0.83	1/14/2000	JF
SW-846-8260B	Bromofluorobenzene-Surrogate	93	% Rec				1/14/2000	JF
SW-846-8260B	Bromoform	<0.45	ug/L		0.45	1.5	1/14/2000	JF
SW-846-8260B	Bromomethane	<0.34	ug/L		0.34	1.1	1/14/2000	JF
SW-846-8260B	Carbon tetrachloride	<0.23	ug/L		0.23	0.76	1/14/2000	JF
SW-846-8260B	Chlorobenzene	<0.096	ug/L		0.096	0.32	1/14/2000	JF
SW-846-8260B	Chloroethane	<0.5	ug/L		0.5	1.7	1/14/2000	JF
SW-846-8260B	Chloroform	<0.18	ug/L		0.18	0.59	1/14/2000	JF
SW-846-8260B	Chloromethane	<0.21	ug/L		0.21	0.71	1/14/2000	JF
SW-846-8260B	cis-1,2-Dichloroethene	<0.19	ug/L		0.19	0.62	1/14/2000	JF
SW-846-8260B	cis-1,3-Dichloropropene	<0.096	ug/L		0.096	0.32	1/14/2000	JF
SW-846-8260B	Dibromochloromethane	<0.19	ug/L		0.19	0.64	1/14/2000	JF
SW-846-8260B	Dibromofluoromethane-Surrogate	90	% Rec				1/14/2000	JF
SW-846-8260B	Dibromomethane	<0.33	ug/L		0.33	1.1	1/14/2000	JF
SW-846-8260B	Dichlorodifluoromethane	<0.27	ug/L		0.27	0.91	1/14/2000	JF
SW-846-8260B	Ethylbenzene	<0.19	ug/L		0.19	0.65	1/14/2000	JF
SW-846-8260B	Hexachlorobutadiene	<0.074	ug/L		0.074	0.25	1/14/2000	JF
SW-846-8260B	Isopropylbenzene	<0.23	ug/L		0.23	0.77	1/14/2000	JF
SW-846-8260B	Methylene chloride	<0.25	ug/L		0.25	0.85	1/14/2000	JF
SW-846-8260B	n-Butylbenzene	<0.040	ug/L		0.040	0.13	1/14/2000	JF
SW-846-8260B	n-Propylbenzene	<0.36	ug/L		0.36	1.2	1/14/2000	JF
SW-846-8260B	Naphthalene	<0.082	ug/L		0.082	0.27	1/14/2000	JF
SW-846-8260B	p-Isopropyltoluene	<0.12	ug/L		0.12	0.41	1/14/2000	JF
SW-846-8260B	sec-Butylbenzene	<0.35	ug/L		0.35	1.2	1/14/2000	JF
SW-846-8260B	Styrene	<0.084	ug/L		0.084	0.28	1/14/2000	JF
SW-846-8260B	tert-Butylbenzene	<0.28	ug/L		0.28	0.94	1/14/2000	JF
SW-846-8260B	Tetrachloroethene	<0.34	ug/L		0.34	1.1	1/14/2000	JF
SW-846-8260B	Toluene	<0.11	ug/L		0.11	0.37	1/14/2000	JF
SW-846-8260B	Toluene-d8-Surrogate	104	% Rec				1/14/2000	JF
SW-846-8260B	trans-1,2-Dichloroethene	<0.21	ug/L		0.21	0.7	1/14/2000	JF
SW-846-8260B	trans-1,3-Dichloropropene	<0.14	ug/L		0.14	0.45	1/14/2000	JF
SW-846-8260B	Trichloroethene	<0.21	ug/L		0.21	0.71	1/14/2000	JF
SW-846-8260B	Trichlorofluoromethane	<0.49	ug/L		0.49	1.6	1/14/2000	JF
SW-846-8260B	Vinyl chloride	<0.14	ug/L		0.14	0.47	1/14/2000	JF
SW-846-8260B	Xylenes-Total	<0.39	ug/L		0.39	1.3	1/14/2000	JF

Robert E. Lee & Associates, Inc.

Quality Control Report - Description of Flags

Flag	Section	Description
13	L	The reported result is less than the practical quantitation limit (PQL).

CHAIN OF CUSTODY RECORD

№ ~~30999~~ 7568A

RECORD NUMBER 1 THROUGH 1

Contact Person Paul Garvey
Phone No. 465-1978 Office Green Bay
Project No. 24871 XE PO No.
Project Name One hour Martinizing Dry Cleaning (SMilitary)

Special Handling Request
- ☐ Rush
- ☐ Verbal
- ☐ Other

Laboratory REL
Contact Person P.K.
Phone No.
Results Due

Sample I.D.	Date	Time	Grab	Composite	No. of Containers	Sample Type (Water, soil, air, sludge, etc.)	Preservation Y	Preservation N	Field Data PID/FID Ambient	Field Data PID/FID Sample	Field Data PH	Field Data Special Cond.	Analysis Request	Comments on Sample (Include Major Contaminants)
	2000												Reg 8021 GST VOC's - 00 1-4-00	
MW-1	1/04	PM	X		7	Water	X	X					VOC's, Nitrate/Nitrite, Sulfate,	unfiltered samples 00108
2	"	"	"		"	"	"	"					Chloride, (Methane, Ethane, Ethene)	00109
3														00110
4														00111
5														00112
6														00113
PZ-1		"	"		"		"	"						00114
Trip Blank	"				1	Water	X						TRIP Blank	00115

Collected by: Kent P Christen	Date 01-04-00	Time 1445	Delivery by: Kent P Christen	Date 01-04-00	Time 1500
Received by:	Date	Time	Relinquished by:	Date	Time
Received by:	Date	Time	Relinquished by:	Date	Time
Received by:	Date	Time	Relinquished by:	Date	Time
Received for lab by:	Date 1-04-00	Time 1520	Relinquished by:	Date	Time

Laboratory Comments Only: Seals Intact Upon Receipt? ☐ Yes ☐ No ☐ N/A Ambient

Final Disposition:	Comments (Weather Conditions, Precautions, Hazards):

Distribution: Original and Green - Laboratory Yellow - As needed Pink - Transporter Goldenrod - STS Project File
Instructions to Laboratory: Forward completed original to STS with analytical results. Retain green copy.

