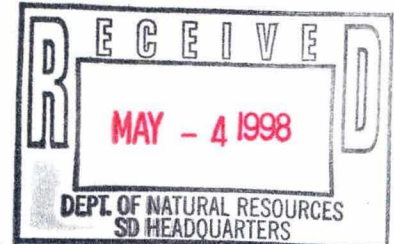




Roy F. Weston, Inc.  
Suite 400  
3 Hawthorn Parkway  
Vernon Hills, Illinois 60061-1450  
847-918-4000 • Fax 847-918-4055



28 April 1998

Mr. Tony Rutter, MC:SR-6J  
Remedial Project Manager  
United States Environmental Protection Agency  
77 West Jackson Boulevard  
Chicago, IL 60604

U.S. EPA Contract No.: 68-W7-0026  
Work Assignment No.: 001-RARA-05T2, Stoughton City Landfill Closure  
Document Control No.: RFW001-3A-AAJM  
Subject: Quality Assurance Project Plan  
and Field Sampling Plan Revisions

Dear Mr. Rutter:

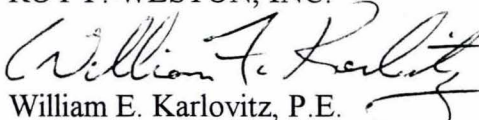
Roy F. Weston, Inc. (WESTON®) is pleased to submit two copies of the Quality Assurance Project Plan (QAPP) and the Field Sampling Plan (FSP) revisions.

Revised pages for the QAPP include Section 2, pages 37 - 45 and Figure 3-1 (Page 3-2). Revised sections for the FSP include Section 2 and Section 3. These revised pages and sections can be directly inserted into the original document.

These documents are being submitted for your review and comment in accordance with the Statement of Work for the Stoughton City Landfill Remedial Action. If you have any questions, please contact me at (847) 918-4042.

Very truly yours,

ROY F. WESTON, INC.

  
William E. Karlovitz, P.E.  
Site Manager

WEK:sl

Attachments

cc: P. Vogtman, Project Office, U.S. EPA HSM-5J  
P. Kozol, WDNR

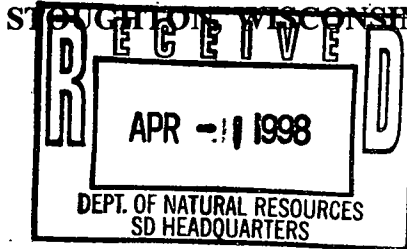
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RFW001-3A-AAJM

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**QUALITY ASSURANCE PROJECT PLAN  
REMEDIAL ACTION  
STOUGHTON CITY LANDFILL**



Prepared for:

U.S. Environmental Protection Agency  
Emergency and Remedial Response Branch  
Region V  
77 West Jackson Boulevard  
Chicago, Illinois 60604

This document was prepared in accordance with U.S. EPA Contract No. 68-W7-0026,  
WESTON Region V Response Action Contract (RAC).

Work Assignment No. 001-RARA-05T2

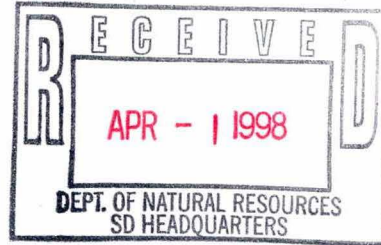
Document Control No. RFW001-2E-AAIT



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31 March 1998

Mr. Paul L. Kozol, P.E.  
State of Wisconsin  
Department of Natural Resources  
3911 Fish Hatchery Road  
Fitchburg, WI 53711



U.S. EPA Contract No.: 68-W7-0026

Work Assignment No.: 001-RARA-05T2, Stoughton City Landfill Closure

Document Control No.: RFW001-3A-AAJD

Subject: Quality Assurance Project Plan  
and Field Sampling Plan

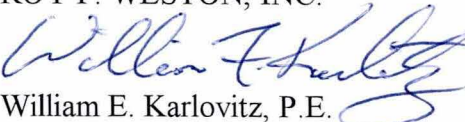
Dear Mr. Kozol:

Roy F. Weston, Inc. (WESTON®) is pleased to enclose a copy of the Quality Assurance Project Plan (QAPP) and the Field Sampling Plan (FSP). The FSP is included as Appendix A of the QAPP.

These documents are being submitted for your review. If you have any questions, please contact me at (847) 918-4042.

Very truly yours,

ROY F. WESTON, INC.

  
William E. Karlovitz, P.E.  
Site Manager

WEK:sl

Attachments

cc: T. Rutter - U.S. EPA

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RFW001-3A-AAJD

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QUALITY ASSURANCE PROJECT PLAN  
STOUGHTON CITY LANDFILL  
STOUGHTON, WISCONSIN

March 1998

Prepared By: Tonya Balla Date: 3-27-98  
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Approved By: \_\_\_\_\_ Date: \_\_\_\_\_  
Tony Rutter, U.S. EPA  
Remedial Project Manager

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- B Special Analytical Services (SAS) Request
- C Standard Operating Procedures (SOPs) for Field Instruments
- D Completed Sample Documentation Examples and Requirements
- E Specifications and Guidance for Obtaining Contaminant-Free Sample Containers

## LIST OF ACRONYMS/ABBREVIATIONS

AMSL	Above Mean Sea Level
AOC	Administrative Order by Consent
APO	Administrative Project Officer
ARARS	applicable or relevant and appropriate requirements
ASTM	American Society of Testing and Materials
ATV	all-terrain vehicle
CCS	Contracts Compliance Screening
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
CLP	Contract Laboratory Program
COC	Chain-of-Custody
CRDL	Contract Required Detection Limits
CRL	Central Regional Laboratory
CRQL	Contract Required Quantitation Limits
DCDFM	Dichlorodifluoromethane
DMI	distance measuring instrument
DNAPL	dense nonaqueous phase liquids
DQO	data quality objective
FID	flame ionization detector
FSM	Field Sample Manager
FSP	field sampling plan
HQ	Headquarters
IATA	International Air Transport Association
M&E	Metcalf and Eddy, Inc.
MCL	maximum contaminant level
MS/MSD	matrix spike/matrix spike duplicate
NBS	National Bureau of Standards
NEIC	National Enforcement Investigations Center
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
OERR	Office of Emergency and Remedial Response
OSC	on-scene coordinator
PAHs	polynuclear aromatic hydrocarbons
PAL	Preventive Action Limit
PE	performance evaluation
PID	photoionization detector
ppb	parts per billion
PRPs	Potential Responsible Parties
QA	quality assurance
QAM	quality assurance manager
QAPP	quality assurance project plan
QC	quality control
R.E.H.S	Registered Environmental Health Specialist

## LIST OF ACRONYMS/ABBREVIATIONS (Continued)

RA	Remedial Action
RAS	routine analytical services
RD	Remedial Design
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
RPM	Remedial Project Manager
RSCC	Regional Sample Control Center
SARA	Superfund Amendments and Reauthorization Act
SAS	special analytical services
SCL	Stoughton City Landfill
SHSC	Site Health and Safety Coordinator
SM	site manager
SMC	sample management coordinator
SMO	sample management office
SOP	standard operating procedure
SOW	Statement of Work
SVOC	semivolatile organic compound
TAL	Target Analyte List
TCFM	Trichlorofluoromethane
TCL	Target Compound List
TDS	Total Dissolved Solids
TES	Technical Enforcement Support
THF	Tetrahydrofuran
TIC	tentatively identified compound
TKN	Total Kjeldahl Nitrogen
TOC	total organic carbon
TPO	Technical Project Officers
TR	Traffic Report
TSS	Total Suspended Solids
U.S. EPA	United States Environmental Protection Agency
USCS	Unified Soil Classification System
USGS	United States Geological Survey
VOA	volatile organic analysis
VOC	volatile organic compound
WDNR	Wisconsin Department of Natural Resources
WESTON	Roy F. Weston, Inc.

## SECTION 1 INTRODUCTION

This document is part of the remedial action for the landfill component for the Stoughton City Landfill (SCL) site in Stoughton, Wisconsin. The United States Environmental Protection Agency (U.S. EPA) requires that all environmental monitoring and measurement efforts mandated or supported by U.S. EPA participate in a centrally-managed quality assurance (QA) program. Any party generating data under this program has the responsibility to implement minimum procedures to ensure that the precision, accuracy, completeness, and representativeness of its data are known and documented. To ensure the responsibility is met uniformly, each party must prepare a written Quality Assurance Project Plan (QAPP) covering each project it is to perform.

This QAPP presents the organization, functional objectives, and specific QA and Quality Control (QC) activities for environmental monitoring associated with the Remedial Action (RA) for the landfill component of the SCL site. This QAPP also describes the specific protocols that will be followed for sampling, sample handling and storage, chain of custody, and laboratory and field analysis. The Field Sampling Plan (FSP) is provided in Appendix A. The FSP presents sample network design and rationale, field investigation protocols, and field QC procedures.

All QA/QC procedures will be in accordance with applicable technical standards, U.S. EPA requirements, government regulations and guidelines, and specific project goals and requirements. This QAPP was prepared by Roy F. Weston, Inc. (WESTON®) in accordance with U.S. EPA QAPP guidance documents; in particular, the following documents:

- *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (QAMS-005/80)*

- *Region V Content Requirements for QAPPs* (U.S. EPA, 1989)
- *Region V Superfund Model QAPP Revision 1* (U.S. EPA, 1996).

## SECTION 2

### PROJECT DESCRIPTION

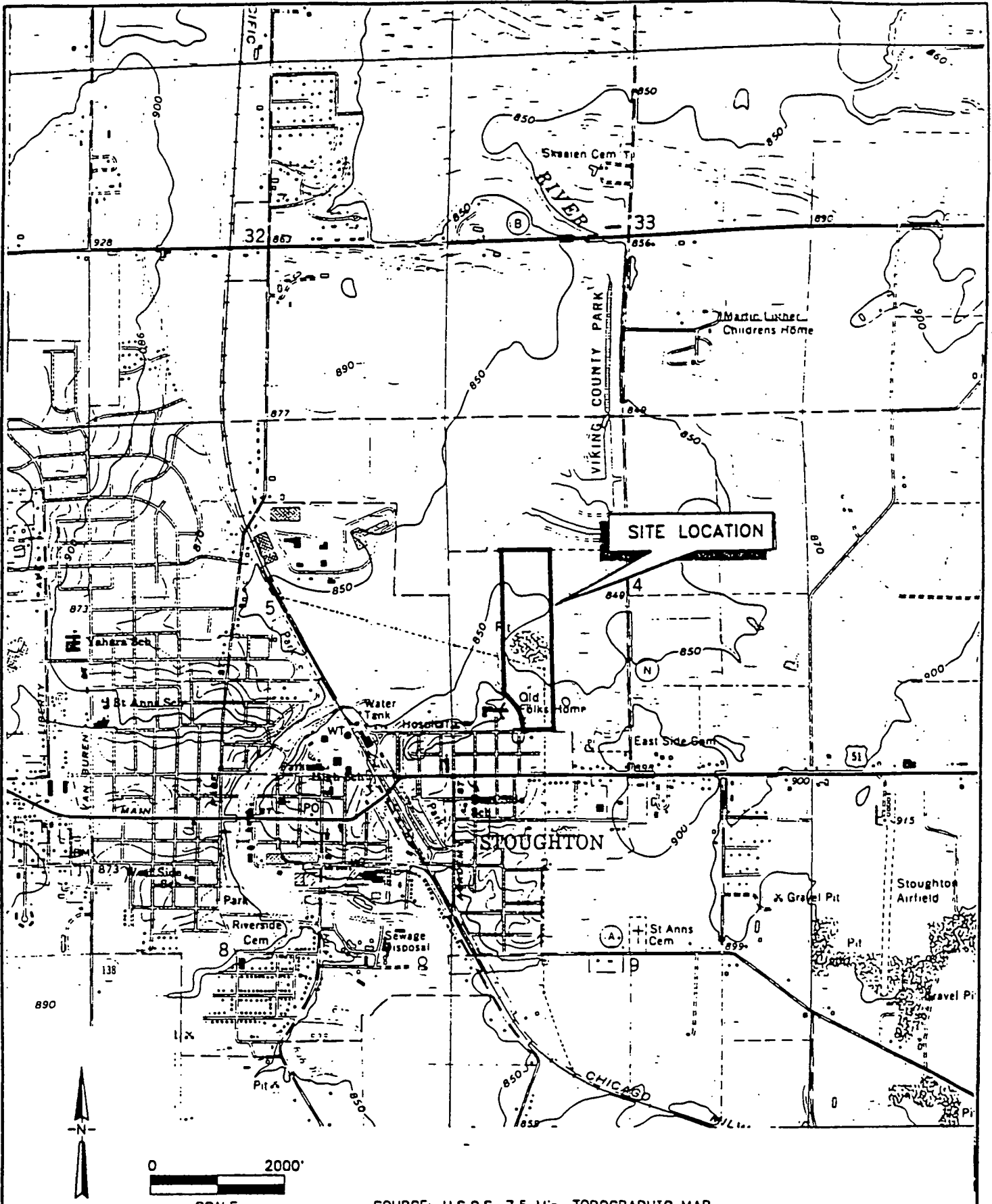
This section presents site background, summary of previous investigations, project objectives and scope, overview of sampling and analysis program, anticipated uses of the results, and project schedule.

#### 2.1 SITE LOCATION/BACKGROUND INFORMATION

##### 2.1.1 Site Location and History

The SCL site is located in the northeast portion of the City of Stoughton, approximately 13 miles southeast of Madison, in Dane County, Wisconsin (Figure 2-1). The property containing the site encompasses approximately 27 acres and occupies portions of the west half of the southwest quarter and the southwest quarter of the northwest quarter of Section 4, Township 5 North, Range 11 East. A wetland area, located along the southeast portion of the present property boundary, was the initial area of waste disposal. Wetlands are also located in the north portion of the site, and west of the site along the Yahara River. The Yahara River is located west of the site and is within approximately 400 feet of the site at its closest distance. Existing site conditions are depicted in Figure 2-2.

The landfill operated from 1952 until it was officially closed in 1982. Between 1952 and 1969, the site was operated as an uncontrolled dump site. During this time, refuse was usually burned or covered by dirt. The site began operation as a state-licensed landfill in 1969. In 1977, the Wisconsin Department of Natural Resources (WDNR) required that the site be closed according to state regulations. Closure activities included construction of a trash transfer station, placement of cover material borrowed from agricultural areas,



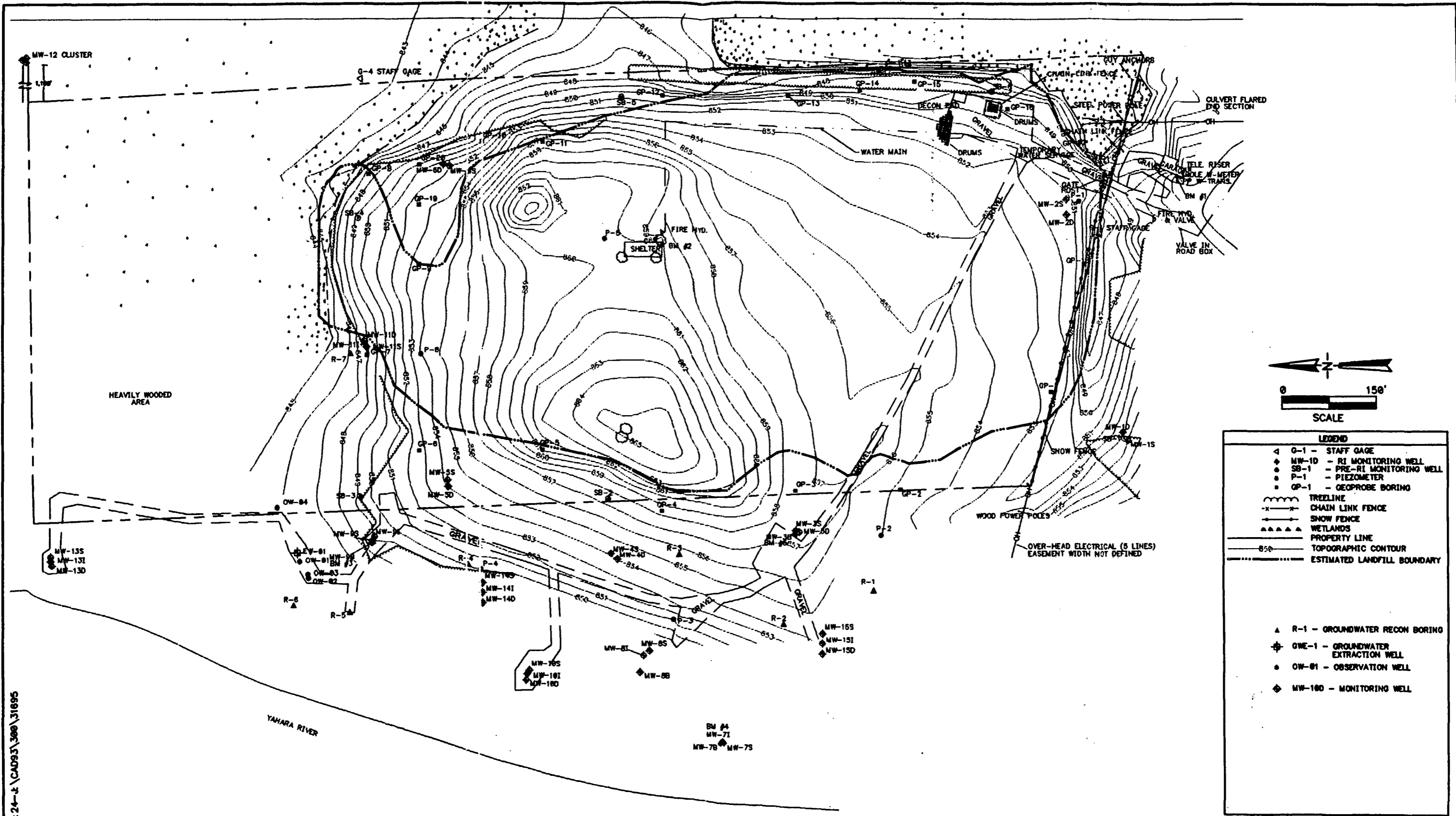
SOURCE: U.S.G.S. 7.5 Min. TOPOGRAPHIC MAP  
STOUGHTON QUADRANGLE

FIGURE 2-1

**RESPONSE ACTION CONTRACT**  
 U.S. EPA CONTRACT No. 68-W7-0026  
 WORK ASSIGNMENT No. 001-RARA-05T2  
 DOCUMENT CONTROL No. RFW001-2E-AAIT