6/99cp10k

STS Consultants Ltd.
Consulting Engineers

Robert E. Lee & Associates, Inc.

Engineering, Surveying, Laboratory Services
2825 S. Webster Ave.
P.O. Box 2100
Green Bay, WI 54306-2100
Phone: (920) 336-6338
Fax: (920) 336-9141
E-Mail: rel@releeinc.com

Milwaukee Area
830 Armour Rd.
Oconomowoc, WI 53066
Phone: (262)569-8893 1-800-775-8893
Fax: (262)569-7995
Wisconsin Certification Number: 405043870

PAUL GARVEY
STS CONSULTANTS LTD - GREEN BAY
1035 KEPLER DR
GREEN BAY WI 54311

Phone:	(920)468-1978
Fax:	(920)468-3312
Client ID:	000875100
Contact ID:	3487

Sample Information

Report Date:	1/03/2000
Chain Number:	75614
Project No:	24871XF
Project Name:	1233 S MILITARY AVE
Receive Date:	12/16/1999
Sample Date:	12/14/1999

Attest: Steve Heraf

Please visit our new Internet homepage at
www.releeinc.com

Solid sample results are reported on a dry weight basis.

Robert E. Lee & Associates, Inc.
Wisconsin Certification Number: 405043870
Certificate of Analysis Report

STS Consultants Ltd - Green Bay
1035 Kepler Dr

Green Bay WI 54311
Project Number: 24871XF
Project Name: 1233 S MILITARY AVE

Attn.: Paul Garvey
Phone: (920)468-1978
Fax: (920)468-3312
Client ID: 000875100
Chain: 75614
Report Date: 1/03/2000

Method	Parameter Name	Result	Units	Flag	MDL	PQL	Anls. Date	Analyst
Lab No.	**Collect Date**	**Sample ID**						
99REL023003	**12/14/1999**	**MW-5, S-2**						
SW-846-9060	Total Organic Carbon	4640	mg/Kg		41	136.66	1/01/2000	AFL
99REL023004	**12/14/1999**	**MW-6, S-2**						
SW-846-9060	Total Organic Carbon	2150	mg/Kg		39	130	1/01/2000	AFL

CHAIN OF CUSTODY RECORD

№ ~~26155~~ 75614

Contact Person PAUL GARVEY
Phone No. 468-1978 Office G.B.
Project No. 24871XF PO No.
Project Name 1233 S. MILITARY AVE

Special Handling Request
- ☐ Rush
- ☐ Verbal
- ☐ Other

RECORD NUMBER 1 THROUGH 1

Laboratory REL
Contact Person P.K.
Phone No.
Results Due

Sample I.D.	Date 1999	Time	Grab	Composite	No. of Containers	Sample Type (Water, soil, air, sludge, etc.)	Preservation Y	Preservation N	Field Data PID/FID Ambient	Field Data PID/FID Sample	Field Data PH	Field Data Special Cond.	Analysis Request	Comments on Sample (Include Major Contaminants)
~~MW-5, S-1~~	12/14		X		4	SOIL	X	X		1				
MW-5, S-2	1		1		1	1	1	1		2			T.O.C. ONLY	23003
~~MW-6, S-1~~										<1				
MW-6, S-2	↓		↓		↓	↓	↓	↓		1			T.O.C. ONLY	23004

Collected by:	Date 12/14/99	Time 12:15P	Delivery by	Date 12/16/99	Time 2:50
Received by:	Date	Time	Relinquished by:	Date	Time
Received by:	Date	Time	Relinquished by:	Date	Time
Received by:	Date	Time	Relinquished by:	Date	Time
Received for lab by:	Date 12-16-99	Time 1450	Relinquished by:	Date	Time

Laboratory Comments Only: Seals Intact Upon Receipt? ☐ Yes ☐ No ☐ N/A ☆ on ID

Final Disposition:

Comments (Weather Conditions, Precautions, Hazards):
PLEASE
* DISPOSE OF ADDITIONAL SAMPLES

Distribution: Original and Green - Laboratory Yellow - As needed Pink - Transporter Goldenrod - STS Project File
Instructions to Laboratory: Forward completed original to STS with analytical results. Retain green copy.

9/94cp10k

STS Consultants Ltd.
Consulting Engineers

APPENDIX C

Average Linear Velocity Calculations

Vertical Gradient Calculations

STS CONSULTANTS LTD.

CALCULATION SHEET

PROJECT One Hour Martinizing - S. Military Ave JOB NO 24871XF PAGE ____ OF ____

SUBJECT Ave. Linear Velocity Calculations for Groundwater Flow DIVISION ____

ORIGINATOR P. Garvey DATE 2/28/00 CHECKED BY [illegible] DATE 2/28/00

$$V_l = \frac{KI}{n}$$

(Freeze + Cherry, 1979)

V_l = ave. linear velocity

K = hydraulic conductivity (estimated $1 * 10^{-6}$ cm/sec → to be conservative for natural silty clays with slow recharge wells)

n = porosity (0.30 assumed)

I = 0.01 ft/ft (from 1/4/00 groundwater contour map)

$$V_l = \frac{(1 * 10^{-6}\ cm/sec)(0.01\ ft/ft)}{0.30}$$

$$V_l = \frac{(3.3 * 10^{-8}\ cm/sec)}{1}\left(\frac{1\ ft}{30.48\ cm}\right)\left(\frac{86400\ sec}{1\ day}\right)\left(\frac{365\ day}{1\ yr}\right)$$

$$V_l = 0.03\ ft/yr$$

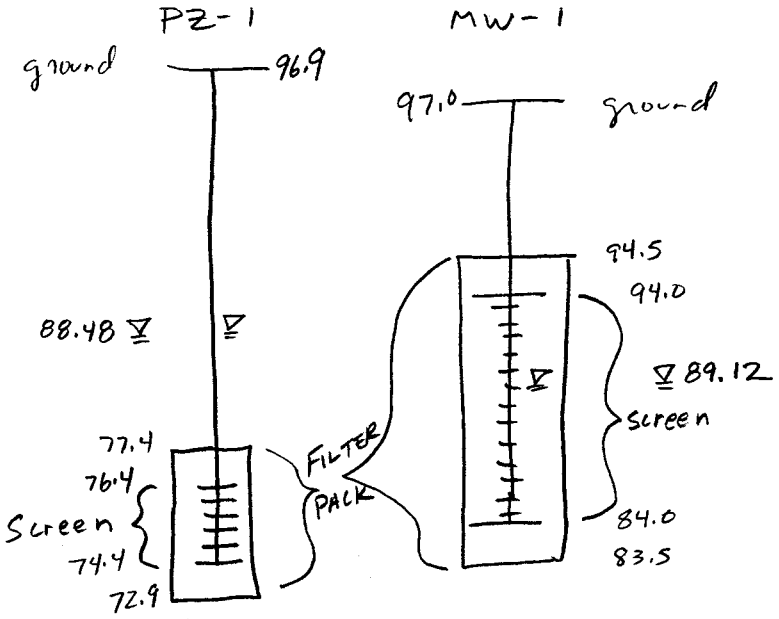
STS CONSULTANTS LTD.