**SITE LOCATION MAP**  
 STOUGHTON LANDFILL SITE  
 Stoughton, Wisconsin





LEGEND	
◁	G-1 - STAFF GAGE
◆	MW-10 - RI MONITORING WELL
●	SB-1 - PRE-RI MONITORING WELL
●	P-1 - PIEZOMETER
●	GP-1 - GEOPROBE BORING
~~~~~	TREELINE
-x-x-	CHAIN LINK FENCE
— — —	SNOW FENCE
▲▲▲▲	WETLANDS
—	PROPERTY LINE
—550—	TOPOGRAPHIC CONTOUR
-----	ESTIMATED LANDFILL BOUNDARY
▲	R-1 - GROUNDWATER RECON BORING
◆	ONE-1 - GROUNDWATER EXTRACTION WELL
●	OW-01 - OBSERVATION WELL
◆	MW-100 - MONITORING WELL

TAD-05/31/86-13:24-J \CA093\300\31695

NOTE: MONITORING WELLS 8S, 8I, 14S, 14I, 14D, 15S, 15I AND 15I) HAVE NOT BEEN INSTALLED AT THE TIME OF INTERMEDIATE DESIGN SUBMITTAL. THESE WELLS ARE PROPOSED TO BE INSTALLED IN SUMMER 1996.

RESPONSE ACTION CONTRACT  
 U.S. EPA CONTRACT No. 68-W7-0026  
 WORK ASSIGNMENT No. 001-RARA-05T2  
 DOCUMENT CONTROL No. RFW001-2E-AAIT

FIGURE 2-2  
 SITE CONDITIONS  
 STOUGHTON CITY LANDFILL  
 Stoughton, Wisconsin

application of topsoil, and seeding. Closure work was performed according to WDNR regulations from 1978 to 1982. Only brick, rubble, and similar construction materials were accepted at the site during this period.

Common municipal waste and solid and liquid industrial wastes were disposed of at the site during its years of operation. Industrial sludge containing acetone, tetrahydrofuran, toluene, xylene, and other organic substances were disposed of at the site from 1954 until 1962. During this period, the liquid wastes were commonly poured over garbage and burned. It was also reported that some liquid wastes were poured down boreholes in the west-central portion of the landfill. (These boreholes had been drilled as part of field testing of drilling equipment.)

The site was placed on the National Priorities List (NPL) in June 1986. In March 1988, the two Potentially Responsible Parties (PRPs), Uniroyal Plastics, Inc., and the City of Stoughton, entered into an Administrative Order on Consent (AOC) with U.S. EPA and WDNR. This AOC required the completion of a remedial investigation and feasibility study (RI/FS). A Record of Decision (ROD) was signed for the site in September 1991. The ROD presents the site background and the selected remedial action for the site.

### **2.1.2 Summary of Key Groundwater Monitoring Activities**

The RI/FS was performed by ENSR Consulting and Engineering, Westmont, Illinois. RI field activities began at the site in March 1989 and the majority of the RI was completed by September 1991. The RI activities and results are described in the *Final Remedial Investigation Report*, dated 17 January 1991. Six shallow and deep monitoring well clusters (MW-1 through MW-6), were installed and sampled during the RI phase. The monitoring

well locations are shown in Figure 2-2. Tetrahydrofuran (THF) was detected above the Wisconsin enforcement standard in groundwater samples in monitoring wells on the western side of the landfill. Dichlorodifluoromethane (DCDFM) and trichlorofluoromethene (TCFM) were detected below the enforcement standards; however, DCDFM was detected close to the preventive action limit. Therefore, the presence of DCDFM and TCFM also required further investigation. The FS is presented in the *Final Feasibility Study Report*, dated 20 June 1991.

Prior to issuance of the ROD, U.S. EPA requested that additional field work be performed by the PRPs for the purpose of further addressing the groundwater contaminants. This work was subsequently tasked by U.S. EPA to the Technical Enforcement Support (TES) X contractor because the PRPs refused to perform the work. Metcalf & Eddy, Inc. (M&E) was the primary TES X contractor to U.S. EPA. Jacobs Engineering Group Inc. (Jacobs), subcontractor to M&E with the TES X contract, performed the actual work. Based on the RI results, Jacobs conducted additional sampling on the west side of the landfill. Jacobs drilled four exploratory borings and installed eight monitoring wells (MW-3B, MW-7S, MW-7I, MW-8B, MW-9S, MW-9I, and MW-9B). The monitoring well locations are shown in Figure 2-2. Monitoring wells MW-3B, MW-7B, MW-8B, and MW-9B were installed in bedrock. Jacobs identified THF, DCDFM, and TCFM as the chemicals of concern in groundwater, and conducted two rounds of groundwater sampling. Tables 2-1 and 2-2 summarize the groundwater sampling results reported by Jacobs.

WESTON under the ARCS contract, was tasked by U.S. EPA to perform the Remedial Design/Remedial Action (RD/RA) at the site.

Based on a review of the groundwater data, WESTON determined that additional predesign groundwater investigation was needed. WESTON conducted the additional predesign data

**Table 2-1**  
**Round 1 Groundwater Sampling Results**  
**(Conducted by Jacobs, October 1993)**  
**Stoughton City Landfill**  
**Stoughton, Wisconsin**  
**(All Concentrations in  $\mu\text{g/L}$ )**

Location	Screen Interval (ft.)	Tetrahydrofuran	Dichlorodifluoromethane	Trichlorofluoromethane
MW-1S	5 - 15	ND	ND	ND
MW-1D	69 - 79	ND	ND	ND
MW-2S	5 - 15	ND	ND	ND
MW-2D	24 - 34	ND	ND	ND
MW-3S	7 - 17	ND	ND	ND
MS-3D	61 - 71	417	ND	ND
MW-3B	82 - 92	ND	ND	ND
MW-4S	5 - 15	ND	ND	ND
MW-4D	63 - 73	ND	ND	ND
MW-5S	5 - 15	ND	18	ND
MW-5D	65 - 75	ND	ND	3 J
MW-6S	4 - 14	ND	ND	ND
MW-6D	46 - 56	ND	ND	ND
MW-7S	6 - 12	ND	ND	ND
MW-7I	46 - 56	ND	ND	ND
MW-7B	71 - 81	ND	ND	ND
MW-8B	71 - 81	ND	ND	ND
MW-9S	18 - 28	42	357	2 J
MW-9I	34 - 44	94	315	24
MW-9B	71 - 81	ND	ND	7 J
Enforcement Standard (E.S.)		50	1,000	3,490
Preventive Action Limit (PAL)		10	200	698

J - Estimated.  
 Detection Limit - 10  $\mu\text{g/L}$ .  
 ND - Nondetect.

Only tetrahydrofuran, dichlorodifluoromethane, and trichlorofluoromethane results are summarized here.

**Table 2-2**  
**Round 2 Groundwater Sampling Results**  
**(Conducted by Jacobs, February - March 1994)**  
**Stoughton City Landfill**  
**Stoughton, Wisconsin**  
**(All Concentrations in  $\mu\text{g/L}$ )**

Location	Screen Interval (ft.)	Tetrahydrofuran	Dichlorodifluoromethane	Trichlorofluoromethane
MW-1S	5 - 15	ND	ND	ND
MW-1D	69 - 79	ND	ND	ND
MW-2S	5 - 15	ND	ND	ND
MW-2D	24 - 34	ND	ND	ND
MW-3S	7 - 17	9 J	ND	ND
MS-3D	61 - 17	300	ND	ND
MW-3B	82 - 92	ND	ND	ND
MW-4S	5 - 15	2 J	ND	ND
MW-4D	63 - 73	ND	ND	ND
MW-5S	5 - 15	ND	23	0.6 J
MW-5D	65 - 75	3 J	5 J	2 J
MW-6S	4 - 14	ND	ND	ND
MW-6D	46 - 56	ND	ND	ND
MW-7S	6 - 12	4 J	ND	ND
MW-7I	46 - 56	ND	ND	ND
MW-7B	71 - 81	ND	ND	ND
MW-8B	71 - 81	ND	ND	ND
MW-9S	18 - 28	150	450	ND
MW-9I	34 - 44	91	290	17
MW-9B	71 - 81	NA	NA	NA
Enforcement Standard (E.S.)		50	1,000	3,490
Preventive Action Limit (PAL)		10	200	698

J - Estimated value.

ND - Nondetect.

NA - Not analyzed.

Detection limit for tetrahydrofuran = 20  $\mu\text{g/L}$ .

Detection limit for dichlorodifluoromethane, trichlorofluoromethane = 10  $\mu\text{g/L}$ .

Only tetrahydrofuran, dichlorodifluoromethane, and trichlorofluoromethane results are summarized here.

collection activities during May 1994 to March 1995 according to the Remedial Design Work Plan Revision (WESTON, April 1994). WESTON presented the results in the *Remedial Design Data Collection Report* (WESTON, June 1995). The following are the conclusions of the predesign groundwater investigation:

- The inorganic groundwater quality west of the site is in the same range as background inorganic groundwater quality east of the site. Iron, lead, and manganese in groundwater are mostly associated with suspended solids.
- Three distinct stratigraphic units exist at the site: landfill materials, glacial deposits, and carbonate bedrock. The thickness of landfill waste and fill material varies from 10 to 15 feet below ground surface (bgs). The glacial deposits are relatively permeable coarse-grained soils composed primarily of outwash sand and gravel, and silty and sandy loam deposits. The thickness of these units range from a few feet to over 70 feet bgs. Bedrock was encountered in deep borings between 70 to 80 feet bgs.
- Shallow groundwater below the landfill flows radially. Regional groundwater generally flows toward the northwest across the study area and has an upward vertical flow gradient component towards the Yahara River. The average horizontal and vertical groundwater velocities are estimated to be 1.2 feet per day (ft/day) and 0.3 ft/day, respectively.
- The chemicals of concern in groundwater are THF and DCDFM. Table 2-3 presents the results of groundwater monitoring conducted during the last round of the predesign investigation. Figures 2-3 and 2-4 present the areal extent of THF and DCDFM contamination in groundwater.

### **2.1.3 Summary of Key Landfill Gas Monitoring Activities**

During the RI, a soil gas survey was conducted at the site. The results of the soil gas survey indicated the presence of low-level chlorinated organics, fluorocarbon compounds, petroleum derivative compounds, and other volatile organic compounds (VOCs). During the predesign

**Table 2-3**  
**Monitoring Well Sampling Results**  
**Predesign Phase II Investigation**  
**Stoughton City Landfill**  
**Stoughton, Wisconsin**

Analyte	Field Sample Numbers SL2-									
	MW1S-01		MW1D-01		MW2S-01		MW2S-01FB		MW2D-01MSD	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Special VOCs (µg/L)</b>										
Dichlorodifluoromethane	4 UJ	--	4 UJ	--	4 UJ	--	4 UJ	--	4 UJ	--
Tetrahydrofuran	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Trichlorofluoromethane	4 U	--	4 U	--	4 U	--	4 U	--	4 U	--
<b>RAS VOCs (µg/L)</b>										
Vinyl Chloride	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Methylene Chloride	10 U	--	10 U	--	6 J	--	10 U	--	4 J	--
Acetone	10 U	--	10 U	--	10 U	--	10 BJU	--	10 U	--
1,2-Dichloroethene (Total)	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Trichloroethene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Benzene	10 U	--	10 U	--	4 J	--	10 U	--	10 U	--
Toluene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Ethylbenzene	10 U	--	10 U	--	290 D	--	10 U	--	10 U	--
<b>Metals (µg/L)</b>										
Aluminum	2050	43.8 B	34.8 B	33.1 B	47.7 B	24.9 U	24.9 U	24.9 U	24.9 U	25.5 B
Antimony	46.2 U	46.2 U	46.2 U	75.1	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U

Table 2-3  
 Monitoring Well Sampling Results  
 Predesign Phase II Investigation  
 Stoughton City Landfill  
 Stoughton, Wisconsin  
 (Continued)

Analyte	Field Sample Numbers SL2-									
	MW1S-01		MW1D-01		MW2S-01		MW2S-01FB		MW2D-01MSD	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Metals (µg/L) (Cont.)</b>										
Arsenic	22.5	15.5 J	2.1 BJ	2.0 U	2.0 U	7.8 BJ	2.0 U	2.0 U	6.5 BJ	6.0 BJ
Barium	259	245	74.1 B	73.3 B	288	273	0.78 BJ	0.79 BJ	97.9 B	96.7 B
Beryllium	0.80 BJ	0.80 BJ	0.37 BJ	0.51 BJ	0.80 BJ	0.73 BJ	0.35 BJ	0.20 U	0.79 BJ	0.79 BJ
Cadmium	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U
Calcium	143000	136000	82000	82900	164000	172000	366 B	221 BJ	86200	84700
Chromium	68.7	3.4 U	3.4 U	3.4 U	3.6 B	3.4 U	3.4 U	3.4 U	3.4 U	3.4 U
Cobalt	5.6 B	6.1 B	3.2 U	3.2 U	4.7 BJ	4.4 BJ	3.2 U	3.2 U	3.2 U	5.6 BJ
Copper	31.5 J	18.2 BJ	11.5 BJ	8.5 BJ	20.2 BJ	11.6 BJ	6.0 BJ	3.3 BJ	12.4 BJ	12.7 BJ
Iron	8170	3030	696 J	352 J	18800	20400	87.8 B	420	1800 J	2200
Lead	2.0 BJ	1.0 BJ	0.80 U	0.80 U	0.80 U	0.80 U	0.80 U	0.80 U	0.80 U	0.80 U
Magnesium	68400	64300	47800	48700	64500	67000	176 BJ	58.5 BJ	50800	51500
Manganese	1010	984	15.9	15.0	1960	2090	2.0 BJ	1.7 BJ	84.1	83.6
Mercury	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Nickel	51.0	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U
Potassium	6770	8500	1950 U	1950 U	13200	14900	1950 U	1950 U	2520 B	1950 U



**Table 2-3**  
**Monitoring Well Sampling Results**  
**Predesign Phase II Investigation**  
**Stoughton City Landfill**  
**Stoughton, Wisconsin**  
**(Continued)**

Analyte	Field Sample Numbers SL2-									
	MW1S-01		MW1D-01		MW2S-01		MW2S-01FB		MW2D-01MSD	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Metals (µg/L) (Cont.)</b>										
Selenium	5.0 J	2.0 U	2.3 BJ	2.0 U	2.0 U	2.6 BJ	2.0 U	2.0 U	2.0 U	2.1 BJ
Silver	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U
Sodium	8580	8710	207000	210000	21300	21900	167 BJ	185 BJ	10600	11300
Thallium	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U
Vanadium	25.8 BJ	19.9 BJ	12.2 BJ	13.8 BJ	22.1 BJ	21.0 BJ	3.1 U	3.1 U	14.4 BJ	11.6 BJ
Zinc	31.6	32.6 J	21.2 J	7.6 BJ	19.0 BJ	7.6 BJ	16.4 B	12.2 B	7.3 BJ	18.7 BJ
Cyanide	--	--	--	--	--	--	--	--	--	--

Table 2-3

Monitoring Well Sampling Results  
 Predesign Phase II Investigation  
 Stoughton City Landfill  
 Stoughton, Wisconsin  
 (Continued)

Analyte	Field Sample Numbers SL2-									
	MW3S-01		MW3D-01		MW3B-01		MW4S-01		MW4D-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Special VOCs (µg/L)</b>										
Dichlorodifluoromethane	4 U	--	4 U	--	4 U	--	4 U	--	4 U	--
Tetrahydrofuran	4 U	--	230 J	--	4 U	--	4 U	--	4 U	--
Trichlorofluoromethane	4 U	--	4 U	--	4 U	--	4 U	--	4 U	--
<b>RAS VOCs (µg/L)</b>										
Vinyl Chloride	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Methylene Chloride	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Acetone	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
1,2-Dichloroethene (Total)	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Trichloroethene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Benzene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Toluene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Ethylbenzene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
<b>Metals (µg/L)</b>										
Aluminum	534	372	249	9.0 U	24.8 B	9.5 B	106 BJ	9.0 U	9.0 U	9.0 U
Antimony	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U

**Table 2-3**  
**Monitoring Well Sampling Results**  
**Predesign Phase II Investigation**  
**Stoughton City Landfill**  
**Stoughton, Wisconsin**  
**(Continued)**

Analyte	Field Sample Numbers SL2-									
	MW3S-01		MW3D-01		MW3B-01		MW4S-01		MW4D-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Metals (µg/L) (Cont.)</b>										
Arsenic	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	9.6 B	9.8 B
Barium	101 B	94.7 B	99.6 B	88.5 B	35.8 B	33.9 B	57.6 B	54.9 B	74.8 B	65.8 B
Beryllium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cadmium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Calcium	104000 J	93000 J	110000 J	108000 J	95600 J	90600 J	66000	63300	148000	127000
Chromium	7.8 B	5.3 B	1.3 B	1.0 U	2.3 B	1.9 B	3.2 BJ	2.6 B	1.0 U	1.0 U
Cobalt	1.3 B	1.0 U	1.4 B	1.0 U	1.0 U	1.0 U	1.3 BJ	1.0 U	1.2 BJ	1.0 U
Copper	4.6 B	2.0 U	2.9 B	2.0 U	2.0 U	2.0 U	2.7 BJ	2.0 B	2.0 U	2.0 U
Iron	1040	140	7550	460	7.0 U	7.0 U	287 J	7.0 U	5860 J	3500
Lead	2.0 U	3.7	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Magnesium	54400 J	48300 J	76700 J	74600 J	51900 J	49200 J	31800	30600	92600	83600
Manganese	80.8 J	1.8 BJ	135 J	101 J	1.0 BJ	1.0 UJ	34.5 J	1.0 BJ	61.4	50.4
Mercury	0.21	0.20 U	0.20 U	0.24	0.22	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	3.0 B	1.9 B	5.1 B	2.1 B	1.0 U	1.0 U	1.6 BJ	1.0 U	2.5 BJ	1.0 U

Table 2-3

Monitoring Well Sampling Results  
 Predesign Phase II Investigation  
 Stoughton City Landfill  
 Stoughton, Wisconsin  
 (Continued)

Analyte	Field Sample Numbers SL2-									
	MW3S-01		MW3D-01		MW3B-01		MW4S-01		MW4D-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Metals (µg/L) (Cont.)</b>										
Potassium	1190 BEJ	1060 BEJ	1690 BEJ	1600 BEJ	1020 BEJ	957 BEJ	694 BEJ	682 BEJ	2360 BEJ	2120 BEJ
Selenium	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Silver	1.0 U	1.1 B	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Sodium	16200 J	16300 J	12300 J	12400 J	7030 J	6640 J	4600 BEJ	5050 EJ	27500 EJ	25000 EJ
Thallium	6.0 U	6.0 B	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U
Vanadium	2.5 B	1.1 B	1.0 U	1.0 U	1.0 U	1.0 U	1.2 B	1.0 U	1.0 U	1.0 U
Zinc	37.9	11.5 B	14.8 B	10.5 B	58.5	33.2	17.8 BJ	34.0	17.0 BJ	10 BJ
Cyanide	--	--	--	--	--	--	--	--	--	--

**Table 2-3**  
**Monitoring Well Sampling Results**  
**Predesign Phase II Investigation**  
**Stoughton City Landfill**  
**Stoughton, Wisconsin**  
**(Continued)**

Analyte	Field Sample Numbers SL2-									
	MW5S-01		MW5D-01		MW6S-01		MW6D-01		MW6D-01DP	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Special VOCs (µg/L)</b>										
Dichlorodifluoromethane	8	–	7	–	4 UJ	–	4 U	–	4 U	–
Tetrahydrofuran	4 U	–	4 U	–	10 U	–	4 U	–	4 U	–
Trichlorofluoromethane	4 U	–	4 U	–	4 U	–	4 U	–	4 U	–
<b>RAS VOCs (µg/L)</b>										
Vinyl Chloride	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Methylene Chloride	10 U	–	10 U	–	9 J	–	10 U	–	10 U	–
Acetone	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
1,2-Dichloroethene (Total)	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Trichloroethene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Benzene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Toluene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
Ethylbenzene	10 U	–	10 U	–	10 U	–	10 U	–	10 U	–
<b>Metals (µg/L)</b>										
Aluminum	499	9.0 U	83.0 BJ	9.0 U	5450	31.7 B	9.0 U	9.0 U	32.6 BJ	9.0 U
Antimony	4.0 U	4.0 U	4.0 U	4.0 U	61.7	46.2 U	4.0 U	4.0 U	4.0 U	4.0 U

Table 2-3

Monitoring Well Sampling Results  
 Predesign Phase II Investigation  
 Stoughton City Landfill  
 Stoughton, Wisconsin  
 (Continued)

Analyte	Field Sample Numbers SL2-									
	MW5S-01		MW5D-01		MW6S-01		MW6D-01		MW6D-01DP	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Metals (µg/L) (Cont.)</b>										
Arsenic	6.0 U	6.0 U	6.0 U	6.0 U	3.8 BJ	2.0 U	6.0 U	6.0 U	6.0 U	6.0 U
Barium	77.8 B	71.2 B	46.6 B	45.4 B	87.2 B	47.4 B	32.7 B	30.2 B	31.0 B	30.8 B
Beryllium	1.0 U	1.0 U	1.0 U	1.0 U	1.1 BJ	0.51 BJ	1.0 U	1.0 U	1.0 U	1.0 U
Cadmium	1.0 U	1.0 U	1.0 U	1.0 U	3.7 U	3.7 U	1.0 U	1.0 U	1.0 U	1.0 U
Calcium	76900	70800	105000	100000	147000	94400	79500	72300	73600	76000
Chromium	3.8 BJ	2.1 B	2.3 BJ	1.0 U	18.5	3.4 U	2.2 BJ	1.7 B	2.3 BJ	1.6 B
Cobalt	2.1 BJ	1.1 BJ	1.0 U	1.0 U	9.3 BJ	3.2 U	1.0 U	1.0 U	1.0 BJ	1.0 U
Copper	6.9 BJ	2.3 B	2.9 BJ	14.2 B	76.6	13.7 BJ	2.0 U	2.0 U	2.0 U	2.0 U
Iron	1030 J	7.0 U	6110 J	95.6 BJ	9880	81.4 BJ	846	7.0 U	1150 J	7.0 U
Lead	2.0 U	2.0 U	2.0 U	2.0 U	3.8 J	0.80 U	2.0 U	2.0 U	2.0 U	2.0 U
Magnesium	38800	34800	62600	62900	75700	48600	49900	46500	48300	47700
Manganese	128	1.0 U	62.2	24.1	503	6.8 BJ	9.2 BJ	5.6 BJ	12.0 BJ	5.0 BJ
Mercury	0.20 U	0.20 U	0.20 U	0.20 U	0.10 U	0.10 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	12.5 BJ	6.2 BJ	2.5 BJ	3.0 BJ	15.5 U	15.5 U	1.3 BJ	1.0 U	1.6 BJ	1.0 U

**Table 2-3**  
**Monitoring Well Sampling Results**  
**Predesign Phase II Investigation**  
**Stoughton City Landfill**  
**Stoughton, Wisconsin**  
**(Continued)**

Analyte	Field Sample Numbers SL2-									
	MW5S-01		MW5D-01		MW6S-01		MW6D-01		MW6D-01DP	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Metals (µg/L) (Cont.)</b>										
Potassium	791 BEJ	671 BEJ	2050 BEJ	2350 BEJ	3290 B	3020 B	1320 BEJ	1230 BEJ	1310 BEJ	1260 BEJ
Selenium	5.0 U	5.0 U	5.0 U	5.0 U	3.1 BJ	2.1 BJ	5.0 U	5.0 U	5.0 U	5.0 U
Silver	1.0 U	1.0 U	1.0 U	1.0 U	3.7 U	3.7 U	1.0 U	1.0 U	1.0 U	1.0 U
Sodium	13900 EJ	16600 EJ	13900 EJ	15200 EJ	5960	5730	4850 BEJ	4530 BEJ	4710 BEJ	4660 BEJ
Thallium	6.0 U	6.0 U	6.0 U	6.0 U	3.1 U	3.1 U	6.0 U	6.0 U	6.0 U	6.0 U
Vanadium	2.2 B	1.0 U	1.0 U	1.0 U	32.2 BJ	14.0 BJ	1.0 U	1.0 U	1.0 U	1.0 U
Zinc	16.0 BJ	4.7 BJ	15.7 BJ	10.9 BJ	45.8 J	7.3 BJ	5.6 BJ	6.0 BJ	4.0 BJ	4.8 BJ
Cyanide	--	--	--	--	--	--	--	--	--	--

Table 2-3

Monitoring Well Sampling Results  
 Predesign Phase II Investigation  
 Stoughton City Landfill  
 Stoughton, Wisconsin  
 (Continued)

Analyte	Field Sample Numbers SL2-									
	MW6D-01FB		MW7S-01		MW7B-01		MW7I-01		MW8B-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Special VOCs (µg/L)</b>										
Dichlorodifluoromethane	4 U	--	4 U	--	4 U	--	4 U	--	4 U	--
Tetrahydrofuran	4 U	--	4 U	--	4 U	--	4 U	--	4 U	--
Trichlorofluoromethane	4 U	--	4 U	--	4 U	--	4 U	--	4 U	--
<b>RAS VOCs (µg/L)</b>										
Vinyl Chloride	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Methylene Chloride	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Acetone	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
1,2-Dichloroethene (Total)	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Trichloroethene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Benzene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Toluene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Ethylbenzene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
<b>Metals (µg/L)</b>										
Aluminum	10.4 BJ	9.0 U	896	24.6 B	18.7 B	9.0 U	9.0 U	16.4 B	12.5 B	9.0 U
Antimony	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U



**Table 2-3**  
**Monitoring Well Sampling Results**  
**Predesign Phase II Investigation**  
**Stoughton City Landfill**  
**Stoughton, Wisconsin**  
**(Continued)**

Analyte	Field Sample Numbers SL2-									
	MW6D-01FB		MW7S-01		MW7B-01		MW7I-01		MW8B-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Metals (µg/L) (Cont.)</b>										
Arsenic	6.0 U	6.0 U	8.1 B	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U
Barium	1.0 U	1.0 U	93.3 B	74.6 B	38.2 B	38.9 B	26.1 B	24.2 B	38.2 B	34.9 B
Beryllium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cadmium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Calcium	471 B	150 BJ	148000 J	104000 J	92200 J	93600 J	83700 J	77600 J	91000 J	80500 J
Chromium	37.0	1.0 U	6.3 B	1.0 U	5.9 B	1.8 B	1.0 U	1.0 U	8.7 B	3.5 B
Cobalt	2.9 B	1.1 B	4.1 B	2.6 B	1.1 B	1.0 U	1.0 U	1.0 U	1.1 B	1.0 U
Copper	15.0 B	2.0 U	18.3 B	3.0 B	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Iron	582	25.1 BJ	2480	7.0 U	75.4 B	7.0 U	7.0 U	7.0 U	35.5 B	7.0 U
Lead	2.0 U	2.0 U	2.4 B	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.6 B	2.0 U
Magnesium	181 B	15.6 BJ	81200 J	56800 J	49800 J	50500 J	46100 J	42700 J	47400 J	43300 J
Manganese	9.4 B	2.2 B	1520 J	1260 J	6.1 BJ	1.7 BJ	19.1 J	16.7 J	3.3 BJ	1.2 BJ
Mercury	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	96.3	5.8 B	15.7 B	9.5 B	6.3 B	6.6 B	1.0 U	1.0 U	5.8 B	1.0 U

Table 2-3

**Monitoring Well Sampling Results  
 Predesign Phase II Investigation  
 Stoughton City Landfill  
 Stoughton, Wisconsin  
 (Continued)**

Analyte	Field Sample Numbers SL2-									
	MW6D-01FB		MW7S-01		MW7B-01		MW7I-01		MW8B-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Metals (µg/L) (Cont.)</b>										
Potassium	42.1 BEJ	32.3 BEJ	1480 BEJ	1150 BEJ	1050 BEJ	1070 BEJ	756 BEJ	697 BEJ	10400 EJ	12800 EJ
Selenium	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Silver	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Sodium	142 BEJ	134 BEJ	10600 J	8800 J	9120 J	9370 J	2830 BJ	2590 B	10700 J	10900 J
Thallium	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U
Vanadium	1.0 U	1.0 U	5.7 B	1.0 B	1.0 U	1.0 U	1.0 B	1.0 U	1.0 U	1.2 B
Zinc	13.2 B	6.3 BJ	40.7	32.5	30.1	53.7	20.5	23.1	2.4 B	2.6 B
Cyanide	--	--	--	--	--	--	--	--	--	--

Table 2-3  
 Monitoring Well Sampling Results  
 Predesign Phase II Investigation  
 Stoughton City Landfill  
 Stoughton, Wisconsin  
 (Continued)

Analyte	Field Sample Numbers SL2-									
	MW9S-01		MW9I-01		MW9I-01DP		MW10S-01		MW10D-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Special VOCs (µg/L)</b>										
Dichlorodifluoromethane	280	--	290	--	260	--	4 UJ	--	4 UJ	--
Tetrahydrofuran	54	--	55 EJ	--	40 U	--	10 U	--	10 U	--
Trichlorofluoromethane	4	--	4 UJ	--	40 U	--	4 U	--	4 U	--
<b>RAS VOCs (µg/L)</b>										
Vinyl Chloride	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Methylene Chloride	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Acetone	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
1,2-Dichloroethene (Total)	10 U	--	5 J	--	5 J	--	10 U	--	10 U	--
Trichloroethene	5 J	--	10 U	--	10 U	--	10 U	--	10 U	--
Benzene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Toluene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Ethylbenzene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
<b>Metals (µg/L)</b>										
Aluminum	256	9.8 B	16.2 B	9.0 U	20.7 B	15.1 B	8100	29.8 B	188 B	24.9 U
Antimony	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	46.2 U	46.2 U	46.2 U	46.2 U

Table 2-3  
 Monitoring Well Sampling Results  
 Predesign Phase II Investigation  
 Stoughton City Landfill  
 Stoughton, Wisconsin  
 (Continued)

Analyte	Field Sample Numbers SL2-									
	MW9S-01		MW9I-01		MW9I-01DP		MW10S-01		MW10D-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Metals (µg/L) (Cont.)</b>										
Arsenic	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	10.2 J	5.6 BJ	2.0 U	2.0 U
Barium	33.5 B	32.0 B	30.8 B	13.8 B	28.7 B	28.8 B	106 B	52.6 B	38.5 B	35.9 B
Beryllium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.2 BJ	0.65 BJ	0.80 BJ	0.80 BJ
Cadmium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	3.7 U	3.7 U	3.7 U	3.7 U
Calcium	66500 J	63000 J	79400 J	36000 J	74000 J	74700 J	132000	77300	89800	87400
Chromium	2.0 B	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	91.3	3.4 U	3.4 U	3.4 U
Cobalt	5.0 B	4.6 B	2.2 B	1.4 B	2.4 B	2.7 B	8.2 B	3.2 U	3.2 U	3.2 U
Copper	3.5 B	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	41.6 J	16.4 BJ	16.0 BJ	14.6 BJ
Iron	329	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	10800	46.6 BJ	293 J	259 J
Lead	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.7 J	0.80 U	0.80 U	0.80 U