CALCULATION SHEET

PROJECT One-hour Martinizing – S. Military, GB. JOB NO 24871XF PAGE ____ OF ____

SUBJECT Calculation of Vertical I (Gradient) DIVISION ____

ORIGINATOR PMG DATE 3/14/00 CHECKED BY RAM DATE 3/14/00



(▽) WLs from 1/4/00

PZ-1 88.48

MW-1 89.12

$X_N = 75.15$ $X_N = 86.31$

21.75 - 10.69 = 11.16

Average Downward Vertical I = $\frac{88.48 - 89.12}{11.16}$

$= -0.06$ ft/ft ∴ DOWNWARD

APPENDIX D

City of Green Bay Well No. 7 (7th Street Well) Construction Diagram

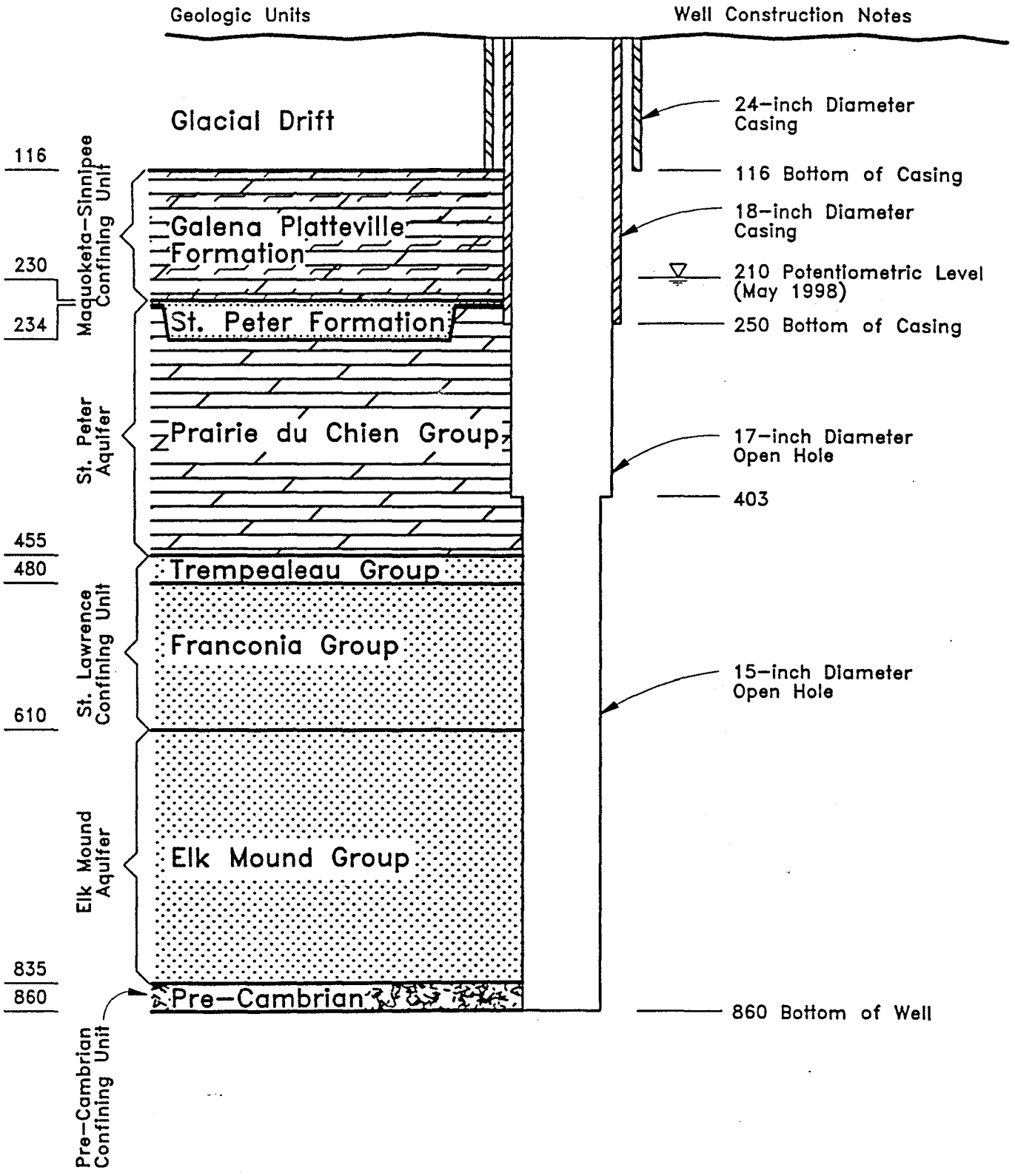


FIGURE 3–18
Green Bay Well No. 7
Seventh Street
Green Bay ASR

1"=125'–0"
10000F14.DWG

CH2MHILL

APPENDIX E

Site-Specific Residual Contaminant Levels Calculations
Cumulative Risk Calculations

Site-Specific Residual Contaminant Level (SSRCL) Calculation Input Parameters

One Hour Martinizing

1223 S. Military Avenue, Green Bay, Wisconsin

Parameter	SFo		SFi		RfD		RfC		K_{oc}		H'		Da		Dw	
	$(mg/kg\text{-}day)^{-1}$	Source	$(mg/kg\text{-}day)^{-1}$	Source	(mg/kg-day)	Source	(mg/m^3)	Source	(L/kg)	Source	(unitless)	Source	(cm^2/s)	Source	(cm^2/s)	Source
cis 1,2-Dichloroethene					1.0E-02	2	3.5E-02	2	36	2	1.70E-01	2	7.40E-02	2	1.10E-05	2
Trichloroethene	1.1E-02	2	6.0E-03	2					94	2	4.20E-01	2	7.90E-02	2	9.10E-06	2
Tetrachloroethene	5.2E-02	2	2.0E-03	2					270	2	7.50E-01	2	7.20E-02	2	8.20E-06	2

NOTES:

1) Abbreviations for RCL chemical fate parameters and health criteria are defined on the calculation sheets.

2) The following equation was used in the conversion of inhalation reference dose (RfDi) to reference concentration (RfC):

$$\text{RfDi}\frac{\text{mg}}{(\text{kg}\cdot\text{day})} = \text{RfC}\,(\text{mg}/\text{m}^3)\ \text{x}\ \frac{20\ \text{m}^3}{\text{day}}\ \text{x}\ \frac{1}{70\ \text{kg}}$$

SOURCES:

1) EPA (U.S. Environmental Protection Agency). 1999. Integrated Risk Information System (IRIS). Office of Solid Waste and Emergency Response, Washington, D.C.

2) EPA (U.S. Environmental Protection Agency). 1999. Region IX Preliminary Remediation Goals (PRGs) Toxicity and Physical/Chemical Tables: http://www.epa.gov/region09/waste/sfund/prg/

Cumulative Risk Calculations (Residential Soil)

One Hour Martinizing

1223 S. Military Avenue, Green Bay, Wisconsin

Compound	Highest Soil Conc.	Non-Carcinogens Ingestion (RfD)		Carcinogens Ingestion (SFo)			Non-Carcinogens Inhalation (RfC)		Carcinogens Inhalation (SFi)		
		RCL (mg/kg)	Soil Conc RCL	RCL (mg/kg)	RCL (mg/kg)	Soil Conc RCL	RCL (mg/kg)	Soil Conc RCL	RCL (mg/kg)	RCL (mg/kg)	Soil Conc RCL
	mg/kg	THQ = 1	THQ = 1	TR = 1 X 10^{-6}	TR = 1 X 10^{-5}	TR = 1 X 10^{-5}	THQ = 1	THQ = 1	TR = 1 X 10^{-6}	TR = 1 X 10^{-5}	TR = 1 X 10^{-5}
cis 1,2-Dichloroethene	0.038	1100	3.455E-05				150	0.00025333			
Trichloroethene	0.511			83	830	0.00062			5.3	50	1.02E-02
Tetrachloroethene	33			18	180	0.18333			20	200	1.65E-01
Cumulative Risk or Hazard* =			**3.455E-05**			**0.18**		**0.0003**			**0.18**

Calculated by: VMK (2/18/00)

Checked by: 2-18-00

Notes:

1)*Summation of chemical-specific ratios (i.e., soil conc./RCL).

2) TR = Target Risk.

3) THQ = Target Hazard Quotient. Site-specific THQ = 1.

4) For carcinogens, the highest soil concentration was divided by the adjusted RCL (adjusted to a target risk of 1 x 10^{-5} as allowed in WAC NR 720.11(3)). The sum of these ratios is below 1 for the ingestion and inhalation pathways. Accordingly, the cumulative risk does not exceed 1 x 10^{-5}.

5) For non-carcinogens, the highest soil concentration was divided by the RCL based on a site-specific hazard quotient (HQ) of 1. The sum of these ratios is below 1 for the ingestion and inhalation pathways. Accordingly, the cumulative hazard does not exceed an HQ of 1.

6) Risks for carcinogens and noncarcinogens are conservatively presumed to be additive within each exposure pathway.

cis 1,2-Dichloroethene
Soil Ingestion Pathway (RfD)

One Hour Martinizing
1223 S. Military Avenue, Green Bay, Wisconsin

Algorithm for Ingestion of Noncarcinogenic Contaminants in Non-Industrial (Residential) Soil

Parameter	Value	Source
THQ - Target Hazard Quotient (unitless)	1	WDNR Default Value
BWc - Average Body Weight for Child (kg)	15	WDNR Default Value
AT - Averaging Time (years)	6	WDNR Default Value
RfDo - Oral Reference Dose (mg/kg-day)	1.0E-02	2
EF - Exposure Frequency (day/year)	245	Frost-Free Days (Est.)
EDc - Exposure Duration During Ages 1-6 (year)	6	WDNR Default Value
IRc - Ingestion Rate of Soil Age 1-6 (mg/day)	200	WDNR Default Value

$$\text{Residual Contaminant Level (mg/kg)} = \frac{\text{THQ x BWc x AT x 365 day/year}}{\text{1/RfDo x } 10^{-6} \text{ kg/mg x EF x ED x IRc}} = \boxed{1100}$$

Calculated by: Vasanta Kalluri (2/18/00)

Checked by: RJM 2-18-00

Note:

See list of references for numbered source citations.

cis 1,2-Dichloroethene
Soil Inhalation Pathway (RfC)

One Hour Martinizing
1223 S. Military Avenue, Green Bay, Wisconsin

Algorithm for Inhalation of Noncarcinogenic Contaminants from Non-Industrial (Residential) Soil

Parameter	Value	Source
THQ - Target Hazard Quotient (unitless)	1	WDNR Default Value
AT - Averaging Time (years)	30	WDNR Default Value
RfC - Reference Concentration (mg/m^3)	3.5E-02	2
EF - Exposure Frequency (day/year)	245	Frost-Free Days (Est.)
ED - Exposure Duration (year)	30	WDNR Default Value
VF - Volatilization Factor (kg/m^3)	2.89E+03	Calculation
Cp - Concentration of Particles less than 10 µm ($µg/m^3$)	1.4	WDNR Default Value

Residual Contaminant Level (mg/kg) = $\frac{THQ \times AT \times 365\ day/year}{1/RfC \times EF \times ED \times [(1/VF) + (Cp \times 10^{-9}\ kg/µg)]}$ = **150**

Algorithm for Inhalation of Noncarcinogenic Contaminants in Industrial Soil

Parameter	Value	Source
THQ - Target Hazard Quotient (unitless)	1	WDNR Default Value
AT - Averaging Time (years)	25	WDNR Default Value
RfC - Reference Concentration (mg/m^3)	3.5E-02	2
EF - Exposure Frequency (day/year)	250	WDNR Default Value
ED - Exposure Duration (year)	25	WDNR Default Value
IRc - Inhalation Rate Correction for Adult Laborer (unitless)	1.2	WDNR Default Value
VF - Volatilization Factor (m^3/kg)	2.89E+03	Calculation
Cp - Concentration of Particles less than 10 µm ($µg/m^3$)	1.4	WDNR Default Value

Residual Contaminant Level (mg/kg) = $\frac{THQ \times AT \times 365\ day/year}{1/RfC \times EF \times ED \times IRc \times [(1/VF) + (Cp \times 10^{-9}\ kg/µg)]}$ = **120**

Volatilization Factor (m^3/kg) = $\frac{Q/C \times (3.14 \times D_A \times T)^{1/2} \times 10^{-4} m^2/cm^2}{2 \times \rho_b \times D_A}$ = **2.89E+03**

D_A (cm^2/sec) = $\frac{[(\theta_a^{10/3} D_a H' + \theta_w^{10/3} D_w)/n^2]}{\rho_b K_d + \theta_w + \theta_a H'}$ = **1.87E-03**

Parameter	Value	Source
Q/C - Inverse Mean Concentration at Center of Source (g/m^2-sec)/(kg/m^3)	68.81	WDNR Default Value
D_A - Apparent Diffusivity (cm^2/sec)	1.87E-03	Calculation
T - Exposure Intervals (sec)	9.50E+08	WDNR Default Value
	1.5	WDNR Default Value
θ_a - Air Filled Porosity (cm^3/cm^3)	0.28	WDNR Default Value
D_a - Air Diffusion Coefficient (cm^2/sec)	7.40E-02	2
H' - Henry's Law Constant (unitless)	1.70E-01	2
θ_w - Volumetric Soil Moisture Content (cm^3/cm^3)	0.15	WDNR Default Value
D_w - Water Diffusion Coefficient (cm^2/sec)	1.10E-05	2
n - Total Soil Porosity (cm^3/cm^3)	0.43	WDNR Default Value
K_d - Soil:Water Distribution Coefficient (L/kg)	0.22	Koc x foc
K_{oc} - Organic Carbon:Water Partitioning Coefficient (L/kg)	36	2
f_{oc} - Soil Fraction Organic Carbon (g/g)	0.006	WDNR Default Value

Calculated by: Vasanta Kalluri (2/18/00)

Checked by: RAM 2-18-00

Note:

See list of references for numbered source citations.

cis 1,2-Dichloroethene

Groundwater Pathway

One Hour Martinizing

1223 S. Military Avenue, Green Bay, Wisconsin

Parameter	Value	Units	Description	Source
K_{oc}	36	L/kg	Organic Carbon Partition Coefficient	2
f_{oc}	0.0021	g/g	Fraction Organic Carbon Content	**Low** TOC from Soil Test
K_d	0.08	L/kg	Soil:Water Distribution Coefficient	K_{oc} x f_{oc}
θ	0.2	cm^3-H_20/cm^3-soil	Volumetric Water Content, Vadose Zone Soils	WDNR Default Value
n	0.43	cm^3-void/cm^3-soil	Porosity	WDNR Default Value
d	152.4	cm	Groundwater Mixing Zone Thickness	WDNR Default Value
R	25.4	cm	Annualized Groundwater Recharge Rate	WDNR Default Value
ρ_b	1.5	g-soil/cm^3-soil	Soil Bulk Density	WDNR Default Value
ES	70	µg/L	Enforcement Standard	NR 140

Calculate Site-Specific Residual Contaminant Level (RCL)

$$DAF = d/R\theta \times (K_d \times \rho_b + n)$$

DAF 16.3 Dilution Attenuation Factor

$$RCL_{ES} = ES \times 10^{-3}_{mg/\mu g} \times (K_d + \theta/\rho_b) \times DAF$$

RCL_{ES} **0.24** mg/kg **cis 1,2-dichloroethene Site-Specific Residual Contaminant Level using ES**

Calculated by: Vasanta Kalluri (2/18/00)

Checked by: RAM 2-18-00

Note:

See list of references for numbered source citations.