Magnesium	43200 J	41400 J	50200 J	22500 J	46700 J	47300 J	78000	48100	47000	45900
Manganese	519 J	495 J	342 J	156 J	320 J	322 J	392	92.5	17.5	5.7 BJ
Mercury	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.21	0.10 U	0.10 U	0.10 U
Nickel	18.2 B	15.7 B	3.3 B	1.0 U	2.8 B	2.8 B	53.6	15.5 U	15.5 U	15.5 U

**Table 2-3**  
**Monitoring Well Sampling Results**  
**Predesign Phase II Investigation**  
**Stoughton City Landfill**  
**Stoughton, Wisconsin**  
**(Continued)**

Analyte	Field Sample Numbers SL2-									
	MW9S-01		MW9I-01		MW9I-01DP		MW10S-01		MW10D-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Metals (µg/L)</b>										
Potassium	1260 BEJ	1380 BEJ	1040 BEJ	398 BEJ	936 BEJ	942 BEJ	4040 B	1950 U	2180 B	1950 U
Selenium	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Silver	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	3.7 U	3.7 U	3.7 U	3.7 U
Sodium	19300 J	19200 J	10800 J	4510 BJ	10000 J	10100 J	11700	11700	10800	10900
Thallium	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	3.1 U	3.1 U	3.1 U	3.1 U
Vanadium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	40.9 B	11.9 BJ	14.7 BJ	14.5 BJ
Zinc	15.8 B	28.5	4.7 B	2.4 B	2.7 B	5.8 B	43.6 J	16.1 BJ	18.4 BJ	15.3 BJ
Cyanide	-	-	-	-	-	-	-	-	-	-

Table 2-3

Monitoring Well Sampling Results  
 Predesign Phase II Investigation  
 Stoughton City Landfill  
 Stoughton, Wisconsin  
 (Continued)

Analyte	Field Sample Numbers SL2-									
	MW10I-01		MW11S-01		MW11D-01		MW11I-01		MW12S-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Special VOCs (µg/L)</b>										
Dichlorodifluoromethane	160 DJ	--	4 UJ	--	4 UJ	--	4 UJ	--	4 UJ	--
Tetrahydrofuran	39	--	10 U	--	10 U	--	10 U	--	10 U	--
Trichlorofluoromethane	4 U	--	4 U	--	4 U	--	4 U	--	4 U	--
<b>RAS VOCs (µg/L)</b>										
Vinyl Chloride	8 J	--	10 U	--	10 U	--	10 U	--	10 U	--
Methylene Chloride	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Acetone	10 U	--	10 U	--	10 U	--	10 U	--	28	--
1,2-Dichloroethene (Total)	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Trichloroethene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Benzene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Toluene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Ethylbenzene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
<b>Metals (µg/L)</b>										
Aluminum	5420	42.6 B	895	24.9 U	1420	24.9 U	178 B	27.1 B	70.2 B	74.5 B
Antimony	75.7	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U

Table 2-3  
**Monitoring Well Sampling Results**  
**Predesign Phase II Investigation**  
**Stoughton City Landfill**  
**Stoughton, Wisconsin**  
**(Continued)**

Analyte	Field Sample Numbers SL2-									
	MW10I-01		MW11S-01		MW11D-01		MW11I-01		MW12S-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Metals (µg/L) (Cont.)</b>										
Arsenic	5.0 BJ	2.6 BJ	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.5 B	6.0 B
Barium	85.9 B	55.0 B	27.2 B	19.7 B	41.1 B	19.7 B	26.3 B	28.0 B	155 B	154 B
Beryllium	1.2 BJ	0.51 BJ	0.63 BJ	0.62 BJ	0.62 BJ	0.47 BJ	0.62 BJ	0.63 BJ	0.48 BJ	0.48 BJ
Cadmium	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U
Calcium	187000	107000	85100	76100	93100	69400	85500	86500	121000	119000
Chromium	42.2	3.4 U	18.4	3.4 U	9.7 B	3.4 U	4.9 B	3.4 U	3.4 U	3.4 U
Cobalt	10.1 B	6.7 B	3.2 U	3.2 U	3.4 B	3.2 U	3.2 B	3.2 U	10.3 BJ	13.2 BJ
Copper	37.0 J	12.8 BJ	15.5 BJ	11.1 BJ	20.3 BJ	11.4 BJ	13.3 BJ	14.7 BJ	13.6 BJ	11.8 BJ
Iron	9400	86.1 BJ	1480	63.1 BJ	2070	235	402	61.7 BJ	1690	1350
Lead	3.2 J	0.80 U	0.80 U	0.80 U	3.2	0.80 U	0.80 U	0.80 U	0.80 U	0.80 U
Magnesium	101000	58400	46800	42300	53800	40900	45800	46200	60600	60000
Manganese	553	60.6	74.6	42.2	174	25.5	30.0	20.9	2820	2810
Mercury	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Nickel	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U

**Table 2-3**  
**Monitoring Well Sampling Results**  
**Pre-design Phase II Investigation**  
**Stoughton City Landfill**  
**Stoughton, Wisconsin**  
**(Continued)**

Analyte	Field Sample Numbers SL2-									
	MW10I-01		MW11S-01		MW11D-01		MW11I-01		MW12S-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Metals (µg/L) (Cont.)</b>										
Potassium	4590 B	3400 B	1950 U	1960 B	1950 U	1950 U	1950 U	1950 U	1950 U	1950 U
Selenium	2.0 U	2.0 U	2.8 BJ	2.0 U	2.6 BJ	3.1 BJ	2.9 BJ	2.9 BJ	5.1 J	3.2 BJ
Silver	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U
Sodium	14600	14600	4150 B	3920 B	11800	11500	4740 B	5000 B	79000	78300
Thallium	3.1 U	3.1 U	7.1 B	3.3 B	5.8 B	3.2 B	7.2 B	4.4 B	3.1 U	3.1 U
Vanadium	37.2 B	15.3 BJ	14.2 B	9.3 B	15.8 B	9.8 B	14.4 B	11.0 B	16.0 BJ	16.0 BJ
Zinc	34.6 J	9.1 BJ	18.5 B*J	12.3 B*J	26.1 *J	14.2 B*J	11.1 B*J	21.5 *J	18.7 B*J	32.9 *J
Cyanide	--	--	--	--	--	--	--	--	--	--



**Table 2-3**  
**Monitoring Well Sampling Results**  
**Pre-design Phase II Investigation**  
**Stoughton City Landfill**  
**Stoughton, Wisconsin**  
**(Continued)**

Analyte	Field Sample Numbers SL2-									
	MW12S-01FB		MW12D-01MSD		MW12I-01		MW12I-01DP		MW13S-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Special VOCs (µg/L)</b>										
Dichlorodifluoromethane	4 UJ	--	4 UJ	--	4 UJ	--	4 UJ	--	4 UJ	--
Tetrahydrofuran	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Trichlorofluoromethane	4 U	--	4 U	--	4 U	--	4 U	--	4 U	--
<b>RAS VOCs (µg/L)</b>										
Vinyl Chloride	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Methylene Chloride	3 J	--	10 U	--	10 U	--	10 U	--	10 U	--
Acetone	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
1,2-Dichloroethene (Total)	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Trichloroethene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
Benzene	41	--	10 U	--	10 U	--	10 U	--	10 U	--
Toluene	5 J	--	10 U	--	10 U	--	10 U	--	10 U	--
Ethylbenzene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	--
<b>Metals (µg/L)</b>										
Aluminum	43.2 BJ	61.5 BJ	144 B	61.2 BJ	206	24.9 U	108 B	32.5 B	19500	24.9 U
Antimony	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U	46.2 U	64.2	46.2 U

Table 2-3

Monitoring Well Sampling Results  
 Predesign Phase II Investigation  
 Stoughton City Landfill  
 Stoughton, Wisconsin  
 (Continued)

Analyte	Field Sample Numbers SL2-									
	MW12S-01FB		MW12D-01MSD		MW12I-01		MW12I-01DP		MW13S-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Metals (µg/L) (Cont.)</b>										
Arsenic	2.0 U	2.0 U	2.0 U	2.0 U	5.2 B	4.3 B	6.0 B	4.5 B	9.0 B	2.0 U
Barium	1.0 BJ	2.4 BJ	38.6 B	36.1 B	98.0 B	97.7 B	94.9 B	96.3 B	165 B	41.6 B
Beryllium	0.20 U	0.20 U	0.49 BJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	2.5 B	0.62 BJ
Cadmium	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U
Calcium	624 B	287 BJ	87600	81000	60800	60800	59900	59900	367000	60900
Chromium	3.4 U	3.4 U	3.4 U	3.4 U	3.4 U	3.4 U	3.4 U	3.4 U	153	3.4 U
Cobalt	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	22.1 B	3.2 U
Copper	5.5 BJ	6.7 BJ	13.3 BJ	11.7 BJ	9.6 BJ	8.1 BJ	12.9 BJ	10.8 BJ	95.1	15.9 B
Iron	78.1 B*J	177 *J	278	202 *J	576	249	502	321	33700	333
Lead	0.80 U	1.2 BJ	1.4 BJ	1.4 BJ	0.80 U	1.0 BJ	0.95 BJ	1.7 BJ	16.3	0.80 U
Magnesium	316 BJ	181 BJ	46500	43600	41700	41300	40800	40700	203000	37200
Manganese	2.6 BJ	3.6 BJ	72.4	55.3	86.1	78.5	87.7	75.6	1210	22.9
Mercury	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Nickel	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	95.7	15.5 U

**Table 2-3**  
**Monitoring Well Sampling Results**  
**Predesign Phase II Investigation**  
**Stoughton City Landfill**  
**Stoughton, Wisconsin**  
**(Continued)**

Analyte	Field Sample Numbers SL2-									
	MW12S-01FB		MW12D-01MSD		MW12I-01		MW12I-01DP		MW13S-01	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
<b>Metals (µg/L) (Cont.)</b>										
Potassium	1950 U	1950 U	1950 U	1950 U	1950 U	1950 U	1950 U	1950 U	6490	1950 U
Selenium	2.3 BJ	2.0 U	4.4 BJ	2.0 U	3.1 BJ	2.0 U	2.9 BJ	3.5 BJ	3.6 BJ	2.7 BJ
Silver	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U
Sodium	383 BJ	298 BJ	5590	5280	4960 B	4770 B	5140	4730 B	7150	5510
Thallium	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U
Vanadium	3.1 U	3.1 U	13.2 BJ	12.5 BJ	9.3 BJ	10.4 BJ	10.7 BJ	10.8 BJ	93.2	10.7 B
Zinc	51.9 J	19.0 BJ	44.0 *J	31.0 J	53.1 *J	14.2 B*J	22.0 *J	34.7 *J	91.8 *J	15.6 B*J
Cyanide	--	--	--	--		--	--	--	--	--

Table 2-3  
 Monitoring Well Sampling Results  
 Predesign Phase II Investigation  
 Stoughton City Landfill  
 Stoughton, Wisconsin  
 (Continued)

Analyte	Field Sample Numbers SL2-											
	MW13D-01		MW13D-01DP		MW13I-01		EW01-01		PTWB-01	PWTB-02	PWTB-03	PWTB-04
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered				
<b>Special VOCs (µg/L)</b>												
Dichlorodifluoromethane	4 UJ	--	4 UJ	--	4 UJ	--	980 DJ	--	4 U	4 U	4 UJ	4 UJ
Tetrahydrofuran	10 U	--	10 U	--	10 U	--	380 EJ	--	4 U	4 U	10 U	10 U
Trichlorofluoromethane	4 U	--	4 U	--	4 U	--	8 J	--	4 U	4 U	4 U	4 U
<b>RAS VOCs (µg/L)</b>												
Vinyl Chloride	10 U	--	10 U	--	10 U	--	10 U	--	10 U	10 U	10 U	10 U
Methylene Chloride	10 U	--	10 U	--	10 U	--	10 U	--	10 U	10 U	10 U	10 U
Acetone	10 U	--	10 U	--	10 U	--	10 BJU	--	10 U	10 U	10 BJU	10 U
1,2-Dichloroethene (Total)	10 U	--	10 U	--	10 U	--	18	--	10 U	10 U	10 U	10 U
Trichloroethene	10 U	--	10 U	--	10 U	--	3 J	--	10 U	10 U	10 U	10 U
Benzene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	10 U	10 U	10 U
Toluene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	10 U	10 U	10 U
Ethylbenzene	10 U	--	10 U	--	10 U	--	10 U	--	10 U	10 U	10 U	10 U
<b>Metals (µg/L)</b>												
Aluminum	3930	24.9 U	3200	40.9 B	24.9 U	24.9 U	175 B	24.9 U	--	--	--	--
Antimony	57.4 B	46.2 U	46.2 U	46.2 U	54.8 B	46.2 U	59.2 B	46.2 U	--	--	--	--

**Table 2-3**  
**Monitoring Well Sampling Results**  
**Predesign Phase II Investigation**  
**Stoughton City Landfill**  
**Stoughton, Wisconsin**  
**(Continued)**

Analyte	Field Sample Numbers SL2-											
	MW13D-01		MW13D-01DP		MW13I-01		EW01-01		PTWB-01	PWTB-02	PWTB-03	PWTB-04
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered				
<b>Metals (µg/L) (Cont.)</b>												
Arsenic	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.4 BJ	2.0 U	--	--	--	--
Barium	59.8 B	24.3 B	57.4 B	24.2 B	44.2 B	43.2 B	32.5 B	30.1 B	--	--	--	--
Beryllium	1.1 BJ	0.32 BJ	1.1 BJ	0.32 BJ	0.47 BJ	0.47 BJ	0.79 BJ	0.51 BJ	--	--	--	--
Cadmium	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	--	--	--	--
Calcium	124000	66300	123000	65000	62100	60100	90400	84600	--	--	--	--
Chromium	15.0	3.4 U	12.3	3.4 U	3.4 U	3.4 U	3.4 U	3.4 U	--	--	--	--
Cobalt	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	--	--	--	--
Copper	29.1	11.6 BJ	26.8	9.0 BJ	13.4 BJ	11.4 BJ	16.7 BJ	10.9 BJ	--	--	--	--
Iron	6260	385 *J	5880	116 J	168	123 J	334 J	211 J	--	--	--	--
Lead	6.6	0.80 U	6.4	0.80 U	0.80 U	0.80 U	0.80 U	0.80 U	--	--	--	--
Magnesium	65500	35500	65000	35200	43100	41400	51100	48800	--	--	--	--
Manganese	453	36.0	440	35.3	28.4	27.5	121	105	--	--	--	--
Mercury	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	--	--	--	--
Nickel	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	15.5 U	--	--	--	--
Potassium	1950 U	1950 U	1950 U	1950 U	1980 B	1950 U	3920 B	2190 B	--	--	--	--

**Table 2-3**  
**Monitoring Well Sampling Results**  
**Pre-design Phase II Investigation**  
**Stoughton City Landfill**  
**Stoughton, Wisconsin**  
**(Continued)**

Analyte	Field Sample Numbers SL2-											
	MW13D-01		MW13D-01DP		MW13I-01		EW01-01		PTWB-01	PWTB-02	PWTB-03	PWTB-04
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered				
<b>Metals (µg/L) (Cont.)</b>												
Selenium	2.2 BJ	5.0 BJ	3.9 BJ	4.9 BJ	2.7 BJ	4.1 BJ	2.0 U	2.0 U	--	--	--	--
Silver	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	3.7 U	--	--	--	--
Sodium	9860	9230	9790	8840	4280 B	4140 B	14200	14700	--	--	--	--
Thallium	3.1 U	3.4 BJ	3.1 U	3.1 U	3.1 U	4.6 BJ	3.1 U	3.1 U	--	--	--	--
Vanadium	21.9 B	10.3 B	20.9 B	10.5 BJ	9.6 B	11.2 B	16.8 BJ	14.4 BJ	--	--	--	--
Zinc	42.2 *J	30.7 J	39.3 *J	17.2 B*J	18.0 B*J	36.4 *J	15.3 BJ	9.1 BJ	--	--	--	--
Cyanide	--	--	--	--	--	--	--	--	--	--	--	--

Table 2-3

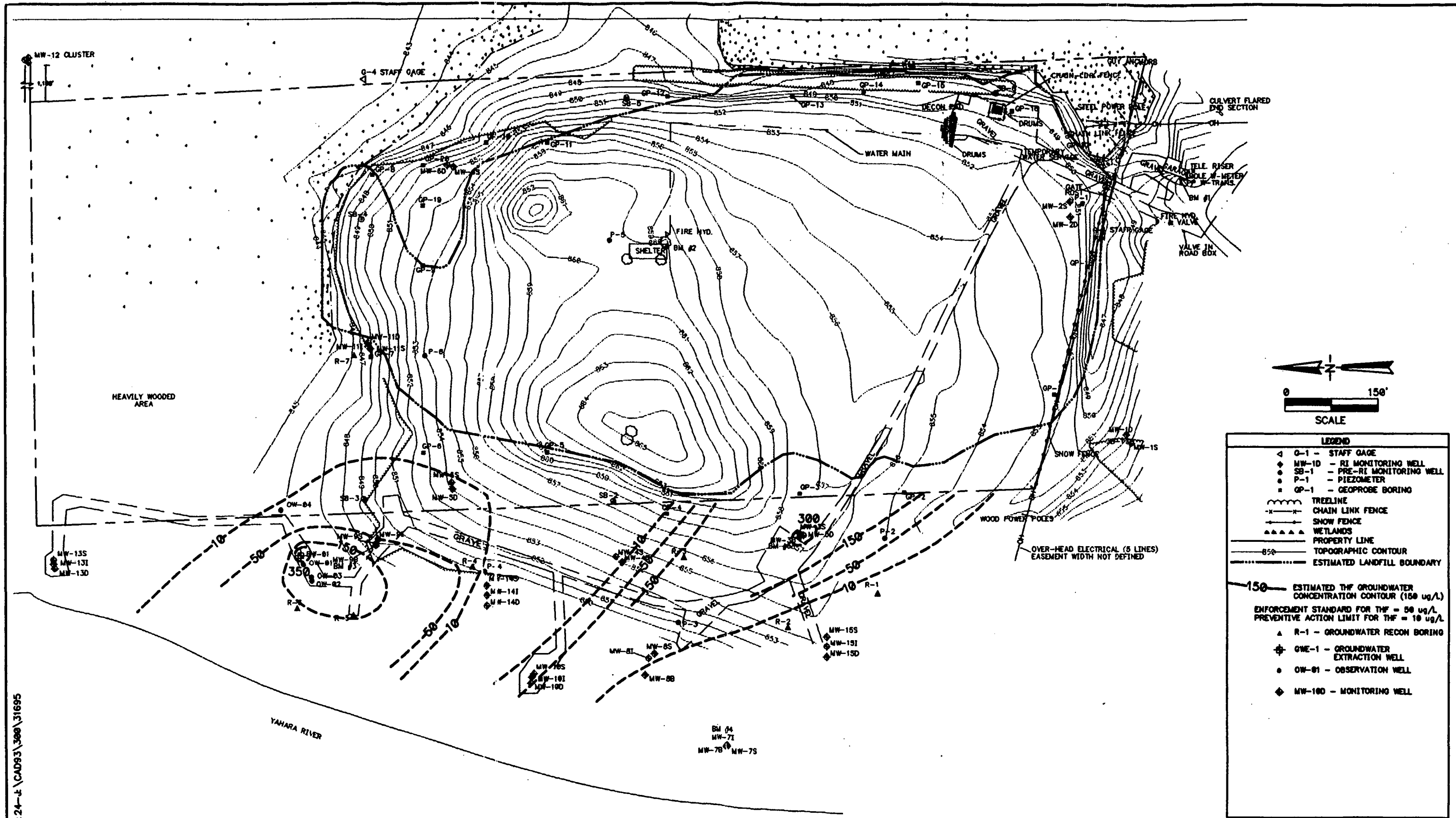
**Monitoring Well Sampling Results  
Predesign Phase II Investigation  
Stoughton City Landfill  
Stoughton, Wisconsin  
(Continued)**

Organic Data Qualifiers:

- U - Indicates that the compound was analyzed for, but not detected. The sample quantitation limit corrected for dilution and percent moisture is reported.
- J - Indicates an estimated value. This flag is used either when estimating a concentration for a tentatively identified compound or when the data indicates the presence of a compound, but the result is less than the sample quantitation limit, but greater than zero. This flag is also used to indicate a reported result having an associated QC problem.
- B - Indicates the analyte is detected in the associated blank as well as the sample.
- E - Indicates compounds whose concentrations exceed the calibration range of the instrument.
- D - Indicates an identified compound in an analysis has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses.
- - Not analyzed.

Inorganic Data Qualifiers:

- U - Indicates the material was analyzed, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- J - Indicates the associated value is an estimated quantity.
- B - Indicates that the reported value is less than the Contract Required Detection Limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).
- \* - Indicates the duplicate analysis is not within control limits.
- - Not analyzed.



**LEGEND**

- ◁ G-1 - STAFF GAGE
- ◆ MW-10 - RI MONITORING WELL
- SB-1 - PRE-RI MONITORING WELL
- P-1 - PIEZOMETER
- GP-1 - GEOPROBE BORING
- TREELINE
- - - CHAIN LINK FENCE
- - - SNOW FENCE
- ▲▲▲ WETLANDS
- PROPERTY LINE
- 850 TOPOGRAPHIC CONTOUR
- ESTIMATED LANDFILL BOUNDARY
- 150 ESTIMATED THF GROUNDWATER CONCENTRATION CONTOUR (150 ug/L)
- ENFORCEMENT STANDARD FOR THF = 50 ug/L
- PREVENTIVE ACTION LIMIT FOR THF = 10 ug/L
- ▲ R-1 - GROUNDWATER RECON BORING
- ⊕ GWE-1 - GROUNDWATER EXTRACTION WELL
- OW-01 - OBSERVATION WELL
- ◆ MW-100 - MONITORING WELL

FIGURE 2-3

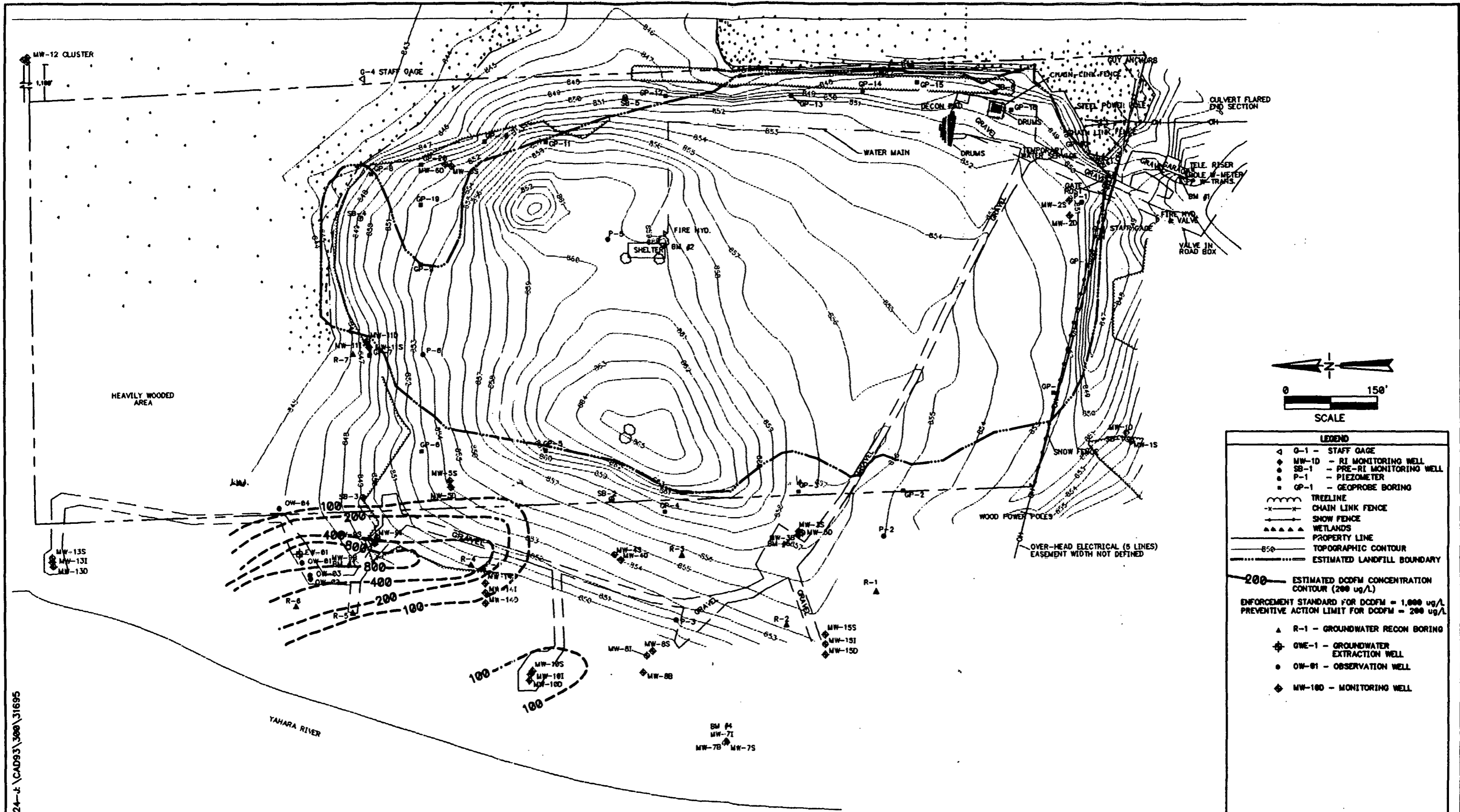
NOTE: MONITORING WELLS 8S, 8I, 14S, 14I, 14D, 15S, 15I AND 15D HAVE NOT BEEN INSTALLED AT THE TIME OF INTERMEDIATE DESIGN SUBMITTAL. THESE WELLS ARE PROPOSED TO BE INSTALLED IN SUMMER 1996.

**RESPONSE ACTION CONTRACT**  
 U.S. EPA CONTRACT No. 68-W7-0026  
 WORK ASSIGNMENT No. 001-RARA-05T2  
 DOCUMENT CONTROL No. RFW001-2E-AAIT

**AREAL EXTENT OF THF CONTAMINATION IN THE GROUNDWATER**  
 STOUGHTON CITY LANDFILL  
 Stoughton, Wisconsin

TAD-05/31/96-13:24-L\CAD93\300\31695





**LEGEND**

- ◁ G-1 - STAFF GAGE
- ◆ MW-1D - RI MONITORING WELL
- SB-1 - PRE-RI MONITORING WELL
- P-1 - PIEZOMETER
- GP-1 - GEOPROBE BORING
- ⌋ TREELINE
- x-x- CHAIN LINK FENCE
- - - SNOW FENCE
- ▲▲▲▲ WETLANDS
- PROPERTY LINE
- 850 TOPOGRAPHIC CONTOUR
- ESTIMATED LANDFILL BOUNDARY

200 ESTIMATED DCFM CONCENTRATION CONTOUR (200 ug/L)

ENFORCEMENT STANDARD FOR DCFM = 1,000 ug/L  
PREVENTIVE ACTION LIMIT FOR DCFM = 200 ug/L

- ▲ R-1 - GROUNDWATER RECON BORING
- ⊕ GWE-1 - GROUNDWATER EXTRACTION WELL
- OW-01 - OBSERVATION WELL
- ◆ MW-100 - MONITORING WELL

FIGURE 2-4

NOTE: MONITORING WELLS 8S, 8I, 14S, 14I, 14D, 15S, 15I AND 15D HAVE NOT BEEN INSTALLED AT THE TIME OF INTERMEDIATE DESIGN SUBMITTAL. THESE WELLS ARE PROPOSED TO BE INSTALLED IN SUMMER 1996

RESPONSE ACTION CONTRACT  
 U.S. EPA CONTRACT No. 68-W7-0026  
 WORK ASSIGNMENT No. 001-RARA-05T2  
 DOCUMENT CONTROL No. RFW001-2E-AAIT

AREAL EXTENT OF DCFM CONTAMINATION  
 IN THE GROUNDWATER  
 STOUGHTON CITY LANDFILL  
 Stoughton, Wisconsin

TAD-05/31/96-13:24-J \CAD93\300\31695

activities, WESTON installed three landfill gas monitoring probes along the southern perimeter of the site to monitor the potential migration of landfill gas through the subsurface geology. WESTON conducted monthly monitoring using a combustible gas indicator (CGI) and a photoionization detector (PID). Based on this monitoring, no landfill gas or chemical constituents were detected in the landfill gas monitoring probes.

During the predesign activities, WESTON also conducted a pilot-scale gas extraction test at the site to evaluate the feasibility of installing an active gas extraction system. The ROD indicated that a passive gas venting system should be installed, but at the request of the WDNR and upon the approval of the U.S. EPA, WESTON conducted a pilot test. Based on the pilot test and air sample results, it appears that an active gas extraction system would not be cost effective for the SCL site. An active extraction system would require a flare system to thermally destroy the methane and other low-level chemical constituents in the extracted airstream. Based on the air sampling results, the methane concentration would not be sufficient to consistently maintain combustion, and an alternate fuel source would be required. This alternate fuel source, such as natural gas, would be needed to keep the flare burning at the required temperature to ensure total destruction of the methane and chemical constituents. In addition, because of the shallow nature of the waste, extraction wells would need to be closely spaced to achieve the necessary extraction rate without drawing air in from above the final cover system.

From this data, WESTON concluded that a passive landfill gas vent system would be the most efficient and cost-effective method of landfill gas control. The horizontal collection trenches will adequately vent any landfill gas generated from the waste layer. In addition, the constituents in the landfill gas vents will be well below any regulatory action levels for air emissions.

#### **2.1.4 Landfill Remedial Action**

The landfill remedial action as identified in the ROD includes:

- Site security measures including the placement of a fence around the entire site perimeter.
- Land use restrictions to prevent the installation of public or private water supply wells within 1,200 feet of the property boundary and to prevent residential development of the site.
- Excavation, relocation, and consolidation of wastes in contact with groundwater.
- Placement of a solid waste disposal cap (NR 504 cap) over the existing fill area and consolidated wastes.
- Long-term groundwater monitoring to confirm the effectiveness of the other components of the selected remedial action.

### **2.2 PROJECT OBJECTIVES AND SCOPE**

The objective of the QAPP is to establish standard procedures so that the integrity, accuracy, precision, completeness, and representativeness of the samples and field activities are maintained and the required objectives of the RA are achieved.

The objectives of the groundwater monitoring are:

- Establish a baseline for site groundwater quality immediately prior to the placement of the landfill cap.

- Collect one round of sampling for the THF and DCDFM after the cap is complete to monitor the movement of the THF and DCDFM plumes to evaluate natural attenuation and the effect of the landfill cap on the THF and DCDFM plumes.

The landfill gas monitoring has the following objectives:

- Monitor the concentration of the landfill gases as a percentage of the lower explosive limit (LEL) for the landfill gases at the site boundary.
- Provide data to estimate air emissions from the passive gas vents.

### **2.3 SAMPLE NETWORK DESIGN AND RATIONALE**

The sample network design and rationale for sample locations is described in detail in Section 3 of the FSP (Appendix A). Table 2-4 provides an overview of sampling and analysis program.

### **2.4 PARAMETERS TO BE TESTED AND FREQUENCY**

Sample matrices, analytical parameters, and frequency of sample collection are presented in Table 2-5. The FSP includes additional discussion on the rationale for parameters to be tested and frequency.

Table 2-4

**Overview of Sampling and Analysis Program  
 Stoughton City Landfill  
 Stoughton, Wisconsin**

Task	Intended Data Use	Sample Matrix	Sampling Procedure	Analysis Required	Analytical Method
Baseline Groundwater Monitoring	- Establish a baseline for the site groundwater quality immediately prior to the placement of the landfill cap.	Groundwater	Grab	Tetrahydrofuron (THF)	SAS Method (EPA Method 524.2 - see Appendix B).
				Dichlorodifluoromethene (DCDFM)	SAS Method (EPA Methods 524.2 - see Appendix B).
				Trichlorofluoromethane (TCFM)	SAS Method (EPA Methods 524.2 - see Appendix B).
				CLP RAS TCL Volatiles	CLP RAS Method
				CLP RAS TAL Metals (Filtered)	CLP RAS Method
				CLP RAS TAL Metals (Unfiltered)	CLP RAS Method
Routine Groundwater Monitoring (first round will be collected by WESTON)	- Monitor the movement of the THF and DCDFM plumes.	Groundwater	Grab	THF	SAS Method (EPA Methods 524.2 - see Appendix B).
				DCDFM	SAS Method (EPA Methods 524.2 - see Appendix B).
Landfill Off Gas Monitoring (first round will be collected by WESTON)	- Verify that the air emissions from the passive gas vents do not exceed the regulatory levels.	Air	Grab (SUMMA® Canister)	EPA Method T014 Standard List of Volatile Organic Compounds (VOCs)	EPA Method T014

Table 2-5

Summary of Sampling and Analysis Program  
 Stoughton City Landfill  
 Stoughton, Wisconsin

RA Task	Sample Matrix	Field Parameters	Laboratory Parameters <sup>4</sup>	Investigative			Field Duplicate			Field Blank			MS/MSD <sup>5</sup>			Matrix Total
				No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	
Baseline Groundwater Monitoring <sup>1</sup>	Groundwater	Water Level, pH, Conductivity, Temperature, Turbidity, Dissolved Oxygen	Tetrahydrofuran (THF)	40	1	40	4	1	4	4	1	4	3	1	3	48
			Dichlorodifluoromethane (DCDFM)	40	1	40	4	1	4	4	1	4	3	1	3	48
			Trichlorofluoromethane (TCFM)	40	1	40	4	1	4	4	1	4	3	1	3	48
			CLP RAS TCL Volatiles	40	1	40	4	1	4	4	1	4	3	1	3	48
			CLP RAS TAL Metals (Filtered)	40	1	40	4	1	4	4	1	4	3	1	3	48
			CLP RAS TAL Metals (Unfiltered)	40	1	40	4	1	4	4	1	4	3	1	3	48
Routine Groundwater Monitoring <sup>2</sup>	Groundwater	Water Level, pH, Conductivity, Temperature, Turbidity, Dissolved Oxygen	THF	28	1	28	3	1	3	3	1	3	2	1	2	34
			DCDFM	28	1	28	3	1	3	3	1	3	2	1	2	34

Table 2-5

Summary of Sampling and Analysis Program  
 Stoughton City Landfill  
 Stoughton, Wisconsin  
 (Continued)

RA Task	Sample Matrix	Field Parameters	Laboratory Parameters <sup>4</sup>	Investigative			Field Duplicate			Field Blank			MS/MSD <sup>5</sup>			Matrix Total
				No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	
Passive Gas Vent Monitoring <sup>3</sup>	Air	Percent LEL, Percent Oxygen	EPA Method T014 Standard List of VOCs	5	1	5	NA	NA	NA	NA	NA	NA	1	1	1	5

<sup>1</sup> Baseline groundwater monitoring will be conducted prior to the placement of the landfill cap and then repeated every five years until the THF and DCEM concentrations fall below the PALS.

<sup>2</sup> Routine groundwater monitoring will be conducted after the placement of the cap.

<sup>3</sup> One round of sampling will be conducted after completion of the cap.

<sup>4</sup> All parameters that are not designated as CLP RAS analyses will be analyzed according to SAS methodologies presented in Appendix B.

<sup>5</sup> MS/MSDs are not additional samples, but are instead investigative samples on which MS/MSD analyses are performed. MS/MSDs are for organic samples only. Duplicate/spike analyses are performed for inorganic samples.

<sup>6</sup> The matrix total does not include trip blank samples and MS/MSD samples. One trip blank will be shipped with every shipment container containing aqueous VOA samples.

## 2.5 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) Process is a series of planning steps based on the scientific method that is designed to ensure that the type, quality, and quantity of environmental data used in decision making are appropriate for the intended application.

DQOs are qualitative and quantitative statements derived from outputs of each step of the DQO Process that:

- Clarify the study objective
- Define the most appropriate data to collect;
- Determine the most appropriate conditions from which to collect the data

The DQOs are then used to develop a scientific and resource-effective sampling design. The DQO Process allows decision makers to define the data requirements and acceptable levels of decision during planning before any data are collected.

The seven-step DQO process was used to establish the DQOs.

### 1. STATE THE PROBLEM

Previous investigations at the site identified tetrahydrofuran (THF), dichlorodifluoromethane (DCDFM), and trichlorofluoromethane. The Remedial Design Data Collection Report (WESTON, 1995) delineated the groundwater plume at the site. The report concluded that there are two plumes moving in the northwest direction away from the landfill towards the Yahara River. These plumes



appear to be disconnected. The chemicals exceeding the PALs for groundwater are THF and DCDFM. The baseline risk assessment, prior to the placement of the cap will provide a basis to compare future sampling results. Routine monitoring will track the concentrations of THF and DCDFM until they fall below the cleanup levels.