Tetrachloroethene
Soil Ingestion Pathway (SFo)

One Hour Martinizing
1223 S. Military Avenue, Green Bay, Wisconsin

Algorithm for Ingestion of Carcinogenic Contaminants in Non-Industrial Soil

Parameter	Value	Source
TR - Target Cancer Risk Level (unitless)	1E-06	WDNR Default Value
AT - Averaging Time (years)	70	WDNR Default Value
SFo - Slope Factor Oral $(mg/kg\text{-}day)^{-1}$	5.2E-02	2
EF - Exposure Frequency (day/year)	245	Frost-Free Days (Est.)
IFs - Age Adjusted Soil Ingestion Factor (mg-year/kg-day)	114	WDNR Default Value
IRc - Ingestion Rate of Soil Age 1-6 (mg/day)	200	WDNR Default Value
EDc - Exposure Duration During Ages 1-6 (year)	6	WDNR Default Value
BWc - Average Body Weight From Ages 1-6 (kg)	15	WDNR Default Value
IRa - Ingestion Rate of Soil Age 7-31 (mg/day)	100	WDNR Default Value
EDa - Exposure Duration During Ages 7-31 (year)	24	WDNR Default Value
BWa - Average Body Weight From Ages 7-31 (kg)	70	WDNR Default Value

$$\text{Residual Contaminant Level (mg/kg)} = \frac{TR \times AT \times 365\ day/year}{SFo \times 10^{-6}\ kg/mg \times EF \times IFs} = \boxed{18}$$

$$IFs = \frac{IRc \times EDc}{BWc} + \frac{IRa \times EDa}{BWa} = 114$$

Algorithm for Ingestion of Carcinogenic Contaminants in Industrial Soil

Parameter	Value	Source
TR - Target Cancer Risk Level (unitless)	1E-06	WDNR Default Value
BWa - Average Body Weight For Adult (kg)	70	WDNR Default Value
AT - Averaging Time (years)	70	WDNR Default Value
SFo - Slope Factor Oral $(mg/kg\text{-}day)^{-1}$	5.2E-02	2
EF - Exposure Frequency (day/year)	250	WDNR Default Value
ED - Exposure Duration (year)	25	WDNR Default Value
IRa - Ingestion Rate for Adult (mg/day)	100	WDNR Default Value

$$\text{Residual Contaminant Level (mg/kg)} = \frac{TR \times BWa \times AT \times 365\ day/year}{SFo \times 10^{-6}\ kg/mg \times EF \times ED \times IRa} = \boxed{55}$$

Calculated by: Vasanta Kalluri (1/31/00)

Checked by: RAM 2-18-00

Note:
See list of references for numbered source citations.

Tetrachloroethene
Soil Inhalation Pathway (SFi)

One Hour Martinizing
1223 S. Military Avenue, Green Bay, Wisconsin

Algorithm for Inhalation of Carcinogenic Contaminants from Non-Industrial (Residential) Soil

Parameter	Value	Source
TR - Target Cancer Risk Level (unitless)	1E-06	WDNR Default Value
BWa - Average Body Weight For Adult (kg)	70	WDNR Default Value
AT - Averaging Time (years)	70	WDNR Default Value
SFi - Slope Factor Inhalation $(mg/kg\text{-}day)^{-1}$	2.0E-03	2
EF - Exposure Frequency (day/year)	245	Frost-Free Days (Est.)
ED - Exposure Duration (year)	30	WDNR Default Value
IR - Inhalation Rate (m^3/day)	20	WDNR Default Value
VF - Volatilization Factor (kg/m^3)	3.23E+03	Calculation
Cp - Concentration of Particles less than 10 µm ($\mu g/m^3$)	1.4	WDNR Default Value

Residual Contaminant Level (mg/kg) = $\frac{TR \times BWa \times AT \times 365\ day/year}{SFi \times EF \times ED \times IR \times [(1/VF) + Cp \times 10^{-9}\ kg/\mu g)]}$ = **20**

Algorithm for Inhalation of Carcinogenic Contaminants in Industrial Soil

Parameter	Value	Source
TR - Target Cancer Risk Level (unitless)	1E-06	WDNR Default Value
BWa - Average Body Weight For Adult (kg)	70	WDNR Default Value
AT - Averaging Time (years)	70	WDNR Default Value
SFi - Slope Factor Inhalation $(mg/kg\text{-}day)^{-1}$	2.0E-03	1
EF - Exposure Frequency (day/year)	250	WDNR Default Value
ED - Exposure Duration (year)	25	WDNR Default Value
IRw - Inhalation Rate for Adult Laborer (m^3/day)	24	WDNR Default Value
VF - Volatilization Factor (kg/m^3)	3.23E+03	Calculation
Cp - Concentration of Particles less than 10 µm ($\mu g/m^3$)	1.4	WDNR Default Value

Residual Contaminant Level (mg/kg) = $\frac{TR \times BWa \times AT \times 365\ day/year}{SFi \times EF \times ED \times IRw \times [(1/VF) + Cp \times 10^{-9}\ kg/\mu g)]}$ = **19**

Volatilization Factor (m^3/kg) = $\frac{Q/C \times (3.14 \times D_A \times T)^{1/2} \times 10^{-4}\ m^2/cm^2}{2 \times \rho_b \times D_A}$ = **3.23E+03**

= $\frac{[(\theta_a^{10/3} D_a H' + \theta_w^{10/3} D_w)/n^2]}{\rho_b K_d + \theta_w + \theta_a H'}$ = **1.50E-03**

Parameter	Value	Source
Q/C - Inverse Mean Concentration at Center of Source $(g/m^2\text{-}sec)/(kg/m^3)$	68.81	WDNR Default Value
D_A - Apparent Diffusivity (cm^2/sec)	1.50E-03	Calculation
T - Exposure Intervals (sec)	9.50E+08	WDNR Default Value
ρ_b - Soil Dry Bulk Density (g/cm^3)	1.5	WDNR Default Value
θ_a - Air Filled Porosity (cm^3/cm^3)	0.28	WDNR Default Value
D_a - Air Diffusion Coefficient (cm^2/sec)	7.20E-02	2
H' - Henry's Law Constant (unitless)	7.50E-01	2
θ_w - Volumetric Soil Moisture Content (cm^3/cm^3)	0.15	WDNR Default Value
D_w - Water Diffusion Coefficient (cm^2/sec)	8.20E-06	2
n - Total Soil Porosity (cm^3/cm^3)	0.43	WDNR Default Value
K_d - Soil:Water Distribution Coefficient (L/kg)	1.62	K_{oc} x f_{oc}
K_{oc} - Organic Carbon:Water Partitioning Coefficient (L/kg)	270	2
f_{oc} - Soil Fraction Organic Carbon (g/g)	0.006	WDNR Default Value

Calculated by: Vasanta Kalluri (1/31/00)

Checked by: RJM 2-18-00

Note:

See list of references for numbered source citations.

Tetrachloroethene
Groundwater Pathway

One Hour Martinizing
1223 S. Military Avenue, Green Bay, Wisconsin

Parameter	Value	Units	Description	Source
K_{oc}	270	L/kg	Organic Carbon Partition Coefficient	2
f_{oc}	0.0021	g/g	Fraction Organic Carbon Content	**Low** TOC from Soil Test
K_d	0.5670	L/kg	Soil:Water Distribution Coefficient	K_{oc} x f_{oc}
θ	0.2	cm^3-H_2O/cm^3-soil	Volumetric Water Content, Vadose Zone Soils	WDNR Default Value
n	0.43	cm^3-void/cm^3-soil	Porosity	WDNR Default Value
d	152.4	cm	Groundwater Mixing Zone Thickness	WDNR Default Value
R	25.4	cm	Annualized Groundwater Recharge Rate	WDNR Default Value
ρ_b	1.5	g-soil/cm^3-soil	Soil Bulk Density	WDNR Default Value
ES	5	µg/L	Enforcement Standard	NR 140

Calculate Site-Specific Residual Contaminant Level (RCL)

$$DAF = d/R\theta \times (K_d \times \rho_b + n)$$

DAF 38.4 Dilution Attenuation Factor

$$RCL_{ES} = ES \times 10^{-3}_{mg/\mu g} \times (K_d + \theta/\rho_b) \times DAF$$

RCL_{ES} **0.13** mg/kg **Tetrachloroethene Site-Specific Residual Contaminant Level using ES**

Calculated by: Vasanta Kalluri (1/31/00)

Checked by: RAM 2-18-00

Note:

See list of references for numbered source citations.

Trichloroethene
Soil Ingestion Pathway (SFo)

One Hour Martinizing
1223 S. Military Avenue, Green Bay, Wisconsin

Algorithm for Ingestion of Carcinogenic Contaminants in Non-Industrial Soil

Parameter	Value	Source
TR - Target Cancer Risk Level (unitless)	1E-06	WDNR Default Value
AT - Averaging Time (years)	70	WDNR Default Value
SFo - Slope Factor Oral $(mg/kg\text{-}day)^{-1}$	1.1E-02	2
EF - Exposure Frequency (day/year)	245	Frost-Free Days (Est.)
IFs - Age Adjusted Soil Ingestion Factor (mg-year/kg-day)	114	WDNR Default Value
IRc - Ingestion Rate of Soil Age 1-6 (mg/day)	200	WDNR Default Value
EDc - Exposure Duration During Ages 1-6 (year)	6	WDNR Default Value
BWc - Average Body Weight From Ages 1-6 (kg)	15	WDNR Default Value
IRa - Ingestion Rate of Soil Age 7-31 (mg/day)	100	WDNR Default Value
EDa - Exposure Duration During Ages 7-31 (year)	24	WDNR Default Value
BWa - Average Body Weight From Ages 7-31 (kg)	70	WDNR Default Value

Residual Contaminant Level (mg/kg) = $\frac{TR \times AT \times 365\ day/year}{SFo \times 10^{-6}\ kg/mg \times EF \times IFs}$ = **83**

$IFs = \frac{IRc \times EDc}{BWc} + \frac{IRa \times EDa}{BWa}$ = 114

Algorithm for Ingestion of Carcinogenic Contaminants in Industrial Soil

Parameter	Value	Source
TR - Target Cancer Risk Level (unitless)	1E-06	WDNR Default Value
BWa - Average Body Weight For Adult (kg)	70	WDNR Default Value
AT - Averaging Time (years)	70	WDNR Default Value
SFo - Slope Factor Oral $(mg/kg\text{-}day)^{-1}$	1.1E-02	2
EF - Exposure Frequency (day/year)	250	WDNR Default Value
ED - Exposure Duration (year)	25	WDNR Default Value
IRa - Ingestion Rate for Adult (mg/day)	100	WDNR Default Value

Residual Contaminant Level (mg/kg) = $\frac{TR \times BWa \times AT \times 365\ day/year}{SFo \times 10^{-6}\ kg/mg \times EF \times ED \times IRa}$ = **260**

Calculated by: Vasanta Kalluri (1/31/00)

Checked by: RJM 2-18-00

Note:
See list of references for numbered source citations.