## 2. IDENTIFY THE DECISION

The baseline sampling will give a basis to compare results to prior to the placement of the cap. Routine monitoring will track future concentrations of THF, and DCDFM to ensure that the remedy (landfill cap), is lowering these concentrations to below cleanup levels.

## 3. IDENTIFY INPUTS TO THE DECISION

Groundwater samples will be analyzed and field instrumentation will be used to generate data to support the site characterizations.

## 4. DEFINE THE STUDY BOUNDARIES

The parameters for analysis are bases on previous sampling information and historical information on the landfill.

## 5. DEVELOP A DECISION RULE

The baseline sampling round will set a basis to compare future results. Routine monitoring after placement of the cap will track concentrations of THF and DCDFM to see if concentrations fall below the cleanup objectives.

## 6. SPECIFY LIMITS ON DECISION ERRORS

Data will be collected with the lowest level of uncertainty possible. All laboratory data will be reviewed for compliance with established methods and U.S. EPA guidelines for acceptability.

## 7. OPTIMIZE THE DESIGN FOR OBTAINING DATA

Samples will be collected from all of the wells during the baseline sampling round (with the exception of MW-9B). Samples will be collected from 28 of the 40 wells during the routine sampling rounds. Data will be collected using locations and methods that will provide quality data for characterizing each site with the lowest possible level of uncertainty.

### 2.6 PROJECT SCHEDULE

The RA project schedule is dependent upon the completion of the RA activities. The estimated project schedule is as follows:

- Prior to the placement of the landfill cap, perform baseline groundwater monitoring.
- Perform one round of routine groundwater monitoring after placement of the cap.
- Perform one round of landfill gas flow measurements and landfill gas sampling.

- Submit reports to U.S. EPA within one month of receipt of analytical data after each sampling event.

The entire RA monitoring will be reassessed according to the criteria discussed in Section 2 of the FSP. Baseline groundwater monitoring is expected to begin in April 1998. Routine groundwater monitoring is anticipated to begin in April 1999.

## SECTION 3 PROJECT ORGANIZATION AND RESPONSIBILITY

This section presents overall project organization and responsibilities, lines of communication, responsibilities for specific quality assurance tasks, and responsibilities for field and laboratory operations.

Key personnel responsibilities in four specific areas (project management, quality assurance, field operations, and laboratory operations) are discussed in the following subsections. Figure 3-1 presents the project organization chart.

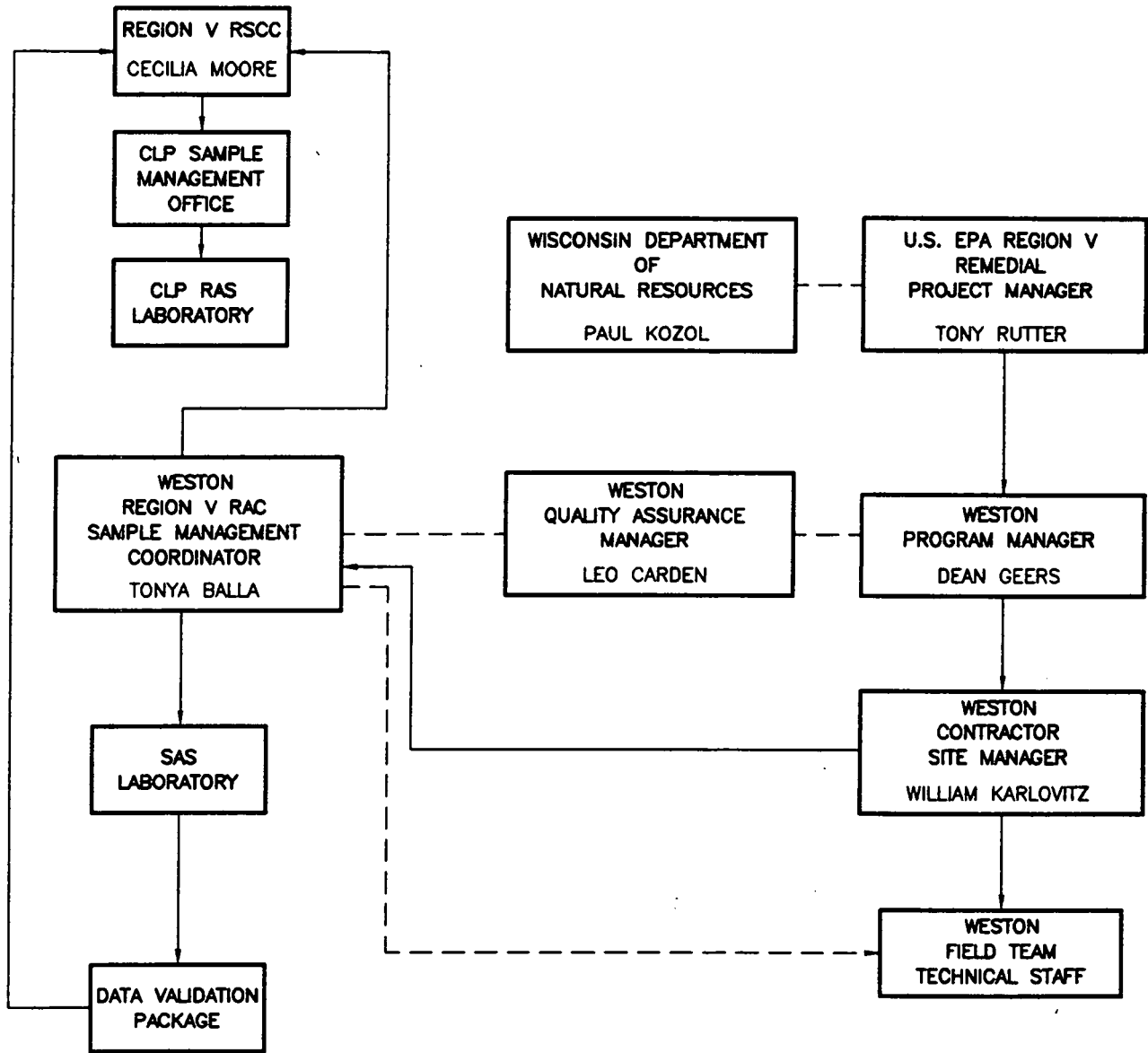
### 3.1 PROJECT MANAGEMENT

This project is a federal-lead project, so the Remedial Project Manager (RPM) has the overall responsibility for all phases of the RD/RA.

Operational responsibilities involving execution and direct management of the technical and administrative aspects of this project have been assigned as follows:

**3.1.1 U.S. EPA Remedial Project Manager**- Mr. Tony Rutter is the RPM for this project. The U.S.EPA Region V RPM has overall responsibility for all phases of the Remedial Action. The U.S. EPA RPM provides the final review and approval of the QAPP.

**3.1.2 WESTON RAC Program Manager** - Mr. Dean F. Geers, the WESTON RAC Program Manager has overall responsibility for all site-related tasks performed under this QAPP. The Program Manager is responsible for ensuring that the project meets U.S. EPA objectives and



\* Contractor selected SAS Laboratory will forward the data package for initial validation.

FIGURE 3-1

RESPONSE ACTION CONTRACT  
 U.S. EPA CONTRACT No. 68-W7-0026  
 WORK ASSIGNMENT No. 001-RARA-05T2  
 DOCUMENT CONTROL No. RFW001-2E-AAJM

PROJECT ORGANIZATION CHART  
 STOUGHTON CITY LANDFILL  
 Stoughton, Wisconsin

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quality standards. He is also responsible for ensuring that all work is executed in accordance with the U.S. EPA's technical directives. The Program Manager is responsible for assigning and monitoring the functions and responsibilities of the WESTON Site Manager.

**3.1.3 WESTON Quality Assurance Manager** - Mr. Leo Carden, the WESTON RAC Quality Assurance Manager (QA Manager) has the responsibility to implement and administer the WESTON quality assurance program. The QA Manager will remain independent of direct job involvement and day-to-day operations, and has direct access to corporate executive staff as necessary to resolve any QA dispute. Other duties include:

- Exercise overall responsibility for all audits.
- Determine projects and activities to be audited; establish audit schedules.
- Notify the audited entity of the nonconformances and the need for corrective actions.
- Approve the disposition of nonconformances.
- Review and approve QA plans and procedures.

**3.1.4 WESTON Technical Operations Manager** - Mr. James M. Buron, P.E., the WESTON RAC TOM is responsible for overall technical review and input for projects. He is also responsible for providing staff for projects.

**3.1.5 WESTON Site Manager** - Mr. William F. Karlovitz, P.E., the WESTON Site Manger is responsible for implementing the project, and to meet the project objectives and requirements. The WESTON Site Manager's primary function is to ensure that the technical, financial, and

scheduling objectives are achieved successfully. The WESTON Site Manager will coordinate with the WESTON Program Manager, TOM, and QA Manager, and will provide the major point of contact and control for matters concerning the project. His other responsibilities include:

- Coordination and management of project personnel.
- Project scheduling.
- Coordination and review of required deliverables.
- General QA of field activities.
- Representing the project team at meetings and public hearings.

### 3.2 QUALITY ASSURANCE

All aspects of the RA at the site are subject to review by the WESTON QA Manager prior to obtaining approval of the U.S. EPA RPM. Primary responsibility for all quality control activities at the site is the responsibility of the WESTON Site Manager. The specific quality assurance tasks and responsibilities are summarized below.

### **3.2.1 Final Review/Approval of the RA QAPP**

The U.S. EPA Region V RPM will review and approve the QAPP. The U.S. EPA Region V RPM may receive assistance and advice from the U.S. EPA Region V Superfund Division, Field Services Section (FSS).

### **3.2.2 Validation of RAS/SAS Analytical Data**

All RAS and SAS analytical data will be forwarded to the U.S. EPA Region V Superfund Division, FSS. In addition, WESTON's data reviewers will conduct a systematic review of the data for compliance with established QC criteria.

### **3.2.3 Performance and Systems Audits**

#### **Field Audits**

- External field audits of the RA monitoring activities are the responsibility of the U.S. EPA Region V Superfund Division, FSS.
- Internal field audits are the primary responsibility of the WESTON QA Manager and the WESTON Site Manager, and may be conducted at their discretion.



## Laboratory Audits

### CLP RAS Laboratories

Audits of the CLP RAS laboratories are the responsibility of the following:

- U.S. EPA Headquarters (HQ) Office of Emergency and Remedial Response (OERR) (Analytical Operations Branch).
- U.S. EPA Region Superfund Division, FSS
- U.S. EPA Regional Technical Project Officers.

### SAS Laboratories

WESTON will be responsible for procurement of laboratories for Special Analytical Services (SAS). Technical audits of the SAS laboratories are the responsibility of WESTON. These audits may include review of available laboratory analytical procedures, analysis of performance evaluation samples and, if necessary, system audits at the laboratory.

#### 3.2.4 Scheduling of Laboratory Analyses

All CLP RAS analyses are scheduled by the U.S. EPA Region V Regional Sample Control Coordinator (RSCC). WESTON's Sample Management Coordinator will coordinate all site sampling requirements and schedules with the RSCC. All SAS analyses will be scheduled by WESTON's Sample Management Coordinator.

### **3.2.5 Preparation of Special Analytical Services Requests**

WESTON has prepared the SAS requests with assistance from the U.S. EPA Region V RSCC. These SAS requests are included in Appendix B. The review and approval of SAS requests are the responsibility of the U.S. EPA Region V Superfund Division FSS, and the U.S. EPA QAS.

### **3.2.6 Final Assessment of Quality Assurance Objectives**

WESTON's QA Manager and Site Manager will jointly assess the validated data to determine whether the QA objectives have been met.

### **3.2.7 Internal Quality Assurance Review and Approval of Reports, Standard Operating Procedures, and Field Activities**

Responsibilities for internal quality assurance review/approval of reports, SOPs and field activities are as follows:

- The WESTON QA Manager and Site Manager are responsible for reviewing all necessary reports and procedures that can affect the data quality for planned site activities.
- The WESTON QA Manager or Site Manager are responsible for auditing the implementation of the QA program (as outlined in the QAPP) to ensure conformance with WESTON's and the U.S. EPA's project requirements.
- The WESTON Field Team Leader (FTL) shall report the status of the field QA program to the WESTON QA Manager or Site Manager on a regular basis during field activities.

- The WESTON QA Manager and Site Manager shall provide QA technical assistance to the field and project staff during the QA plan's development and field implementation.

### **3.2.8 Evidence Audits of Field Records**

Internal evidence audits of field records shall be the responsibility of the WESTON Site Manager and/or WESTON QA Manager.

External evidence audits of field records are the responsibility of the U.S. EPA Region V Superfund Division, FSS.

### **3.3 FIELD OPERATIONS**

The WESTON field team shall operate under the direction of the WESTON Site Manager. The field team's activities include sample collection, field measurements, sample packaging, sample shipment, and sample chain-of-custody preparation. Within the field team, there will be a minimum of three specific roles:

- **FTL**—Responsible for the management of the field team and the supervision of all field activities in the absence of the WESTON Site Manager.

- **Site Health and Safety Coordinator (SHSC)**—Responsible for the implementation of the Health and Safety Plan (HASP). Will perform health and safety monitoring and ensure compliance with all health and safety requirements for the site.
- **Field Sample Manager (FSM)**—Manages the custody of all samples from the time they are collected to when they are shipped. Responsible for ensuring that all sample management and documentation procedures are implemented correctly.

For health and safety and QA reasons, a minimum of two field personnel will be present at all times during sampling activities. Depending on the schedule for the field sampling activity, the WESTON Site Manager will evaluate the need for additional personnel. When necessary, the FTL may also perform in the capacity of the SHSC. To the extent practicable, the FSM will not be given any additional responsibilities other than field samples. All personnel will be given the title of field sampler in order to encourage full utilization of all personnel at all times. The field samplers will collect samples and decontaminate equipment. In the absence of the WESTON Site Manager, the FTL will provide QA of field activities.

### 3.4 **LABORATORY OPERATIONS**

All RAS laboratory analyses for samples collected as part of the RA activities, with the exception of field parameters (e.g., pH, temperature), shall be performed by U.S. EPA CLP RAS laboratories. For the RAS analyses, the Contractor Sample Management Coordinator (SMC) is responsible for initiating and scheduling the request for analytical services with the U.S. EPA Region V RSCC. The U.S. EPA CLP Sample Management Office (SMO) schedules samples for CLP RAS laboratories prior to sample collection based upon information received

from the U.S. EPA Region V RSCC. The WESTON SMC will coordinate with the WESTON Site Manager and FTL in executing all laboratory arrangements. WESTON will be responsible for procurement of laboratories for all SAS analyses.

## SECTION 4

### QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for field sampling, chain of custody, laboratory analysis, and reporting that will provide results which are legally defensible in a court of law. Specific procedures for sampling, chain of custody, laboratory instrument calibration, laboratory analysis, reporting of data, internal quality control, audits, preventive maintenance of field equipment, and corrective action are described in other sections of this QAPP. The purpose of this section is to address the specific objectives for accuracy, precision, completeness, representativeness, and comparability of reported data from all analytical laboratories. QA objectives for field measurements are also discussed in this section.

#### **4.1 LEVEL OF QUALITY CONTROL EFFORT**

Field blank, trip blank, duplicate, and matrix spike samples will be analyzed to assess the quality of the data resulting from the field sampling program. Field and trip blanks consisting of Ultra Pure (HPLC Grade) water will be submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field sampling program. Field blank samples are analyzed to check for procedures at the site that may cause sample contamination. Trip blanks are used to assess the potential for contamination of samples due to contaminant migration during sample shipment and storage. Duplicate samples are analyzed to check for sampling and analytical reproducibility. Matrix spikes provide information about the effect of the sample matrix on the digestion and measurement methodology. All matrix spikes are performed in duplicate and are hereinafter referred to as matrix spike/matrix spike duplicate (MS/MSD) samples.

The general level of the QC effort to groundwater samples will be one field duplicate and one field blank for every 10 or fewer investigative samples (i.e., a 10 percent frequency). However, field blanks will only be collected for water samples and will consist of Ultra Pure (HPLC Grade) water. No field blanks will be collected for air samples. One volatile organic analysis (VOA) trip blank, consisting of Ultra Pure (HPLC Grade) water, will be included along with each shipment of aqueous VOA samples.

MS/MSD and spike/duplicate samples are investigative samples on which additional analyses are performed. One MS/MSD will be collected/designated for every 20 or fewer investigative samples per sample matrix (i.e., air and groundwater). Aqueous MS/MSD samples must be collected at triple the volume for VOCs. Aqueous spike/duplicate samples require double the normal volume for total metals. The specific level of field QC for samples collected as part of the RA sampling is summarized by sample matrix and parameter in Table 2-4. Sampling procedures are specified in the FSP (Appendix A).

The analysis for Target Compound List (TCL) volatiles, and Target Analyte List (TAL) metals will be in accordance with RAS protocols. The analysis for other parameters will be according to specified SAS protocol. If the U.S. EPA Region V CRL chooses to analyze samples, the analytical protocols will be in accordance with the CRL Standard Operating Procedure (SOP).

The level of laboratory QC effort for RAS analysis provided by the CLP is specified in the current statements of work (SOWs), SOW-OLM03.2 for organic and SOW-ILM04.0 for inorganic analyses or most recent revision. Tables 4-1 and 4-2 present the quantitation levels for TCL parameters and TAL parameters, respectively. The specified level of QC for the SAS analyses is specified in each individual SAS request.

Table 4-1

**U.S. EPA Contract Laboratory Program  
 Low/Medium Concentration Organic  
 Target Compound List (TCL) and  
 Contract Required Quantitation Limits (CRQL)<sup>1</sup>**

	Volatiles	CAS Number	Water ( $\mu\text{g/L}$ )
1.	Chloromethane	74-87-3	10
2.	Bromomethane	74-83-9	10
3.	Vinyl Chloride	75-01-4	10
4.	Chloroethane	75-00-3	10
5.	Methylene Chloride	75-09-2	10
6.	Acetone	67-64-1	10
7.	Carbon Disulfide	75-15-0	10
8.	1,1-Dichloroethene	75-35-4	10
9.	1,1-Dichloroethane	75-34-3	10
10.	1,2-Dichloroethene (total)	540-59-0	10
11.	Chloroform	67-66-3	10
12.	1,2-Dichloroethane	107-06-2	10
13.	2-Butanone	78-93-3	10
14.	1,1,1-Trichloroethane	71-55-6	10
15.	Carbon Tetrachloride	56-23-5	10
16.	Bromodichloromethane	75-27-4	10
17.	1,2-Dichloropropane	78-87-5	10
18.	cis-1,3-Dichloropropene	10061-01-5	10
19.	Trichloroethene	79-01-6	10
20.	Dibromochloromethane	124-48-1	10
21.	1,1,2-Trichloroethane	79-00-5	10
22.	Benzene	71-43-2	10
23.	trans-1,3-Dichloropropene	10061-02-6	10
24.	Bromoform	75-25-2	10
25.	4-Methyl-2-pentanone	108-10-1	10
26.	2-Hexanone	591-78-6	10
27.	Tetrachloroethene	127-18-4	10
28.	Toluene	108-88-3	10
29.	1,1,2,2-Tetrachloroethane	79-34-5	10
30.	Chlorobenzene	108-90-7	10
31.	Ethylbenzene	100-41-4	10
32.	Styrene	100-42-5	10
33.	Xylenes (total)	1330-20-7	10

<sup>1</sup> This listing is from SOW OLM03.2.



Table 4-2

**U.S. EPA Contract Laboratory Program  
 Low/Medium Concentration  
 Inorganic Target Analyte List (TAL)<sup>1</sup>**

Analyte	Contract Required Quantitation Limit <sup>2,3</sup> ( $\mu\text{g/L}$ )
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5,000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	3
Magnesium	5,000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5,000
Selenium	5
Silver	10
Sodium	5,000
Thallium	10
Vanadium	50
Zinc	20

<sup>1</sup> Listing from SOW ILM04.0.

<sup>2</sup> Subject to the restrictions specified in the first page of Part G, Section IV of Exhibit D (Alternate Methods - Catastrophic Failure) any analytical method specified in SOW Exhibit D may be utilized as long as the documented instrument or method detection limits meet the Contract Required Detection Limit (CRDL) requirements. Higher detection limits may only be used in the following circumstance:

If the sample concentration exceeds five times the detection limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the Contract Required Detection Limit. This is illustrated in the example below:

For lead:

Method in use - ICP

Sample concentration - 220

Instrument Detection Limit (IDL) - 40

Contract Required Detection Limit (CRDL) - 3

The value of 220 may be reported even though instrument detection limit is greater than CRDL. The instrument or method detection limit must be documented as described in Exhibit E.

<sup>3</sup> The CRDLs are the instrument detection limits obtained in pure water that must be using the procedure in Exhibit E. The detection limits for samples may be considerably higher depending on the sample matrix.

#### **4.2 ACCURACY, PRECISION, AND SENSITIVITY OF ANALYSIS**

The fundamental QA objective with respect to accuracy, precision, and sensitivity of laboratory analytical data is to achieve the QC acceptance criteria of the analytical protocols. The accuracy and precision requirements for CLP RAS are specified in the current SOW-OLM03.2 for organics and SOW-ILM04.0 for inorganics or the most recent revision. The sensitivities required for CLP RAS analyses will be the Contract Required Quantitation Limits (CRQL) for organic and inorganic compounds, presented in Tables 4-1 and 4-2, respectively. The accuracy, precision, and sensitivity requirements for SAS from the CLP are specified in each individual SAS request.

The QC limits should be met completely without any outliers. If an out-of-control result occurs and the QC coordinator of the laboratory does not believe it necessary to rerun the sample, the result will be flagged and a memorandum written regarding the utility of the data.

The calibration procedures, range of measurement, and measurement procedures for equipment to be used for field measurements for pH, conductivity, temperature, dissolved oxygen, turbidity and headspace organic vapor are provided in the SOPs in Appendix C.

#### **4.3 COMPLETENESS, REPRESENTATIVENESS, AND COMPARABILITY**

*Completeness* is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. It is expected that the laboratories will provide data meeting QC acceptance criteria for 95 percent or more of all samples tested using the RAS and SAS. Following the completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$\text{Completeness (\%)} = \frac{\text{Number of valid data}}{\text{Number of samples collected for each parameter analyzed}} \times 100$$

*Representativeness* expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative parameter which is dependent upon the proper design of the sampling program and proper laboratory protocol. The sampling network was designed to provide data representative of conditions at the site. During development of this network, consideration was given to the prior investigation results, physical setting, and RA objectives. The rationale of the sampling network is discussed in detail in the FSP (Appendix A). Representativeness will be satisfied by ensuring that the FSP is followed, proper sampling techniques are used, proper analytical procedures are followed, and holding times of the samples are not exceeded in the laboratory. Representativeness will be assessed by the analysis of field duplicate samples.

*Comparability* expresses the confidence with which one data set can be compared with another. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data, as documented in the QAPP, are expected to provide comparable data.

## SECTION 5 SAMPLING PROCEDURES

Sampling procedures are specified in the FSP, which is presented as Appendix A.

## SECTION 6 SAMPLE CUSTODY

This section describes the sample custody procedures to be followed in the field and the laboratory. It is U.S. EPA Region policy to follow U.S. EPA Region V sample custody, or chain-of-custody protocols as described in *NEIC Policies and Procedures*, (U.S. EPA, 1985). This custody is in three parts: sample collection, laboratory analysis, and final evidence files. Final evidence files, including all originals of laboratory reports and purge files, are maintained under document control in a secure area.

A sample or evidence file is under your custody if it is:

- In your possession.
- In your view, after being in your possession.
- In your possession and you place it in a secured location.
- In a designated secure area.

### 6.1 FIELD CHAIN-OF-CUSTODY PROCEDURES

WESTON will utilize the U.S. EPA field sample custody procedures as required by the U.S. EPA Region V Superfund Division Field Services Section (FSS) and outlined in the U.S. EPA Region V Sample Handling Manual and recent revisions. These procedures are outlined in the FSP (Appendix A).

The sample packaging and shipping procedures summarized below will ensure that samples arrive at the laboratory with the chain-of-custody intact. The protocol for specific sample numbering

using case numbers and traffic report numbers (if applicable) and other sample designations are included in the FSP (Appendix A).

### **6.1.1 Field Procedures**

Field procedures are as follows:

- (a) The field sampler is personally responsible for the care and custody of the samples until they are transferred to the Field Sample Manager or properly dispatched. As few people as possible should handle the samples.
- (b) All bottles will be tagged with sample numbers and locations. The appropriate CRL or SAS number and sticker will be affixed to each bottle.
- (c) Sample tags are to be completed for each sample using waterproof ink unless prohibited by weather conditions. For example, a logbook notation would explain that a pencil was used to fill out the sample tag because the ballpoint pen would not function in freezing weather.
- (d) The WESTON Site Manager (or his designee) will review all field activities to determine whether proper custody procedures were followed during the field work. The designee will notify the WESTON SMC and Site Manager of a breach or irregularity in chain-of-custody procedures.

### **6.1.2 Field Logbooks/Documentation**

Field logbooks will provide the means of recording data collecting activities performed at the site. As such, entries will be described in as much detail as possible so that persons going to the site could re-construct a particular situation without relying on memory.

Field logbooks will be bound, consecutively numbered, field survey books or notebooks. Logbooks will be assigned to the field team, but will be stored in a secure area when not in use. The logbooks will be identified by the project-specific document number.

The title page of each logbook will contain the following:

- Person to whom the logbook is assigned.
- Logbook number.
- Project name.