Trichloroethene
Soil Inhalation Pathway (SFi)

One Hour Martinizing
1223 S. Military Avenue, Green Bay, Wisconsin

Algorithm for Inhalation of Carcinogenic Contaminants from Non-Industrial (Residential) Soil

Parameter	Value	Source
TR - Target Cancer Risk Level (unitless)	1E-06	WDNR Default Value
BWa - Average Body Weight For Adult (kg)	70	WDNR Default Value
AT - Averaging Time (years)	70	WDNR Default Value
SFi - Slope Factor Inhalation $(mg/kg\text{-}day)^{-1}$	6.0E-03	2
EF - Exposure Frequency (day/year)	245	Frost-Free Days (Est.)
ED - Exposure Duration (year)	30	WDNR Default Value
IR - Inhalation Rate (m^3/day)	20	WDNR Default Value
VF - Volatilization Factor (kg/m^3)	2.60E+03	Calculation
Cp - Concentration of Particles less than 10 µm ($\mu g/m^3$)	1.4	WDNR Default Value

Residual Contaminant Level (mg/kg) = $\frac{TR \times BWa \times AT \times 365\ day/year}{SFi \times EF \times ED \times IR \times [(1/VF) + Cp \times 10^{-9}\ kg/\mu g)]}$ = **5.3**

Algorithm for Inhalation of Carcinogenic Contaminants in Industrial Soil

Parameter	Value	Source
TR - Target Cancer Risk Level (unitless)	1E-06	WDNR Default Value
BWa - Average Body Weight For Adult (kg)	70	WDNR Default Value
AT - Averaging Time (years)	70	WDNR Default Value
SFi - Slope Factor Inhalation $(mg/kg\text{-}day)^{-1}$	6.0E-03	2
EF - Exposure Frequency (day/year)	250	WDNR Default Value
ED - Exposure Duration (year)	25	WDNR Default Value
IRw - Inhalation Rate for Adult Laborer (m^3/day)	24	WDNR Default Value
VF - Volatilization Factor (kg/m^3)	2.60E+03	Calculation
Cp - Concentration of Particles less than 10 µm ($\mu g/m^3$)	1.4	WDNR Default Value

Residual Contaminant Level (mg/kg) = $\frac{TR \times BWa \times AT \times 365\ day/year}{SFi \times EF \times ED \times IRw \times [(1/VF) + Cp \times 10^{-9}\ kg/\mu g)]}$ = **5.2**

Volatilization Factor (m^3/kg) = $\frac{Q/C \times (3.14 \times D_A \times T)^{1/2} \times 10^{-4} m^2/cm^2}{2 \times \rho_b \times D_A}$ = **2.60E+03**

= $\frac{[(\theta_a^{10/3} D_a H' + \theta_w^{10/3} D_w)/n^2]}{\rho_b K_d + \theta_w + \theta_a H'}$ = **2.31E-03**

Parameter	Value	Source
Q/C - Inverse Mean Concentration at Center of Source $(g/m^2\text{-}sec)/(kg/m^3)$	68.81	WDNR Default Value
D_A - Apparent Diffusivity (cm^2/sec)	2.31E-03	Calculation
T - Exposure Intervals (sec)	9.50E+08	WDNR Default Value
ρ_b - Soil Dry Bulk Density (g/cm^3)	1.5	WDNR Default Value
θ_a - Air Filled Porosity (cm^3/cm^3)	0.28	WDNR Default Value
D_a - Air Diffusion Coefficient (cm^2/sec)	7.90E-02	2
H' - Henry's Law Constant (unitless)	4.20E-01	2
θ_w - Volumetric Soil Moisture Content (cm^3/cm^3)	0.15	WDNR Default Value
D_w - Water Diffusion Coefficient (cm^2/sec)	9.10E-06	2
n - Total Soil Porosity (cm^3/cm^3)	0.43	WDNR Default Value
K_d - Soil:Water Distribution Coefficient (L/kg)	0.56	$K_{oc} \times f_{oc}$
K_{oc} - Organic Carbon:Water Partitioning Coefficient (L/kg)	94	2
f_{oc} - Soil Fraction Organic Carbon (g/g)	0.006	WDNR Default Value

Calculated by: Vasanta Kalluri (1/31/00)

Checked by: RAM 2-18-00

Note:

See list of references for numbered source citations.

One Hour Martinizing
1223 S. Military Avenue, Green Bay, Wisconsin

Trichloroethene--Groundwater Pathway
Site-Specific Residual Contaminant Level Calculation

Parameter	Value	Units	Description	Source
K_{oc}	**94**	L/kg	Organic Carbon Partition Coefficient	2
f_{oc}	**0.0021**	g/g	Fraction Organic Carbon Content	**Low** TOC from Soil Test
K_d	0.20	L/kg	Soil:Water Distribution Coefficient	K_{oc} x f_{oc}
θ	0.2	cm^3-H_20/cm^3-soil	Volumetric Water Content, Vadose Zone Soils	WDNR Default Value
n	0.43	cm^3-void/cm^3-soil	Porosity	WDNR Default Value
d	152.4	cm	Groundwater Mixing Zone Thickness	WDNR Default Value
R	25.4	cm	Annualized Groundwater Recharge Rate	WDNR Default Value
ρ_b	1.5	g-soil/cm^3-soil	Soil Bulk Density	WDNR Default Value
ES	5	µg/L	Enforcement Standard	NR 140

Calculate Site-Specific Residual Contaminant Level (RCL)

$$DAF = d/R\theta \times (K_d \times \rho_b + n)$$

DAF 21.8 Dilution Attenuation Factor

$$RCL_{ES} = ES \times 10^{-3}_{mg/\mu g} \times (K_d + \theta/\rho_b) \times DAF$$

RCL_{ES} **0.036** mg/kg Site-Specific Residual Contaminant Level using ES

Calculated by: Vasanta Kalluri (1/31/00)

Checked by: RJM 2-18-00

Notes:

See list of references for numbered source citations.