- Project start date.
- Anticipated project end date.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, the level of personal protection being used, and the signature of the person making the entry will be entered. The names of visitors to the site, field sampling or investigative team personnel, and the purpose of their visit will also be recorded in the field logbook.

Measurements taken and samples collected will be recorded. All entries will be made in ink (weather permitting), and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark and the initials of the person making the correction placed next to the strike mark. Whenever a sample is collected or a measurement is made, a detailed description of the location of the station (including compass and approximate distance measurements) will be recorded. The number of photographs taken of the station, if any, will also be noted. All equipment used to take measurements will be identified, along with the date of calibration.

Samples will be collected following the sampling procedures described in the FSP (Appendix A). The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth at which the sample was collected, volume, and number of containers. Sample identification numbers will be assigned prior to sample collection. Field duplicate samples, which will receive an entirely separate sample identification number, will be noted under sample description. The sample identification system is described in Section 6 of the FSP.

### **6.1.3 Transfer of Custody and Shipment Procedures**

Transfer of custody and shipment procedures are as follows:

- (a) Samples are accompanied by a properly completed chain-of-custody (COC) form. The sample numbers and locations will be listed on the COC. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, to a mobile laboratory, to the permanent laboratory, or to/from a secure storage area.
- (b) Samples will be packaged for shipment and dispatched to the appropriate laboratory for analysis. A separate signed COC form will be enclosed in each sample shipment container. Shipping containers will be locked and secured with strapping tape and U.S. EPA custody seals for shipment to the laboratory. A custody seal will be attached to the front right and back left of the shipment container. The custody seals will be covered with clear plastic tape. The shipment container will be strapped shut with strapping tape in at least two locations.
- (c) Whenever samples are split with a source or government agency, a separate sample receipt will be prepared for those samples and marked to indicate with whom the samples are being split. The person relinquishing the samples to the source or agency will request the representative's signature acknowledging sample receipt. If the representative is unavailable or refuses, this will be noted in the "received by" space.



- (d) All shipments will be accompanied by the COC form identifying the contents. The bottom two forms will be retained by the sampler for return to the sampling office, while the top two copies will accompany the shipment.
- (e) If the samples are sent by common carrier, a bill of lading will be used. Receipts of bills of lading will be retained as part of the permanent documentation. If sent by mail, the package will be registered with return receipt requested. Commercial carriers will not be required to sign off on the custody form as long as the custody forms are sealed inside the sample shipment container and the custody seals remain intact.

#### 6.1.4 Summary of Field Chain-of-Custody Procedures

A site field team will consist mainly of the following individuals:

- The FTL.
- The SHSC.
- The FSM.

There will be a minimum of two people in each field team. All members will be considered to be field samplers and may be involved in the actual sample collection. Depending on the magnitude of the field operations, the WESTON Site Manager will evaluate the need for additional personnel. When necessary, the FTL will also perform in the capacity of the SHSC. To the extent practicable, the FSM will not be given any additional responsibilities other than sometimes performing as a field sampler. If more than two people are in the field team, there may be personnel who are designated as only field samplers.

The FTL will have overall responsibility for ensuring the completion of all field activities in accordance with the QAPP and FSP. The FTL is the overall coordinator of sampling activities

at the site and is the communication link between field team members and the WESTON Site Manager. The FTL will assign specific field duties to the team members based on input from the WESTON Site Manager.

The WESTON SMC will give all required sample documentation to the FSM prior to leaving for the site. The FSM will be responsible for preparing (and reviewing for accuracy and completeness) all sample paperwork such as combination chain-of-custody/traffic report forms (COC/TR), SAS/packing list (COC/SAS) forms, sample tags, and any other paperwork required for sample documentation. The FSM will also prepare all sample shipment information such as airbills. If the FSM does not participate in sampling activities at a site, the FSM will have one or more of the field samplers sign the sample tags. If the FSM requests assistance from other members of the field team in completing sample paperwork, the FSM will be responsible for reviewing and ensuring the accuracy and completeness of this paperwork before he/she encloses it in the sample shipment container. All members of the field team may be involved in the actual sample packaging and shipment. The FSM is responsible for tracking all sample paperwork from the time of receipt until the completed paperwork is given to the WESTON SMC.

The FTL is responsible for maintaining the site field logbook. The site field logbook will contain notes made by the FTL on site activities, including the tracking of the samples from the time of sample collection to the delivery of the samples to the shipping carrier. The names and function of all field team members will be listed in the logbook. During the course of sample collection activities, the FTL will document the times and dates of all sampling activities (e.g., who collected the sample, when and where the sample was collected, who delivered the sample to FSM, when the sample coolers were delivered to the shipping carrier, etc.) If the FSM was part of the sampling team this will be specifically noted. The FTL will note the names of the actual samplers

for each station location along with the time, date, station location identifier and sample identifiers, etc.

The collected samples will be transported to the FSM by a member or members of the field team. If the sample locations are far apart, multiple samples may be collected prior to delivering them to the FSM. The FTL will ensure that any preservation requirements (e.g., keeping the samples cool) are implemented prior to the time that the samples are delivered to the FSM. To the extent practicable, the FSM will be in view of the sampling crew.

Upon receipt of the samples, the FSM will be responsible for ensuring that custody is transferred. The FSM will require the field team member delivering the samples to sign and date the COC/TR, COC/SAS or the stand-alone COC form associated with the samples as relinquisher of the samples in the "relinquished by" area. The FSM will then sign the forms as the recipient. The signed forms will be the same forms that will accompany the samples to the laboratory. Prior to enclosing the forms in the shipment container, the FSM will sign the various COC forms to indicate he or she is relinquishing custody to the shipment carrier. If the forms are sealed in the shipment container with COC seals on the outside of the container, the shipment carrier will not sign the forms as the recipient. The FSM will be responsible for completing the remainder of all forms except as noted previously. In all instances, the FTL will sign each form in the area for "sampler" since he or she will be present during all sampling activities.

The FSM will sign sample tags if he or she participates in sampling activities. Otherwise, the FSM will have members of the sampling team sign the tags when they deliver samples. The team member delivering the samples will also provide the FSM with the individual time of collection for each sample. All sample documentation shipped with the sample to the laboratory (i.e.,

COC/TR, COC/SAS, etc.) will become part of the evidence file for the samples. The site field logbook will be maintained in the site file or in the custody of the FTL.

The FSM assumes custody of the samples once he or she has signed the COC form(s). If the FSM must leave the "staging area" (where sample preparation for shipment and documentation completion is performed), the samples will either be locked inside of the sampling team's vehicle/trailer, or will be secured in a cooler with custody seals. The custody seals will be inspected by the FSM upon return to the staging area to ensure they are intact. These practices will be followed whenever necessary to maintain custody of the samples in the field and will be logged into the site field logbook.

## **6.2 LABORATORY CHAIN-OF-CUSTODY PROCEDURES**

The chain-of-custody procedures for the CLP are described in the SOWs for RAS; these same procedures apply to SASs. These custody procedures, along with the holding time requirements for CLP samples, are described in the appropriate SOW documents. Prior to procuring the SAS laboratories, WESTON must ensure that the SAS laboratories will follow the approved chain-of-custody procedures.

If the U.S. EPA Region V CRL chooses to analyze samples, chain-of-custody procedures for the CRL are described in the CRL's SOP.

## **6.3 FINAL EVIDENCE FILES CUSTODY PROCEDURES**

WESTON is the custodian of the evidence file and maintains the contents of the evidence files for the site field activities. WESTON maintains all relevant records, reports, correspondence, logs,

field notebooks, pictures, subcontractor reports, and the U.S. EPA Region V data reviews in a secured, limited access area. WESTON submits all technical files to the U.S. EPA when a project is closed out.

## SECTION 7 CALIBRATION PROCEDURES AND FREQUENCY

This section describes procedures for maintaining the accuracy of all the instruments and measuring equipment which are used for conducting field tests and laboratory analyses. For any activity that influences data quality, all instruments and equipment should be calibrated prior to each day's use or on a scheduled periodic basis.

### 7.1 FIELD INSTRUMENTS/EQUIPMENT

Instrument and equipment used to gather, generate, or measure environmental data will be calibrated with sufficient frequency and in such a manner that the accuracy and reproducibility of results are consistent with the manufacturer's specifications. The field instruments should be calibrated and maintained by trained personnel.

Equipment to be used during the field sampling will be examined to certify that it is in operating condition. This includes checking the manufacturer's operating manual and the instructions for each instrument to ensure that all maintenance requirements are being observed. Field notes from previous sampling trips will be reviewed so that any prior equipment problem is not overlooked and all necessary repairs to equipment have been made.

Calibration of field instruments is governed by the specific SOP for the applicable field analysis method, and such procedures take precedence over the following general discussion. Calibration of field instruments will be performed at the intervals specified by the manufacturer or more frequently as conditions dictate. In the event that an internally calibrated field instrument fails to meet calibration/checkout procedures, it will be returned to the manufacturer for service.

Field instruments to be used during the investigation include:

- pH meter.
- Thermometer.
- Specific conductivity meter.
- Dissolved oxygen meter.
- Water level indicator/electronic sounding device.
- Turbidimeter.
- Flame Ionization Detector (FID).
- PID
- CGI/Oxygen Meter.

The calibration/checkout of all field instruments will be performed prior to use each day. The calibration/checkout and maintenance programs for each instrument will be according to the manufacturer's specifications. Appendix C includes Field SOPs.

All calibration performed in the field will be documented in the site field logbook. The calibration/maintenance record will be maintained by the WESTON FTL for each measuring instrument and will include at least the following information:

- Name of device or instrument calibrated.
- Device/instrument serial and/or identification (I.D.) number.
- Frequency of calibration.
- Results of calibration.
- Name of person performing the calibration.
- Identification of the calibration media (e.g., pH buffer solutions).

Tape measures used to locate sampling stations and to determine depths in boreholes or wells will be examined visually prior to each day of use to check for damage. Damaged tape measures will not be used.

## **7.2 LABORATORY INSTRUMENTS**

### **7.2.1 Calibration Procedures and Frequency for RAS Analyses**

The CLP RAS calibration procedure and frequencies are specified in the CLP organic and inorganic SOWs.

### **7.2.2 Calibration Procedure and Frequency for SAS Analyses**

The groundwater SAS calibration procedures and frequency are specified in the SAS request.

### **7.2.3 U.S. EPA Region V CRL Calibration Procedures and Frequency**

The CRL calibration procedures and frequency are specified in the CRL organic and inorganic SOWs.



## SECTION 8 ANALYTICAL PROCEDURES

This section describes the analytical procedures for all analysis that will be conducted during the RA. Table 2-4 identifies the field and laboratory parameters for groundwater for each RA task.

### 8.1 LABORATORY ANALYTICAL SERVICES

#### 8.1.1. Routine Analytical Services Laboratory Procedure

All samples for CLP TCL volatiles will be analyzed according to analytical procedures set forth in U.S. EPA CLP RAS SOW OLM03.2 or the most recent revision. All samples for CLP TAL metals will be analyzed according to the analytical procedures set forth in U.S. EPA CLP RAS SOW ILM04.0 or the most recent revision. If the U.S. EPA Region V CRL chooses to analyze samples, the analyses will be in accordance with the analytical procedures set forth in the CRL SOP.

#### 8.1.2 Special Analytical Services Laboratory Procedure

Table 2-3 identifies the laboratory parameters (for air and groundwater samples) which require SAS analyses. The analytical procedures to be used for performing the SAS groundwater analyses are described in the SAS requests in Appendix B of this QAPP. The analytical procedure for analyzing VOCs in landfill gas would be EPA Method TO-14. This method is referenced in *Compendium of Methods for the Determination of Toxic Organic Compounds in Air, EPA 600/4-84-041, EPA Method TO-14*. WESTON is responsible for procuring the SAS laboratories.

## 8.2 FIELD SCREENING ANALYTICAL PROTOCOLS

The procedures for field measurement of pH, specific conductivity, temperature, dissolved oxygen, and turbidity are described in the SOPs in Appendix C. For air screening, a landfill gas analyzer meter and an anemometer will be used for field screening.

## SECTION 9 INTERNAL QUALITY CONTROL CHECKS

This section describes the internal quality control checks for field sample collection, field measurements, and laboratory analyses.

### 9.1 FIELD SAMPLE COLLECTION

The assessment of QC for field sampling will be made through the collection of field blank and field duplicate samples, in accordance with the applicable procedures and frequency described in Table 2-4 of this QAPP and Section 5 of the FSP.

### 9.2 FIELD MEASUREMENT

QC procedures for pH, conductivity, dissolved oxygen, turbidity, and temperature, as well as manual and electronic measurement of water levels, are limited to checking the reproducibility of the measurement by obtaining multiple readings on a single sample or standard and/or by calibrating the instruments (when appropriate).

### 9.3 LABORATORY ANALYSIS

#### 9.3.1 RAS Internal Quality Control Checks

The CLP QC program is structured to provide consistent results of known and documented quality. Internal quality control procedures for RAS from the CLP are specified in the SOWs for organics and inorganics, or in the method description of SOPs. These specifications include the types of QC checks required (method blanks, reagent/preparation blanks, MS/MSDs, calibration

standards, internal standards, surrogate standards, the frequency of each audit, the specific calibration check standards, laboratory duplicate/replicate analysis), compounds and concentrations to be used, and the quality control acceptance criteria for these audits. If the U.S. EPA Region V CRL chooses to analyze samples, internal quality control check procedures will be followed in accordance with the CRL SOP.

### **9.3.2 SAS Internal Quality Control Checks**

Quality control checks for groundwater SAS are identified in the SAS requests in Appendix B. Quality control for air SAS are identified in EPA Method TO-14.

## **SECTION 10**

### **DATA REDUCTION, VALIDATION, AND REPORTING**

This section identifies responsibilities and procedures for data reduction, validation and reporting for field measurements, sample collection and laboratory services.

#### **10.1 FIELD MEASUREMENTS AND SAMPLE COLLECTION**

Raw data from field measurements and sample collection activities will be appropriately recorded in the site field logbook. If the data are to be used in the project reports, they will be reduced or summarized, and the method of reduction will be documented in the report.

#### **10.2 LABORATORY SERVICES**

##### **10.2.1 Data Reduction**

Data reduction, evaluation, and reporting for samples analyzed by the CLP according to the RAS protocol will be performed in accordance with specifications outlined in the CLP RAS SOW OLM03.2 for organics and SOW ILM04.0 for inorganics, or the most recent revision. Data resulting from groundwater SAS analyses will be reduced, evaluated, and reported as described above, unless special procedures are given in the actual SAS request presented in Appendix B. If the U.S. EPA Region V CRL chooses to analyze samples, data reduction will be performed by the CRL according to specifications outlined in the CRL SOP.

### **10.2.2 Data Validation**

The U.S. EPA Region V Superfund Division FSS is responsible for SAS data validation. Validation will be accomplished by comparing the contents of the data packages and QA/QC results to the requirements contained in RAS methods and SAS methods. Raw data such as GC/MS Total Ion Current (TIC) chromatograms, GC chromatograms, and mass spectra, ICAP and FAA data reports, and data station printouts will be examined to ensure that reported results are accurate. The U.S. EPA Region V FSS will be responsible for this.

The U.S. EPA Region V validation protocols for the CLP, RAS, and SAS data are based on the following guidelines:

- *Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses* - U.S. EPA, February 1994.
- *Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses* - U.S. EPA, February 1994.

### **10.2.3 Data Reporting**

The RAS and SAS analytical laboratories will prepare and submit full analytical and QC reports to U.S. EPA Region V in compliance with the requirements of the CLP. They will include the following (as applicable):

1. Narrative including statement of samples received, description of any deviations from RAS or SAS standard procedures, explanation of qualifications regarding data quality, and any other significant problems encountered during analysis.

2. Up to 20 extractable organic compounds not included in the RAS analytes, tentatively identified and quantified against the nearest internal standard.
3. An organic QA/QC report including Forms I to X, surrogate spike results for each sample, matrix spike and matrix spike duplicate results, method blank results, and initial and continuing calibration checks.
4. An inorganic QA/QC report including Forms I to XIII spike and duplicate results, method blank results, and initial and continuing calibration checks.
5. Field and laboratory chain-of-custody documentation pertaining to each sample delivery group analyzed.

## SECTION 11

### PERFORMANCE AND SYSTEM AUDITS AND FREQUENCY

Performance and system audits of both field and laboratory activities will be conducted to verify that sampling and analysis are performed in accordance with the procedures established in the FSP and the QAPP. The audits of field and laboratory activities include two separate, independent parts: internal and external audits.

Quality assurance system audits are conducted at least once during activities that may affect the integrity of the sampling program. The objectives of the QA systems audits are:

- To verify that a system of quality control measures, procedures, reviews, and approvals is established for all activities that generate and process environmentally-related data.
- To verify that a system for project documentation (records, chain-of-custody forms, analytical tags, logbooks, worksheets, etc.) is established.
- To verify documentation of the required quality control reviews, approvals, and activity records (logbooks, worksheets, etc.).
- To identify nonconformance with the established system of quality control measures, procedures, reviews, approvals, and documentation.
- To recommend corrective actions for identified nonconformance.
- To verify implementation of corrective action.
- To provide written reports of audits.



## 11.1 **FIELD AUDITS**

Internal audits of field activities at the site will be the responsibility of the WESTON Technical Operations Manager and/or Site Manager. In the absence of both persons, the QA of field activities will be conducted by the designated FTL. Field audits will cover the following:

- Organization and responsibilities—determine whether the quality assurance organization is operational.
- Collection of samples—to ensure that written procedures are available and being followed.
- Chain-of-Custody program—to ensure that the appropriate steps have been followed in the traceability of sample origin.
- Implementation of the operational procedures—to ensure that the appropriate QC checks are being made in the field and records are maintained of these checks.
- Equipment—to determine whether the specified equipment is available, calibrated, and in proper working order.
- Training—to ensure that sampling crews are adequately trained.
- Records—to ensure that record keeping procedures are operational and that field notebooks, log sheets, bench sheets, and tracking forms are properly prepared and maintained.

These audits will occur at the outset of the project to verify that all established procedures are followed. Follow-up audits will be conducted to ensure correction of any deficiencies that were previously identified and to verify that QA procedures are maintained throughout the project.

In addition, constant surveillance of field sampling and testing activities shall be performed by

qualified technical personnel, as approved by the WESTON Site Manager. The WESTON Site Manager may conduct audits of site work procedures on an unscheduled basis.

External field audits are the responsibility of by the U.S. EPA Region V. External audits may be conducted at any time during field operations. These audits may or may not be announced and are at the discretion of the U.S. EPA Region V. External audits will be conducted according to the field activity information presented in the QAPP.

## **11.2 LABORATORY AUDITS**

The CLP RAS laboratories are audited on a regular basis by the U.S. EPA. Audits of the SAS laboratories are the responsibility of WESTON; however, the U.S. EPA Region V RSCC may choose to accompany WESTON on these audits.

Audits include the examination of laboratory documentation for sample receiving, sample log-in, sample storage, chain-of-custody procedure, sample preparation and analysis, instrument operating records, etc. Performance audits consist of sending performance evaluation (PE) samples to laboratories for ongoing assessment of laboratory precision and accuracy. The analytical results of CLP PE samples are evaluated by U.S. EPA to ensure that the laboratory maintains good performance. The analytical results of a PE sample for a SAS laboratory will be evaluated by WESTON.

## SECTION 12 PREVENTATIVE MAINTENANCE PROCEDURES

This section describes the specific preventive maintenance procedures to be followed for field equipment and laboratory instruments.

### 12.1 FIELD EQUIPMENT/INSTRUMENTS

The field equipment for this project includes thermometers, pH meter, conductivity meter, turbidimeter, and dissolved oxygen meter. Specific preventative maintenance procedures for this equipment are discussed in the SOPs in Appendix C, and will be conducted in accordance with manufacturer's specifications.

Field instruments will be checked and calibrated daily before use. Calibration checks will be documented in the site field logbook. The FTL will be responsible for implementing and documenting these procedures in the logbook.

Preventative maintenance will normally be conducted by the equipment supplier. Additional maintenance of equipment will be performed at the site, if necessary, by the field sampling personnel on an as-needed or an as-recommended basis. In addition, critical spare parts, such as tape, pH probes, and batteries, will be kept on site to reduce downtime. Backup instruments and equipment will be available on site if deemed necessary, or will be within one-day's shipment to avoid delays in the field schedule.

## **12.2 LABORATORY INSTRUMENTS**

All laboratories participating in the CLP are required under the CLP RAS SOW OLM03.2 for organics and SOW ILM04.0 for inorganics (or the most current version) to have SOPs for preventative maintenance for each measurement system and required support activity. Preventative maintenance procedures for laboratories performing SAS analyses are the same as those described above for RAS. All maintenance activities must be documented in logbooks to provide a history of maintenance records. If the U.S. EPA Region V CRL chooses to analyze samples, laboratory instruments will be maintained according to CRL SOP.

**SECTION 13**  
**SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION,  
ACCURACY, COMPLETENESS**

This section describes the specific routine procedures to be followed to assess data precision, accuracy and completeness for field measurements and laboratory results.

**13.1 FIELD MEASUREMENTS**

Field data will be checked for compliance with the established QC criteria that are specified in the QAPP and FSP. Data from field measurements of pH, specific conductance, temperature, dissolved oxygen, turbidity, groundwater levels, and CGI/Oxygen levels will be assessed by thorough review of QC data (i.e., calibrations, standards, blanks, replicates), documentation in site field logbooks, and reports from system audits.

Accuracy of field measurements will be assessed using daily instrument calibration, calibration check, and analysis of blanks. Precision will be assessed on the basis of reproducibility by multiple readings of a single sample.

All data will be reviewed for completeness by the FTL or his/her designee. Data completeness will be calculated using the following equation.

$$\text{Completeness} = \frac{\text{Valid Data Obtained}}{\text{Total Data Planned}} \times 100 \quad \text{Eq. 13-1}$$

## 13.2 LABORATORY DATA

Laboratory results will be assessed for compliance with required precision, accuracy, completeness, and sensitivity as discussed in the following subsections.

### 13.2.1 Precision

The degree of agreement between the numerical values of a set of duplicate samples performed in an identical fashion constitutes the precision of the measurement. Precision of laboratory analysis will be assessed by comparing the analytical results between MS/MSD samples for organic analysis and laboratory duplicate analyses for inorganic analysis. Precision will be reported as a relative percent difference and will be calculated for each pair of duplicate analysis using the following equation.

$$\% \text{ RPD} = \frac{S-D}{(S + D) / 2} \times 100 \quad \text{Eq. 13-2}$$

Where:

- % RPD = Relative percent difference.
- S = First sample value (MS for organics and initial sample result for inorganics).
- D = Second sample value (MSD for organics and method duplicate for inorganics).

### 13.2.2 Accuracy

Accuracy is the measure of a result to the accepted (or true) value. Accuracy of laboratory results will be assessed for compliance with the QC criteria that are described in Section 4 of the QAPP, using the analytical results of QA samples like the method blanks, reagent/preparation blank, MS/MSD samples, field blanks, and bottle blanks.

Analytical accuracy is expressed as the percent recovery of an analyte that has been added to the sample or standard matrix (i.e., blank) at a known concentration before analysis. The percent recovery of matrix spike samples will be calculated using the following equation:

$$\% R = \frac{SSR - SR}{SA} \times 100 \quad \text{Eq. 13-3}$$

Where:

- % R = Percent recovery
- SSR = The total analyte concentration determined experimentally from the spiked sample (spiked sample recovery).
- SR = The sample result (SR) determined by separate analysis of the unspiked sample. SR is zero if the SR is qualified U.
- SA = Amount of the spike added.

### 13.2.3 Completeness

The data completeness of laboratory analyses results will be assessed for compliance with the amount of data required for decisionmaking. Data completeness will be calculated using Equation 13.1.

### 13.2.4 Sensitivity

The achievement of method detection limits depends on instrument sensitivity and matrix effects. Therefore, it is important to monitor the instrument sensitivity to ensure the data quality through constant instrument performance. The instrument sensitivity will be monitored through the analysis of method blank, calibration check sample, laboratory control samples, etc.



## SECTION 14 CORRECTIVE ACTIONS

Corrective actions may be required for two classes of problems: analytical and equipment problems and noncompliance problems. Analytical and equipment problems may occur during sampling and sample handling, sample preparation, laboratory instrument analysis, and data review.

For noncompliance problems, a formal corrective action program will be determined and implemented at the time the problem is identified. The person who identifies the problem is responsible for notifying the WESTON Site Manager. Information on these problems will be promptly communicated to the U.S. EPA RPM, the WESTPM Site Manager, QA Manager or the U.S. EPA RSCC, as applicable. Implementation of corrective actions will be confirmed in writing through the same channels.

Any nonconformance with the established quality control procedures in the QAPP or FSP will be identified and corrected in accordance with the QAPP. The WESTON QA Manager or his designee will issue a nonconformance report for each nonconformance condition.

Corrective actions will be implemented and documented in the site field logbook. No staff member will initiate corrective action without prior communication of findings through the proper channels. Corrective actions will be defined by the auditor and implemented to the satisfaction of the WESTON QA Manager. If corrective actions are insufficient, work may be stopped by a stop-work order issued by the U.S. EPA RPM, the WESTON Site Manager, or the WESTON QA Manager.

#### **14.1 SAMPLE COLLECTION/FIELD MEASUREMENTS**

Technical staff and field personnel will be responsible for reporting all suspected technical or QA nonconformance or suspected deficiencies of any activity or issued document by reporting the situation to the FTL or his/her designee. The FTL will be responsible for assessing the suspected problem, consulting with the WESTON Site Manager on the problem and anticipated change, and implementing the change. If it is determined that the situation warrants a reportable nonconformance requiring corrective action, then a nonconformance report will be initiated by the WESTON Site Manager.

The WESTON Site Manager will be responsible for informing the WESTON QA Manager, and the U.S. EPA RPM of the problem. The WESTON Site Manager will be responsible for ensuring that corrective action for the nonconformance is initiated by:

- Evaluating all reported nonconformance.
- Controlling additional work on nonconforming items.
- Determining disposition or action to be taken.
- Reviewing nonconformance reports and corrective actions to be taken.
- Ensuring nonconformance reports are included in the final site documentation in project files.

If appropriate, the WESTON Site Manager will ensure that no additional work that is dependent on the nonconforming activity is performed until the corrective actions are completed.

Corrective action for field measurements may include:

- Repeating the measurement to check the error.
- Checking all proper adjustments for ambient conditions such as temperature.
- Checking the batteries.
- Checking the calibration.
- Re-calibration.
- Replacing the instrument or measurement device.
- Stopping work (if necessary).

All changes will be evaluated based on the potential to impact the quality of the data. The WESTON Site Manger has ultimate responsibility for all site activities. In this role, the Site Manager at times is required to adjust the site programs to accommodate site-specific needs. When it becomes necessary to modify a program, the FTL notifies the WESTON Site Manager of the anticipated change and implements the necessary changes. The WESTON Site Manager or his designee must approve all changes verbally and/or in writing prior to field implementation by the FTL. The WESTON QA Manager, and the U.S. EPA RPM will be notified when any field changes are made.

All problems and corrective actions will be documented in the site field logbook by the FTL. No field team member will initiate corrective action without prior communication of findings through the proper channels. The action taken during the period of deviation will be evaluated in order to determine the significance of any departure from established program practices and action taken. If corrective actions are insufficient, work may be stopped by the FTL following instructions from the WESTON Site Manager, WESTON QA Manager, or the U.S. EPA RPM.

## **14.2 LABORATORY ANALYSES**

CLP RAS issues are dealt with by the U.S. EPA data reviewer, who contacts the CLP laboratory directly. WESTON will handle all SAS issues. The SMO Contracts Compliance Screening (CCS) group performs automated CCS (screening) of the RAS data, which the laboratory must respond to within 10 days. The RAS re-analyses are authorized by the U.S. EPA CLP Administrative Project Officer (APO). The U.S. EPA Regional Technical Project Officers (TPO) handle laboratory problems with CLP laboratories in their Region.

### **14.2.1 Laboratory Corrective Actions - CLP RAS**

For the CLP RASs, corrective action is implemented at several different levels. The laboratories participating in the CLP are required to have a written SOP specifying corrective action to be taken when an analytical error is discovered or the analytical system is determined to be out of control. The SOP requires documentation of the corrective action and notification by the analyst about the errors and corrective procedures.

The SMO also may request corrective action for any contractual nonconformance identified by audits or data validation. The CRL may request corrective action by the laboratories for any nonconformances identified in the data validation process through the SMO or, for minor problems, the lab may be contacted directly. Corrective action may include:

- Re-analyzing the samples, if holding time criteria permits.
- Resampling and analyzing.
- Evaluating and amending sampling procedures.
- Evaluating and amending analytical procedures.

- Accepting the data and acknowledging the level of uncertainty.

If resampling is deemed necessary due to laboratory problems, the U.S. EPA RPM must identify the necessary approach including cost recovery from the CLP for the additional sampling effort. The WESTON QA Manager must be notified in writing of all decisions.

#### 14.2.2 Laboratory Corrective Actions - SAS

For SAS requests, corrective action will be implemented as specified in the SAS request and in accordance with the procedures described in the previous paragraph (Subsection 14.2.1). WESTON is responsible for ensuring that the SAS laboratories implement corrective action procedures in accordance with approved procedures.

If the U.S. EPA Region V CRL chooses to analyze samples, corrective actions by the CRL will be implemented according to CRL SOP.

## SECTION 15 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The WESTON QA Manager and/or Site Manager (or designee) will audit the implementation of this QAPP. These reviews will include an assessment of data quality, and the results of systems and/or performance audits as appropriate. These reviews are done to ensure that problems, if any, identified during sampling and/or analysis are investigated, and corrective actions are properly taken. The preparation of a Quality Assurance Report is not anticipated, except as necessitated by problems arising during the execution of project activities. Any QA reports prepared by WESTON for the site will be submitted to the U.S. EPA RPM.

The technical memorandum describing the monitoring activities will contain QA sections that summarize data quality information collected during the project.

**SECTION 16**  
**REFERENCES**

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- Roy F. Weston, Inc., *Remedial Design Work Plan for Stoughton City Landfill, Stoughton, Wisconsin,* December 1992.
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**APPENDIX A**  
**FIELD SAMPLING PLAN**



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## SECTION 1 INTRODUCTION

This Field Sampling Plan (FSP) describes the field sampling protocols to be followed as part of the Remedial Action (RA) for the landfill remediation component at the Stoughton City Landfill (SCL) site in Stoughton, Wisconsin.

Specifically, the FSP addresses the following:

- Sampling plan rationale.
- Field sampling procedures.
- Numbers, locations, and types of samples.
- Quality Assurance/Quality Control (QA/QC) of field sampling.
- Sample numbering system.
- Sample containers and preservation.
- Sample packaging and shipment.
- Chain-of-custody procedures.
- Documentation.
- Sampling team organization.
- Management of investigation-derived wastes.
- Sample container procurements.

During the RA, additional field sampling may be necessary. If the additional field sampling is not covered in this FSP, an addendum to the FSP should be made at the appropriate time, and approval should be obtained by the United States Environmental Protection Agency (U.S. EPA) before initiating the field work.

## SECTION 2

### SAMPLE NETWORK DESIGN AND RATIONALE

This section presents the rationale for sampling frequency and analysis during the remedial action. The sampling activities include groundwater monitoring and landfill gas monitoring. Table 2-1 summarizes the sampling and analysis program.

#### 2.1 GROUNDWATER MONITORING

The Record of Decision (ROD) identified the Wisconsin Preventive Action Limits (PALs) as the applicable groundwater quality standards for the site. The Remedial Design (RD) Data Collection Report (WESTON, 1995) delineated the groundwater plume at the site. The report concluded that there are two plumes moving in the northwest direction away from the landfill towards the Yahara River (Figures 2-3 and 2-4 of the QAPP). These plumes appear to be disconnected. The chemicals exceeding the PALs for groundwater are tetrahydrofuran (THF) and dichlorodifluoromethane (DCDFM). The PAL for THF is 10 micrograms per liter ( $\mu\text{g/l}$ ) and for DCDFM is 200  $\mu\text{g/l}$ . Both of the plumes exceed the PALs for both THF and DCDFM.

The groundwater monitoring has the following objectives:

- Establish a baseline for site groundwater quality immediately prior to the placement of the landfill cap.
- Collect one round of sampling for THF and DCDFM after the cap is complete to monitor the movement of the THF and DCDFM plumes semiannually to evaluate natural attenuation and the effect of the landfill cap on the THF and DCDFM plumes.

**Table 2-1**  
**Summary of RA Sampling and Analysis Program**  
**Stoughton City Landfill**  
**Stoughton, Wisconsin**

O&M Task	Sample Matrix	Field Parameters	Laboratory Parameters <sup>4</sup>	Investigative			Field Duplicate			Field Blank			MS/MSD <sup>5</sup>			Matrix Total
				No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	
Baseline Groundwater Monitoring <sup>1</sup>	Groundwater	Water Level, pH, Conductivity, Temperature, Turbidity, Dissolved Oxygen	Tetrahydrofuran (THF)	40	1	40	4	1	4	4	1	4	3	1	3	48
			Dichlorodifluoromethane (DCDFM)	40	1	40	4	1	4	4	1	4	3	1	3	48
			Trichlorofluoromethane (TCFM)	40	1	40	4	1	4	4	1	4	3	1	3	48
			CLP RAS TCL Volatiles	40	1	40	4	1	4	4	1	4	3	1	3	48
			CLP RAS TAL Metals (Filtered)	40	1	40	4	1	4	4	1	4	3	1	3	48
			CLP RAS TAL Metals (Unfiltered)	40	1	40	4	1	4	4	1	4	3	1	3	48
Routine Groundwater Monitoring <sup>2</sup>	Groundwater	Water Level, pH, Conductivity, Temperature, Turbidity, Dissolved Oxygen	THF	28	1	28	3	1	3	3	1	3	2	1	2	34
			DCDFM	28	1	28	3	1	3	3	1	3	2	1	2	34

**Table 2-1**  
**Summary of Annual RA Sampling and Analysis Program**  
**Stoughton City Landfill**  
**Stoughton, Wisconsin**  
**(Continued)**

O&M Task	Sample Matrix	Field Parameters	Laboratory Parameters <sup>4</sup>	Investigative			Field Duplicate			Field Blank			MS/MSD <sup>5</sup>			Matrix Total
				No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	
Passive Gas Vent Monitoring <sup>1</sup>	Air	Percent LEL, Percent Oxygen	EPA Method T014 Standard List of VOCs	5	1	5	NA	NA	NA	NA	NA	NA	1	1	1	5

<sup>1</sup> Baseline groundwater monitoring will be conducted prior to the placement of the landfill cap.

<sup>2</sup> Routine groundwater monitoring will be conducted once after the completion of the cap.

<sup>3</sup> One round of sampling will be conducted after completion of the cap.

<sup>4</sup> All parameters that are not designated as CLP RAS analyses will be analyzed according to SAS methodologies presented in Appendix B.

<sup>5</sup> MS/MSDs are not additional samples, but are instead investigative samples on which MS/MSD analyses are performed. MS/MSDs are for organic samples only. Duplicate/spike analyses are performed for inorganic samples.

<sup>6</sup> The matrix total does not include trip blank samples and MS/MSD samples. One trip blank will be shipped with every shipment container containing aqueous VOA samples.



### **Baseline Groundwater Monitoring**

The baseline groundwater monitoring will be prior to the placement of the landfill cap. A network of groundwater monitoring wells exist at the site (Figure 2-1). The network includes 41 monitoring wells. All the monitoring wells will be used for the baseline groundwater monitoring except MW-9B because it was damaged during RI sampling efforts. For the baseline, the groundwater samples will be analyzed for routine analytical services (RAS) Target Compound List (TCL) volatiles, Target Analyte List (TAL) metals, THF, DCDFM, and trichlorofluoromethane (TCFM). TCFM is included in the analysis because it was detected during the remedial investigation (RI) sampling effort. TCL semivolatiles, TCL pesticides/polychlorinated biphenyls (PCBs), and cyanide are not included in the list of analysis because these parameters were not detected in groundwater in previous investigations.

### **Routine Groundwater Monitoring**

The routine groundwater monitoring will be conducted after the completion of the cap. The objective of the routine groundwater monitoring is to monitor the movement of THF and DCDFM plumes. Therefore, only THF and DCDFM analysis will be performed. The monitoring wells located on the western edge of the landfill (28 monitoring wells) will be used for the routine groundwater monitoring. These include monitoring wells 3S, 3D, 3B, 4S, 4D, 5S, 5D, 7S, 7I, 7B, 8S, 8I, 8B, 9S, 9I, 10S, 10I, 10B, 13S, 13I, 13B, 14S, 14I, 14B, 15S, 15I, 15B, and EW-01. MW-9B is not included because it was damaged during previous sampling efforts. The background monitoring wells 12S, 12I and 12D will also be included in routine groundwater monitoring.

## **2.2 LANDFILL GAS MONITORING**

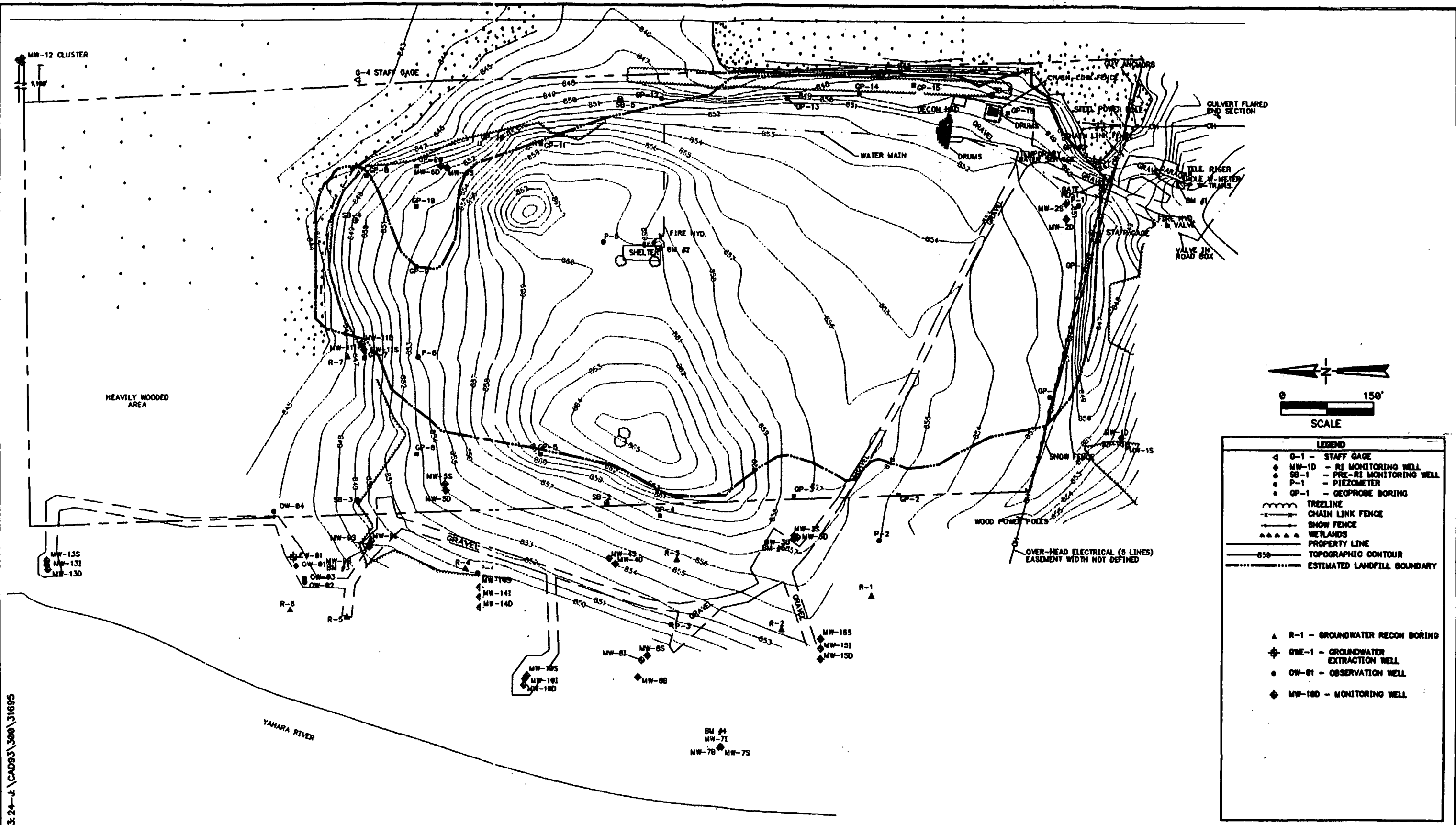
The landfill gas monitoring has the following objectives:

- Monitor the concentration of the landfill gases as a percentage of the lower explosive limit (LEL) for the landfill gases at the site boundary.
- Verify that the air emissions from the passive gas vents do not exceed the regulatory levels found in the applicable provisions of the National Emission Standards for Hazardous Air Pollutants (NESHAP), and Chapter NR 445, Wisconsin Administrative Code (WAC).

During the predesign activities, WESTON used a combustible gas indicator (CGI) to periodically monitor the concentration of the landfill gases as a percentage of the LEL for the landfill gases at the monitoring probes outside the site boundary. The percent LEL readings at these locations during the predesign monitoring were zero. During the RA, a series of landfill gas monitoring probes will be installed outside the waste boundary. These probes will be monitored once every three months to verify that the LEL is below 25 percent.

Landfill gas sampling from the passive gas vents will focus on the NR 445 criterion because NR 445 levels are lower than the NESHAP levels. Design estimates indicate that the amount of gas generated by the landfill is small (approximately 6 cubic feet per minute). Given the age of the landfill (it stopped receiving municipal waste in 1978) and that prior to cap construction infiltration from the rainfall and runoff would have percolated readily through landfill refuse, it is likely much of the decomposition of waste has already occurred and the landfill may be approaching the end of its landfill gas generation capability. Based on the data collected during the predesign activities and engineering estimates, WESTON expects that the gas emissions from the passive gas vents will be below the NR 445 de minimis levels. Therefore, hazardous air containment technology will not be required and long-term monitoring of offgas from the passive gas vents may not be necessary. During the RA, 21 passive gas vents will be installed on the landfill cap. Landfill gas flow will be measured from each of these vents annually. Gas samples will also be collected annually. It is

estimated that five vents will be sufficient to collect representative gas samples from the landfill. The samples will be analyzed for volatile organic compounds (VOCs) included in EPA Method TO-14. The VOCs included in this method encompass VOCs typically found in landfill gases. The National Ambient Air Quality Standard for particulate matter (PM) will not be monitored. PM is not a concern because the landfill gas will not be flared and the physical processes occurring within the landfill will not generate particulate matter. At the end of the sampling event, the data will be used to determine if the landfill gas emissions exceed the NR 445 de minimis levels.



LEGEND	
	G-1 - STAFF GAGE
	MW-10 - RI MONITORING WELL
	SB-1 - PRE-RI MONITORING WELL
	P-1 - PIEZOMETER
	GP-1 - GEOPROBE BORING
	TREELINE
	CHAIN LINK FENCE
	SNOW FENCE
	WETLANDS
	PROPERTY LINE
	TOPOGRAPHIC CONTOUR
	ESTIMATED LANDFILL BOUNDARY
	R-1 - GROUNDWATER RECON BORING
	OME-1 - GROUNDWATER EXTRACTION WELL
	OW-01 - OBSERVATION WELL
	MW-100 - MONITORING WELL

NOTE: MONITORING WELLS 8S, 8I, 14S, 14I, 14D, 15S, 15I AND 15D HAVE NOT BEEN INSTALLED AT THE TIME OF INTERMEDIATE DESIGN SUBMITTAL. THESE WELLS ARE PROPOSED TO BE INSTALLED IN SUMMER 1996.

RESPONSE ACTION CONTRACT  
 U.S. EPA CONTRACT No. 68-W7-0026  
 WORK ASSIGNMENT No. 001-RARA-05T2  
 DOCUMENT CONTROL No. RFW001-2E-AAIT

FIGURE 2-1  
 SITE CONDITIONS  
 STOUGHTON CITY LANDFILL  
 Stoughton, Wisconsin

TAD-05/31/96-13:24-J \CAD93\300\31695

## SECTION 3

### FIELD INVESTIGATION PROTOCOLS

The following sections detail the procedures that will be followed during the RA field sampling activities.

#### 3.1 WATER LEVEL MEASUREMENT

Prior to the sampling of monitoring wells, water level measurements will be collected. The water level data will be used in determining the approximate direction of groundwater flow, and will provide information on lateral and vertical hydraulic gradients. All readings within a single round shall be collected within two hours of each other in order to obtain accurate information on aquifer conditions. The following protocols will be used during water level measurement:

- The water level probe and cable will be decontaminated prior to each use with a distilled water rinse.
- Depth to water will be measured with an electrical sounding device (accuracy  $\pm 0.01$  feet). The reference point for this measurement will be the top of the well riser pipe. Measurements will be converted into elevations (i.e., mean sea level), using established survey information.
- The depth to water and the time will be recorded in a field notebook.

### 3.2 GROUNDWATER MONITORING WELL SAMPLING PROCEDURES

Monitoring wells will be sampled using a bladder pump (or a submersible pump) utilizing a very slow flow rate (0.2 to 2 liters per minute [L/min]). Sampling equipment and all downhole equipment will be decontaminated pursuant to the protocols outlined in Table 3-1. Each sample will be collected using the following methodology:

- Upon removing the protective cap to the monitoring well riser, the head space will be monitored with a Flame Ionization Detector (FID) or a Photoionization Detector (PID). The purpose of this analysis is for health and safety monitoring, not for characterization. The measured values will be recorded in the field notebook.
- The depth to the water level in the well and the total depth of the well will be measured with an electrical sounding device (accuracy  $\pm 0.01$  feet). The depth to water and the time of measurement will be recorded. The reference point for these depths will be the top of the well riser pipe.
- The volume of standing water in the well will be calculated. Volume of water in a 2-inch-diameter well (gallons) = length (feet) x 0.16 (gallons/foot). For a 4-inch diameter well (gallons) = length (feet) x 0.65 (gallons/foot). For a 6-inch diameter well (gallons) = length (feet) x 1.47 (gallons/foot).
- A bladder pump or a submersible pump that has been decontaminated prior to use will be used for sampling utilizing a very slow flow rate (0.2 to 2 L/min). Tubing will be thick and of minimal length to exclude atmospheric gases.
- Well purging will be conducted at low flow rates (1.0 to 4.0 L/min) with the pump intake just above or within the screened interval. Field measurements of pH, temperature, conductivity, dissolved oxygen and turbidity will be made over time. Stabilization of these well purging parameters ( $\pm 0.25$  units for pH,  $\pm 0.5^\circ\text{C}$  for temperature,  $\pm 10$  percent for conductivity,  $\pm 0.1$  mg/L for dissolved oxygen, and  $\pm 1$  units for turbidity) indicate equilibrated conditions. Well purging will continue until the turbidity has decreased to 5 nephelometric turbidity units (NTU) or less, or until five purge volumes have been removed.

**Table 3-1**

**Standard Decontamination Protocol for Sampling Equipment  
Stoughton City Landfill  
Stoughton, Wisconsin**

Step	Procedure
1	Scrub equipment thoroughly with soft-bristle brushes in a phosphate-free, low-sudsing detergent solution.
2	Rinse equipment with tap water by submerging and/or spraying. (See note below.)
3	Rinse equipment with reagent-grade distilled/deionized water until dripping and allow to air dry for 1 to 2 minutes.
4	Rinse equipment a second time with deionized water by spraying until dripping.
5	Place equipment on polypropylene or aluminum foil and allow to air-dry for 5 to 10 minutes.
6	Wrap equipment in polypropylene or aluminum foil for handling and/or storage until next use.

Note: The decontamination liquids will be managed as described in Section 9. If sampling equipment was used to collect oily or adhesive types of contaminated media, or the presence of organic compound residue is suspected, a rinse via spraying with isopropanol will be included after Step 2.

- In the event that the monitoring well pumps dry before three volumes have been removed, the well will be allowed to recharge for 15 minutes and then be pumped dry again before sampling. All purge water will be containerized and managed in accordance with Section 9 protocols.
- Samples will be collected directly from the pump after the well purging has been completed. The groundwater samples will be collected in decreasing order of sensitivity of volatilizing organic contaminants: TCFM, DCDFM, THF followed by VOCs and total metals.
- Sample bottles will be filled at an angle in order to limit splashing and bubbling. VOA sample bottles will be preserved with hydrochloric acid (HCl) prior to the addition of the sample. The VOA sample bottles will be filled such that no air space is present in the bottle after it is capped. If bubbles appear after the bottle is capped, additional sample (water) will be added and the bottle resealed. If the sample has to be discarded and a new sample collected, a new, preserved VOA container will be used to collect the sample. If bubbles persist, an unpreserved VOA sample will be collected. (The Field Sample Manager will note the absence of the preservative on the sample paperwork and in the field logbook.)
- For collecting filtered and unfiltered metal samples, two samples will be collected at each monitoring well sample locations. One sample will be field filtered via a sterilized disposable 0.45 micron filter. Both the filtered and unfiltered sample will be submitted for analysis. Sample preservation will occur following field filtration within 30 minutes of sample collection unless the filtration process is lengthy due to the presence of suspended solids.

### 3.3 LANDFILL GAS FLOW RATE MEASUREMENTS

During the landfill gas sampling event, a landfill gas analyzer meter will be used to evaluate which of the 21 passive gas vents have landfill gas. Flow rates will be measured at the active gas vents. Caution should be used near the vents because of potential explosion and breathing hazards. The landfill gas flow rates will be measured using the following procedure:



- Record weather conditions in the field logbook including temperature, rainfall, barometric pressure, cloud cover/sunshine, wind speed and direction.
- Remove the threaded fittings from the passive gas vents and place the inlet to the anemometer in the threaded hole. Record the flow rate in the field logbook.

### 3.4 LANDFILL GAS SAMPLING PROCEDURES

During the landfill gas sampling event, gas samples will be collected from 5 passive gas vents. The presence of landfill gas in these vents should have been verified by a landfill gas analyzer meter during gas flow rate measurements. Caution should be used near the vents because of potential explosion and breathing hazards. The gas sampling will be performed using SUMMA passivated 6-liter stainless steel canisters utilizing a teflon line and a flow control system. The laboratory should transport each canister certified as clean and evacuated to an absolute pressure of 0.05 millimeters of mercury (mm Hg). The interior surfaces of the canister must be treated with a pure chrome-nickel oxide layer. This provides for greater stability for VOCs stored in the canisters. The sample flow controller is used to maintain a constant flow rate from full vacuum to 25 psig. The laboratory should preset the flow controllers to 200 mL/min to equal collection of a 6-liter sample in about 30 minutes. The gas samples will be collected using the following procedures:

- At least three days prior to sample collection, place an airtight stainless steel monitoring well cap on each passive gas vent to allow landfill gas to equilibrate in the vent. Seal the cap threads with teflon tape.
- Purge the vent immediately before sample collection. Connect a vacuum pump to the vent using teflon tubing. Each seal cap has a 1/4-inch Swagelok fitting that is used to connect to the vent. Use a combustible gas indicator/oxygen (CGI/O<sub>2</sub>) meter to monitor the percent lower explosive limit (LEL) and the percent oxygen (O<sub>2</sub>) in the landfill gas being purged from the vent. Collect percent LEL and percent O<sub>2</sub> measurements continuously every 1 to 2 minutes to determine whether a

representative sample of landfill gas is being obtained (i.e., stability is reached). The landfill gas being purged from the vent is determined to be stable after two consecutive readings within 10 percent of each other. Begin sample collection after stability is reached.

- Attach the flow controller to the canister. Connect the canister and the flow controller to the vent using teflon tubing and fitting. The 1/4-inch Swagelok fitting in the seal cap is used to connect the vent to the canister and flow controller. The connecting line between the sample outlet and the vent should be as short as possible to minimize the contained sample volume.
- Open canister valve and record start time and canister pressure. Periodically check and record canister pressure and sampler operation during the 30 minute sampling event.
- When the canister is near ambient pressure, record canister pressure and elapsed time; then close the canister inlet valve.
- Disconnect canister from the flow controller, and cap the canister with the Swagelok end cap.

### **3.5 DECONTAMINATION REQUIREMENTS**

All sampling equipment will be decontaminated before being used to collect a sample. The decontamination protocol for sampling equipment is presented in Table 3-1. The management of water generated during decontamination will be in accordance with the requirements outlined in Section 9. All decontamination wastewater will be containerized.

## SECTION 4 FIELD QUALITY CONTROL SAMPLES

The RA sampling effort will include the following types of field quality control (QC) samples:

- Field duplicates.
- Matrix spikes/matrix spike duplicates.
- Field blanks.
- Trip blanks.

Section 4 of the QAPP explains the purpose of each type of QC sample. Sample containers and handling and shipment procedures used for QC samples are identical to those used for the investigative samples. Each field QC sample will be documented on a chain-of-custody (COC) form.

Table 2-1 shows the specific level of QC effort for field activities, respectively. The following subsections detail the collection procedures for each QC sample type.

### 4.1 FIELD DUPLICATE SAMPLES

Field duplicate samples will be collected at selected locations during water sampling at a 1 per 10 sample frequency using procedures identical to those for the investigative samples. Duplicate samples will be analyzed for the same parameters as the investigative samples. Duplicate samples will be collected by alternatively filling two sets of sample bottles from the same sample unit (e.g., pump, split spoon, scoop, etc.). The volatile organic analysis (VOA) fraction for each duplicate sample will be collected immediately after the VOA fraction for the investigative sample, in order to minimize the possibility of loss of VOCs during sample collection.

#### **4.2 MATRIX SPIKE/MATRIX SPIKE DUPLICATE SAMPLES**

Matrix spike/matrix spike duplicate samples (MS/MSDs), will be collected on a one per 20 sample (or less) basis for air and water. MS/MSD samples are investigative samples on which MS/MSD analyses are performed. MS/MSD analyses only apply to organic samples. For inorganic samples spike/duplicate analyses are performed. Extra sample volume is required for aqueous MS/MSD and spike/duplicate analyses. For aqueous MS/MSD analyses, triple the normal volume is required for volatile organics. Double volume is required for spike/duplicate analyses for the inorganic aliquot (total metals). Field blank, trip blanks and field duplicate samples will not be utilized as MS/MSD and spike/duplicate samples. All MS/MSD and spike/duplicate samples will be identified as such on all sample paperwork.

#### **4.3 FIELD BLANKS**

Field blank samples will be collected during water sampling events. One field blank will be collected for every 10 or fewer investigative aqueous samples collected during the field sampling activities. For water samples, field blanks will be obtained by pouring ultra pure water (HPLC-grade water) over and through a decontaminated or disposable sampling device such as a bailer, and collecting the water in the required sample containers. Each field blank will be analyzed for the same parameters as the investigative samples in accordance with the same analytical methodologies. When collecting a field blank, the volatile SAS parameters THF, DCDFM, and TCFM will be collected first, followed by RAS VOCs and total metals. All field blanks will be identified as such on all sample documentation.

#### **4.4 TRIP BLANKS**

One trip blank sample will be enclosed in each sample shipment container in which aqueous

VOA samples are included. Trip blanks will consist of two 40-milliliter (ml) glass vials. All sample handling, packaging and preservation requirements for the trip blanks will be identical to the investigative VOA sample aliquot. The 40-ml vials for each trip blank will be filled under laboratory-type conditions as soon as is practicable (give the sample holding time) prior to the beginning of a field sampling event. Preparation of the trip blank will entail the pouring of ultra pure water (HPLC-grade water) into the 40-ml vial (leaving no airspace) and carefully securing the caps to ensure the absence of air bubbles. The sealed bottles will be subsequently placed in a sample container and accompany field personnel to the sample site. All trip blanks will be shipped to the laboratories in containers with other VOA samples. The trip blank will be documented and identified as such on all sample documentation.

## SECTION 5 SAMPLE NUMBERING SYSTEM

All samples for analysis, including QC samples, will be given a unique sample number. A listing of sample numbers cross-referenced to COC and shipment documents, will be maintained in the site field logbook.

WESTON will assign each sample two identification numbers: a project sample number and a Contract Laboratory Program (CLP) sample number or SAS number. The project sample number highlights the sample matrix and location, and will be used for documentation purposes in field logbooks, as well as for presentation of the analytical data in WESTON memoranda and reports. The CLP sample number is utilized by the U.S. EPA to track samples through the CLP system. The SAS number is also used by U.S. EPA and WESTON for tracking samples.

### 5.1 PROJECT SAMPLE NUMBERING SYSTEM

The project sample numbers will be comprised of the three components described below:

- Project identifier. A three-character designation will be used to identify where (the site) and when (RA sampling round) the sample is collected. For the baseline groundwater monitoring round and the first round of routine sampling, it will be SL1. SL stands for Stoughton City Landfill, and the number (1,2,3...) will change depending on the sampling round.
- Sample type and location. This shall consist of the following components:
  - A sample type code. For the proposed field sampling, it will be MW for monitoring well groundwater, GV for landfill gas vent, and TB for trip blank samples.

- The code above will be combined with a two-digit location code (e.g., MW02 for sample from monitoring well MW02 location). In the case of field blanks and trip blanks, it will be a two-digit sequential sampling order code (e.g., FB01 for first field blank).
- Sequence and Quality Control Type Identifier. This shall consist of the following components:
  - A two-digit sequence number that tracks the number of samples collected from a specific location. Sequence 01 refers to the first sample interval, and sequence 02 refers to the second sample interval. Sample depths will not be a part of the sample code; rather, depth information will be recorded in the site field logbook and presented with the analytical results. There is no need for this sequence number for field and trip blanks.
  - If the sample is a field duplicate sample, the above will be combined with DP. If the sample is a matrix spike/matrix spike duplicate sample, the above will be combined with MS/MSD.
  - If the sample is an unfiltered metal sample, the above will be combined with UF. If the sample is a filtered metal sample, the above will be combined with F. UF and F relates to metals samples only.

It should be noted that field duplicate samples will be submitted without reference to the laboratory (i.e., the laboratory will not be informed that the sample is duplicate).

Some examples of the project sampling number system and their respective definitions are as follows:

- SL1-MW10I-01DP: Stoughton City Landfill site, RA Round 1 sampling; monitoring well sample, monitoring well location 10I; field duplicate of first sample at this location.
- SL2-MWFB02: Stoughton City Landfill site, RA Round 2 sampling; second monitoring well field blank sample.

- SL2-MW01-F: Stoughton City Landfill site, RA Round 2 sampling; monitoring well location 01; filtered metal sample.
- SL1-GV02-01MSD: Stoughton City Landfill site, RA Round 1 sampling; landfill gas vent sample, location 2; first sample at this location; matrix spike/matrix spike duplicate sample.

## 5.2 THE CONTRACT LABORATORY PROGRAM SAMPLE NUMBERING SYSTEM

The CLP sample numbers are unique numbers generated by the CLP that are assigned to each RAS organic and inorganic sample. The CLP sample numbers are printed at the Sample Management Office (SMO) on adhesive labels and distributed to the U.S. EPA Region V Regional Sample Control Center (RSCC). The RSCC will provide label sets to the WESTON Sample Management Coordinator (SMC), who will give the organic and inorganic labels to the Field Sample Manager (FSM) prior to the commencement of field work. The FSM will assign the unique CLP sample numbers to each organic and inorganic sample.

The CLP sample numbers enable the SMO to track RAS samples through their system. The labels are placed on the outside of the sample containers, and the number is utilized on all documentation (traffic report [TR], COC form, sample tag, etc.). The CLP sample numbers will be correlated to the WESTON project sample number thereby identifying where the sample was collected. Organic aliquots of RAS samples will have a CLP sample number that begins with the fifth letter of the alphabet (E for Region V) followed by other letters and numbers (e.g., EG 006, EJK 17, etc.). The corresponding inorganic aliquot of the RAS samples will have a CLP sample number that begins with the consonant "M" for metals followed by the fifth letter of the alphabet (E for Region V), followed by additional letters and/or numbers (e.g., MEE 001, MEG 27, etc.).



For SAS samples, follow the CRL sample numbering system.

### 5.3 CRL SAMPLE NUMBERING SYSTEM

If the U.S. EPA Region V CRL chooses to analyze the samples, each sample aliquot submitted to the CRL will be assigned a CRL sample number in lieu of the CLP sample number. The CRL sample number contains the following elements:

- 98—Indicates fiscal year (October 1 through September 30).
- Two characters indicating the Contractor code (e.g, ZG is the contractor code for WESTON; ).
- 01—Indicates number of sites the Contractor has sampled during the fiscal year. Each site is assigned a number in consecutive order (01, 02 - 99).
- S—Indicates sample type (S=sample, D=duplicate, R=blank).
- 01—Indicates sample number (01, 02 - 99).

An example CRL sample number is as follows: 98ZG01S02—Sample number two of the first site collected by WESTON in fiscal year 1998.

## SECTION 6 SAMPLE DOCUMENTATION AND TRACKING

### 6.1 FIELD RECORDS

Field observations and other information pertinent to the collection of samples will be recorded in the field. All entries will be made in a bound logbook. All field documentation will be in accordance with procedures outlined in Subsection 6.1.2 of the QAPP. Logbooks will be identified by unique sequential numbers. The data to be recorded for each sample will include date, time (military time reference), sample number, sample location, sample appearance, and name of the person(s) collecting the sample. In addition, general information will be recorded in the logbook daily, including personnel present at the site, level of protection being worn, and weather. Direct instrument readings obtained from health and safety monitoring of the breathing zone during sampling activities will also be recorded in the logbook. Photographs will also be taken and logged to document sampling activities.

### 6.2 FIELD CHAIN-OF-CUSTODY PROCEDURES

Field COC procedures are presented in Subsection 6.1 of the QAPP, with a detailed summary in Subsection 6.1.4. Details on the completion of field sample COC documentation are discussed in Subsection 6.3 of the FSP.

### 6.3 SAMPLE DOCUMENTATION FORMS

Sample documentation forms required by the U.S. EPA are numbered. Copies of the multiple copy forms must accompany samples to the laboratory. Upon return from the field, the FSM

must give the other copies to the SMC, who will forward them to the RSCC and/or SMO, ensuring that the appropriate paperwork is attached.

Required paperwork for laboratory samples includes COC forms, TR forms, SAS packing lists, sample tags, and COC seals. All sample documentation forms will be completed by WESTON personnel (mainly the assigned FSM) in accordance with the requirements outlined in the *U.S. EPA Region V Sample Handling Manual* (March 1989) or the most recent revision/update. The U.S. EPA is currently utilizing a combined COC/TR form for RAS analyses, and a stand-alone COC form for shipping samples to the U.S. EPA Region V CRL. An SAS packing list COC is used for SAS analyses. The U.S. EPA Region V RSCC is responsible for providing WESTON with updates on changes in the sample documentation forms/requirements. The WESTON SMC will train all field personnel on any new documentation requirements prior to their commencing field sampling activities.

The critical aspects of the documentation protocol for shipping samples to the laboratories are summarized below:

#### **Chain-of-Custody/Traffic Report Form**

Combination COC/TR forms are utilized for samples sent to the laboratories for RAS analyses. A stand-alone COC form is used for CRL and an SAS packing list COC for SAS analyses. In order to maintain sample custody in accordance with the U.S. EPA requirements, the following aspects of sample documentation protocol must be implemented and adhered to:


- Each sample shipment container must have at least one COC/TR form or stand-alone COC form, or SAS packing list COC enclosed.

- Each sample in a shipment container must be identified/documentated on the accompanying form.
- All information associated with the samples must be included on the form.
- If sample custody is transferred from field samplers to the FSM, the field sampler must sign the COC record as the relinquisher of the samples and include the date and time of the transfer. The FSM must then sign as the recipient of the samples.
- The COC seal numbers on seals assigned to a particular cooler must be documented on the COC form(s) in that cooler in the section provided.
- The carrier service person does not have to sign the COC form if the custody seals remain intact. The airbill number must be written on the COC form in the section provided.
- Field personnel must carefully transcribe RAS CLP sample numbers from the printed sample labels onto the COC/TR form in the space provided. The CRL sample numbers must be transcribed onto the stand-alone COC form and SAS numbers onto the SAS packing list COC form. The labels should be affixed to the appropriate sample containers.

Figures 6-1 and 6-2 present examples of organic and inorganic COC/TR forms. Appendix D contains the U.S. EPA document that outlines the requirements for completing the multi-sample COC/TR forms and an example of completed forms. Figure 6-3 presents an example of a stand-alone COC form. This form will continue to be used when shipping samples to the U.S. EPA Region V CRL. Figure 6-4 presents an example of a SAS packing list COC. Figure 6-5 presents an example of a sample tag.

### Chain-of-Custody Seals

- Two seals per shipping container are used to secure the lid and provide evidence that samples have not been tampered with.

 <b>EPA</b>		United States Environmental Protection Agency Contract Laboratory Program		<b>Organic Traffic Report &amp; Chain of Custody Record</b> (For Organic CLP Analysis)			SAS No. (if applicable)	Case No.				
1. Project Code	Account Code	2. Region No.	Sampling Co.	4. Date Shipped	Carrier	6. Matrix (Enter in Column A)  1. Surface Water 2. Ground Water 3. Leachate 4. Field QC 5. Soil/Sediment 6. Oil (High only) 7. Waste (High only) 8. Other (Specify in Column A)	7. Preservative (Enter in Column D)  1. HCl 2. HNO3 3. NaHSO4 4. H2SO4 5. Ice only 6. Other (Specify in Column D) N. Not preserved					
Regional Information		Sampler (Name)		Airbill Number								
Non-Superfund Program		Sampler Signature		5. Ship To								
Site Name		3. Purpose*		ATTN:								
City, State	Site Spill ID	<input type="checkbox"/> SF <input type="checkbox"/> PRP <input type="checkbox"/> ST <input type="checkbox"/> FED		<input type="checkbox"/> CLEM <input type="checkbox"/> PA <input type="checkbox"/> REM <input type="checkbox"/> RI <input type="checkbox"/> SI <input type="checkbox"/> ESI		<input type="checkbox"/> FS <input type="checkbox"/> RD <input type="checkbox"/> RA <input type="checkbox"/> O&M <input type="checkbox"/> NPLD						
CLP Sample Numbers (from labels)	A Matrix (from Box 6)	B Conc.: Low Med High	C Sample Type: Comp./ Grab	D Preservative (from Box 7)	E RAS Analysis		F Regional Specific Tracking Number or Tag Numbers	G Station Location Identifier	H Mo/Day/Year/Time Sample Collection	I Corresponding CLP Inorganic Sample No.	J Sampler Initials	K Field QC Qualifier <small>B = Blank S = Spike D = Duplicate R = Rinse PE = Perform. Eval. - = Not a QC Sample</small>
	Other:			Other:	VOA	BNA						
Shipment for Case Complete? (Y/N)		Page	Sample(s) to be Used for Laboratory QC				Additional Sampler Signatures		Chain of Custody Seal Number(s)			

**CHAIN OF CUSTODY RECORD**

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	Is custody seal intact? Y/N/none

DISTRIBUTION: Blue - Region Copy      Pink - SMO Copy      EPA Form 9110-2      SEE REVERSE FOR ADDITIONAL STANDARD INSTRUCTIONS  
 White - Lab Copy for Return to Region      Yellow - Lab Copy for Return to SMO      \*SEE REVERSE FOR PURPOSE CODE DEFINITIONS

**361213**

Figure 6-1  
Organic Chain of Custody Form

A21-012-3 REV. 3/83









Case # or Project Code	Sample Number	Month/Day/Year	Time	DESIGNATE	
				Comp.	Grab
Station Number and Location		Samplers (signatures)			
PRESERVATIVE: H <sub>2</sub> SO <sub>4</sub> <input type="checkbox"/> ICE <input type="checkbox"/> HCL <input type="checkbox"/> HNO <sub>3</sub> <input type="checkbox"/> NaOH <input type="checkbox"/> Other <input type="checkbox"/>					
<b>ANALYSES</b>					
VOA		METALS			
ABN		CYANIDE			
PEST/PCB					
		Mercury			
Pesticides		Fluoride			
Herbicides		Nitrate/Nitrite			
PCB		TOC			
PCDD/PCDF		BOD			
2,3,7,8-TCDD		COD			
Ames Mutagen		TDS			
Asbestos		TSS			
Phosphorus		O&G			
Phenols		Sulfate			
PAH		Chloride			
TCLP		Sulfide			
TOX		Ammonia			
CBOD		Alkalinity			
Bio-Acute		Acidity			
Bio-Chronic		TKN			
Matrix:					
Remarks:					
USE FOR MS:MSD <input type="checkbox"/>					
Tag Number			Lab Sample Number		
5- 147989					

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY



REGION 5  
77 WEST JACKSON  
Chicago, Illinois 60604



Figure 6-5  
Sample Tag

- The COC seals must be covered with clear tape to avoid accidental damage during shipment.
  - The COC seal numbers must be documented on the COC/TR, stand-alone COC forms or SAS packing list COC as herein described.
  - All sample shipment containers require COC seals.

### Sample Tags

- Each sample container must have a Sample Tag affixed to it with string or tape.
- Stand-alone COC or COC/TR form numbers are recorded in the "Remarks" section of the tag.
- Sample Tag numbers are recorded on the stand-alone COC form, the COC/TR form, or the SAS packing list form.

All paperwork accompanying the samples being shipped to the CLP laboratory will be sealed in a plastic bag that is taped to the inside of the cooler lid. Copies will be made of all sample documentation and retained for in-house files.

All sample handling procedures and paperwork will be performed and completed according to guidance set forth in the *U.S. EPA, Region V CRL Sample Handling Manual*, (U.S. EPA, 1989) (or the most recent version) and the *U.S. EPA User's Guide to the Contract Laboratory Program*, December (U.S. EPA, 1988).

## SECTION 7 SAMPLE HANDLING

### 7.1 SAMPLE CONTAINERS AND SAMPLE PRESERVATION

All samples collected for analysis will be containerized, preserved, packaged and shipped in accordance with *U.S. EPA Region V CRL Sample Handling Manual*, (U.S. EPA, 1989), *U.S. EPA User's Guide to the Contract Laboratory Program* (U.S. EPA, 1988), *The U.S. Department of Transportation (DOT) Regulations*, and *Dangerous Goods Regulations* (International Air Transport Association [IATA], 1997). The RAS organic Statement of Work (SOW) covers samples with organic compound concentrations up to 20 parts per million (ppm), which are considered low level, and samples with organic compound concentrations between 20 ppm and 15 percent, which are considered medium level. The RAS inorganic SOW considers samples low level if they contain less than 10 ppm of any of the priority pollutants and medium level if the priority pollutant concentration levels are between 10 ppm and 15 percent. Based on these definitions and on existing site conditions, all groundwater and air samples from the SCL site are expected to be low level. Table 7-1 lists the required sample containers, sample volumes, sample preservation requirements, and holding times associated with all parameters and media applicable to the RA monitoring sampling.

### 7.2 SAMPLE PACKAGING AND SHIPMENT

All samples shipped from the site must be shipped in accordance with DOT regulations and must comply with *Dangerous Goods Regulations* (IATA, 1997) if shipped by air transportation. Following sampling, the exterior of all sample bottles will be initially decontaminated near the sampling location by wiping with a moist cloth. The filled sample containers will not be sprayed

**Table 7-1**  
**Sample Container, Volume, and Preservation Requirements**  
**Stoughton City Landfill**  
**Stoughton, Wisconsin**

Matrix Type	Analysis	Sample Concentration Level	No. of Bottles	Type of Bottles	Preservatives	Technical Holding Time***
Water (RAS)	Volatiles	Low	2	40-ml glass vials	Cool, 4 degrees C 4 drops 1:1 HCL to pH < 2	14 days
	Metals (1 unfiltered, 1 filtered)	Low	1	1-L Polyethylene bottle	HNO3 to a pH < 2	6 months (28 days for mercury)
Water (SAS)	Tetrahydrofuran (THF), Dichlorodifluoromethane (DCDFM), and Trichlorofluoromethane (TCFM)	Low	2	40-mL glass vials	Cool, 4 degrees C 1:1 HCL to pH < 2	14 days
Air	EPA Method TO-14 list for VOCs	Low	1	SUMMA Cannister	—	—

\*\*\* All holding times are from the date of sample collection.

Note: - Aqueous MS/MSD sample analysis will require triple the normal volume for volatile organics. Spike/duplicate sample analysis will require double the normal volume.  
 - Trip blanks will be collected in two 40-ml glass vials. One VOA trip blank will accompany each aqueous VOA shipment container.

with water during decontamination because this water could contact the sample if the container was not tightly sealed. In preparation for shipment to the CLP laboratory, all samples will be packaged in accordance with the following general procedures:

- Check to make sure container cap is securely tightened.
- Make sure the CLP sample labels and sample tags are securely attached to the sample containers. Place each container in a zip-lock baggie.
- Samples will be placed in a shipment container lined with a large polyethylene bag. Enough vermiculite or equivalent absorbent material will be packed around the samples to minimize the possibility of sample container breakage. The temperature will be maintained at 4° C with cold packs or ice, sealed in plastic bags as appropriate to the sample. The remaining space in the container will be filled with additional packing material and the large bag sealed. If a sample meets guidelines for a dangerous good, it will be packaged in accordance with the IATA *Dangerous Goods Regulations*, based on the classification of the samples.
- Place COC/TR forms, TR forms, and, if appropriate, SAS packing lists, in a zip-lock bag and tape to inside of shipment container lid.
- Close shipment container and seal it shut with strapping tape. If shipment container has a drain port, seal it shut with tape. Place custody seals across seam between the container lid and base so that custody seal would be broken if shipment container was opened. Cover custody seals with clear tape.
- Affix airbill with shipper's and recipient's names and addresses to the top of the shipment container. Affix a second mailing label with the same information to the top of the container in case the airbill becomes detached from the container during shipment. Place "This End Up" labels and other appropriate labels on front and sides of container.
- Organic samples will be shipped on the day of collection or within 24 hours of collection, and inorganic samples will be shipped within 48 hours of collection. All samples will be shipped via Federal Express overnight delivery unless prohibited under IATA regulations.

The WESTON Field Team Leader (FTL) or FSM must contact the WESTON SMC to confirm sample shipment dates for both RAS and SAS analyses. The SMC is required to inform the RSCC of the schedule for RAS analyses at least one week in advance. The FTL will notify the SMO of any last-minute changes in sampling schedule that will affect the sample shipment schedule. Upon shipment of samples to the CLP, the FSM will call the SMO (before 5:00 p.m. Central Standard Time [CST] on the day of the shipment or by 9:00 a.m. the following morning). The SMO must be notified by 2:00 p.m. CST Friday for shipments to the CLP for Saturday delivery/pick-up. The SMO must be provided with the following information for RAS and CRL analysis:

- Name of site.
- Case and/or CRL number.
- Name of laboratory(ies).
- Date of shipment.
- Carrier and airbill number.
- Number and matrices of samples shipped.
- Information regarding changes or delays pertaining to the activity.
- Whether all shipments pertaining to the sample case are complete.

In instances where the FTL does not have easy access to a telephone, the FTL will provide the above-mentioned information to the SMC. The SMC will convey all site sample shipment information to the SMO.

## SECTION 8 SAMPLING TEAM ORGANIZATION

The sampling team organization is presented in Subsection 3.3 of the QAPP.

## SECTION 9 MANAGEMENT OF INVESTIGATION-DERIVED WASTES

For purposes of this FSP, investigation-derived wastes (IDWs) are defined as any by-products of the SCL site field investigative activities that are suspected or known to be contaminated with hazardous substances. The performance of RA field activities will produce waste products such as development and purge groundwater, decontamination wastewater, and expendable personnel protective equipment. Wastewater will be pumped from the decontamination pad, collected, and containerized. Wastewater and purge water from the developing and sampling of groundwater monitoring wells will be stored in DOT-approved drums. Depending on the volume of waste generated during the field activities and the duration of storage time, the water in the drums may be pumped into a portable on-site storage tank. Storing the water in a tank would reduce the number of drums needed. Each type of waste will be segregated during the field activity and containerized separately. All storage containers will be labeled appropriately. Wastes will be stored on-site in a secured, accessible staging area until the analytical results of the monitoring are interpreted. At that time, each segregated waste will be evaluated based on the field data, and disposal arrangements will be executed in accordance with appropriate local, state, or federal regulations. WESTON will refer to the U.S. EPA's *Management of Investigation-Derived Wastes During Site Inspections* (U.S. EPA, 1991) for guidance on off-site disposal policy, if this action is deemed necessary.



## SECTION 10 SAMPLE CONTAINER PROCUREMENT

All sample containers to be used during the sampling program will be purchased by WESTON from a reputable supplier capable of providing the bottle quantity and type that meets or exceeds the strict quality control requirements set forth by the U.S. EPA in OSWER Directive No. 9240.0-05A.

The contaminant-free sample containers (bottles) used for analyzing CLP TCL and TAL analytes for this sampling effort will be prepared according to the procedures specified in the U.S. EPA's *Specifications and Guidance for Obtaining Contaminant-Free Sample Containers*, (U.S. EPA, 1993) or the most current revision. It will be ensured that the bottles used for the sampling activity do not contain target organic and inorganic contaminants exceeding the level specified in the above-mentioned document. For non-CLP TCL and TAL types of analytes, bottles shall either be cleaned in the same way as for the similar types of analytes or it will be negotiated with the bottle supplier(s) to clean and test the bottles for the analytes of interest to exceed approximately one-third of the required quantitation limits. Specifications for the bottles will be verified by checking the supplier's certified statement and analytical results for each bottle lot, and will be documented on a continuing basis. The FTL or his/her designee will record the bottle lot numbers associated with each sample collected during the sampling effort. This data will be maintained in the project evidence file and will be available, if requested, for U.S. EPA review.

SUMMA Canisters will be used for air sampling. These canisters must be obtained by the laboratory performing the analysis. The laboratory should ship each canister certified as clean and evacuated to an absolute pressure of 0.05 mm Hg. The interior surfaces of the canisters

must be treated by the SUMMA passivation process.

In addition, the data for field blanks and trip blanks will be monitored for contamination, and corrective actions will be taken as soon as a problem is identified. This will be accomplished either by discontinuing the use of a specific bottle lot, contacting the bottle supplier(s) for retesting the representative bottle from a suspect log, resampling the suspected samples, validating the data (taking into account that the contaminants could be introduced by the laboratory [i.e., common laboratory solvents, sample handling artifacts, etc.] or could be bottle QC problem) so as to make an educated determination if the bottles, and hence the data, are still usable.

For the SCL site project, the corrective actions will be conducted in a comprehensive manner in order to avoid the use of identified contaminated lot(s) from other projects, and to ensure that if the bottle supplier(s) is deemed unresponsive or unable to provide cleaned bottles as specified, then other U.S. EPA-related projects are not negatively impacted by the use of the noncompliant bottles.

If resampling is deemed necessary, WESTON will require authorization for additional effort. Any schedule delays will be brought to the attention of the U.S. EPA RPM.

## SECTION 11 REFERENCES

International Air Transport Association; January, 1997; *Dangerous Goods Regulations*, IATA Resolution 618, Attachment "A."

U.S. EPA; December 1987; *A Compendium of Superfund Operations Methods*, EPA/540/P-87/001.

U.S. EPA; March 1989; *Region V CRL Sample Handling Manual*.

U.S. EPA; December 1988; *User's Guide to the Contract Laboratory Program*; EPA/617-003/84306.

U.S. EPA; 1991; *Management of Investigation - Derived Wastes During Site Inspection*.

U.S. EPA; 1993; *Specifications and Guidance for Obtaining Contaminant-Free Sample Containers*.

**APPENDIX B**

**SPECIAL ANALYTICAL SERVICES (SAS) REQUESTS**

U.S. Environmental Protection Agency  
77 West Jackson Street, Chicago, Illinois 60604  
PHONE: (312) 886-1488 or FAX (312) 886-0753

SAS Number

98ZG04

SPECIAL ANALYTICAL SERVICES  
Client Request

Regional Transmittal

- A. EPA Region/Client: Region V
- B. RSCC Representative: Cecilia Moore
- C. Telephone Number: (312) 886-1488
- D. Date of Sampling: April/May 1998 & April 1999
- E. Site Name: Stoughton City Landfill, Stoughton, Wisconsin
- F. Site/Spill ID# T2

Please provide below a description of your request for Special Analytical Services under the Contract Laboratory Program. In order to most efficiently obtain laboratory capability for your request, please address the following considerations, if applicable. Incomplete or erroneous information may result in delays in the processing of your request. Please continue response on additional sheets, or attach supplementary information as needed.

1. General description of analytical service requested:  
Analysis of low-level nonstandard volatile organics (specifically, Tetrahydrofuran (THF), Dichlorodifluoromethane (CCL2F2), and Trichlorofluoromethane (CCI3F) by EPA 524.2. For routine groundwater monitoring, only THF and DCDFM analysis is requested.
2. Definition and number of work units involved (specify whether whole samples or fractions; whether aqueous or soil and sediments; and whether low, medium, or high concentration):  
Forty-eight groundwater samples for analysis of THF, DCDFM, and TCFM during baseline monitoring. Thirty-four groundwater samples for analysis of THF and DCDFM during routine groundwater monitoring. These totals do not include trip blank samples and MS/MSD samples.
3. Purposes of analysis (specify whether Superfund [Remedial or Enforcement], RCRA, NPDES, etc.):  
Superfund -Remedial Action
4. Estimated date(s) of collection:  
The baseline groundwater monitoring samples will be collected prior to the placement of the cap. Routine groundwater monitoring sampling will begin after placement of the cap. (April 1998 & April 1999)
5. Estimated date(s) and method of shipment: Shipped by overnight courier (FEDEX).
6. Number of days analysis and data required after laboratory receipt of samples:  
Laboratory should report results within 30 days of receipt of last sample.
7. Analytical protocol required (attach copy if other than a protocol currently used in this program):  
Low-level analysis of groundwater samples in accordance with EPA Method 524.2.

Note: Laboratory data rejection and non-payment will be recommended if methods other than those specified in this document are used.

8. Special technical instruction (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.):

The three compounds (i.e., THF CAS# 109-99-9, CCL2F2 CAS# 74-71-8 & CCL3F CAS# 74-69-4) detection limits required are 10 µg/L.

Note: The case narrative must discuss any sample problems.

9. Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain of Custody documentation, etc.). If not completed, format of results will be left to program discretion.

All procedures used must be clearly identified. All original raw data, forms, calculation worksheets, instrument read-outs, preparation forms, internal sample and/or extract chain of custody forms, strip charts, and copies of pages from preparation and analysis logbooks shall be submitted. If originals were submitted in another data package, photocopies may be submitted with a record of the location of the originals.

All records of analysis and calculations shall be legible, complete, and sufficient to recalculate all sample concentrations and QA audit results. QC reference samples or initial calibration standards shall be identified as to source, lot number, and sample number.

Results will be reported as µg/L.

10. Other (use additional sheets or attach supplementary information, as needed):

All original sample tags, chain of custody forms, SAS packing lists, airbills, and original data shall be submitted to the Region within the time frame listed in section 6 above. Copies of the results should be submitted to WESTON.

Payment of laboratories for this SAS analysis may be reduced if all procedures noted above are not followed and all required deliverables noted above are not submitted. The Region or its contractors shall not be charged further for the provision of required deliverables within this agreement.

Data should be shipped to:

Mr. Chuck Elly  
U.S. EPA Central Regional Laboratory  
536 South Clark Street 10th Floor  
Chicago, Illinois 60605

A copy of this SAS request must accompany the data.

11. Name of sampling/shipping contact: Tonya Balla  
Phone: (847) 918-4000

I. **DATA REQUIREMENTS**

See instruction number 8 above. For additional analytical requirement see EPA Method 524.2.

II. **QC REQUIREMENTS - Do not use designated field blanks for QA audits.**

See EPA Method and 524.2.

III. **ACTION REQUIRED IF LIMITS ARE EXCEEDED:**

Contact Region V..

Please return this request to the Region as soon as possible to expedite processing of your request for special analytical services. Should you have any questions or need any assistance, please call the Region.

Note: Laboratory data rejection and non-payment will be recommended if methods other than those specified in this document are used. The Trap must have coconut charcoal.

**APPENDIX C**

**STANDARD OPERATING PROCEDURES (SOPs)  
FOR FIELD INSTRUMENTS**



FIELD MEASUREMENT OF PH, TEMPERATURE AND  
SPECIFIC CONDUCTIVITY IN WATER

1. Scope and Application

This method is applicable to samples of stormwater, surface water, potable water supplies, and groundwater with measurement occurring at the sampling point.

2. Apparatus

The Corning M90 is a portable, microprocessor based pH, specific conductivity, and temperature meter.

3. Reagents

A) pH reference buffer solutions:

- 1) pH = 4.00
- 2) pH = 7.00
- 3) pH = 10.00

B) Specific conductivity buffer solutions:

- 1) Conductivity standards A or B = 1413  $\mu$ S or 12.88 mS

C) Distilled water

4. Calibration Procedures

A) Select sensor (i.e. pH, conductivity)

B) One point calibration

- 1) Place the sensor in the calibrating medium:

<u>Measurement</u>	<u>Solution</u>	<u>Reading</u>
pH	pH = 7 buffer	7.00 pH (25°C)
Cond	Hold in free air	0.00 $\mu$ S
TDS	Hold in free air	0.00 mg/L

- 2) Press CAL - cal 1 is displayed. After endpointing, the display automatically updates to the calibrated value shown, or the temperature compensated value.

- 3) If READ is pressed after cal 1 update, the meter assumes one point calibration only is required. Samples can now be measured.

C) Two point calibration

- 1) Follow one point calibration. Place sensor in second calibrating medium:

During SI's, calibration for pH measurements will utilize the two point calibration option. Section 7-1 of the QAPP addresses the required frequency and documentation for field equipment calibration.

<u>Measurement</u>	<u>Solution</u>	<u>Reading</u>
pH	pH 4 or pH 10 buffer	4.00 or 10.01 pH (at 25°C)
Cond	Cond std A or B	1413 uS or 12.88 mS
TDS	Cond std A or B	706 mg/L or 6.44 g/L

- 2) Press CAL - cal 2 is displayed. After endpointing the display automatically updates to the calibrated value shown or the temperature compensated value.

5. Sample Handling and Preparation

Samples collected for pH, specific conductivity, total dissolved solids and temperature should be obtained directly from the sampling point. Groundwater samples being tested during well purging can be obtained directly from the bailer.

6. Procedures

Select sensor for required measurement (i.e. pH sensor or conductivity sensor). Attach sensor to the M90 meter. Calibrate meter to the solution corresponding to type of sensor. Meter is now ready to make a measurement following these steps:

- A) Prepare sensor
  - 1) pH - remove the sensor wetting cap and slide the vent sleeve to expose the fill hole.
  - 2) Specific conductivity/TDS - immerse probe to halfway point in solution.
  - 3) Temperature - pH and conductivity sensors automatically measure temperature.
- B) Press MODE, READ, CAL, or M to turn meter and start measurement. Place sensor into solution. Automatic endpoint detection freezes the display when plateau is reached; to manually endpoint press READ. Press READ again to start new measurement.
- C) After use, close the fill hole and replace the wetting cap (pH).

7. Trouble-Shooting and Maintenance

- A) Use distilled water when transferring from one solution to another.
- B) Response time is a function of the sensor and the solution. If the solutions are at different temperatures (or ionic strength - pH only), allow more time for the sensor to respond.
- C) Avoid handling the sensor tip.
- D) Make sure no large air bubbles are trapped under the sensor when making measurements.
- E) Do not use calibration standards after the expiration date.
- F) Wetting caps should contain:  
pH - pH 7 buffer
- G) For greatest accuracy, callibrants and samples should be at the same temperature.
- H) pH - keep the electrode filled with the appropriate fill solution to prevent reading drift.
- I) Conductivity - the sensor shield and probe should be kept clean. Make sure no air bubbles are in the cell chamber during measurement.

8. Verification of Accuracy

Following the last of the four replicate measurements, immerse the rinsed sensor in each of the reference solutions used to calibrate the meter/sensor prior to sample measurements. If the readings are not within 0.10 units of the reference values, recalibrate the meter/sensor and redo the measurement of the sample just tested.

9. Reporting

- A) pH - report the average value of the replicate measurements to the nearest 0.1 units.
- B) Temperature - report the average value of the replicate measurements to the nearest 1°C.
- C) Specific Conductivity/TDS - report the average value of the replicate measurements to three significant digits.

**STANDARD OPERATING PROCEDURE  
FIELD MEASUREMENT OF TURBIDITY**

**1. Scope and Application**

This method is applicable to samples of groundwater, potable water supplies, surface water, and stormwater with measurement occurring at the sampling point.

**2. Apparatus**

The Hach Model 2100P Portable Turbidimeter and accessories will be used for measuring turbidity.

**3. Principle of Operation**

The model 2100P Portable Turbidimeter operates on the nephelometric principle of turbidity measurement. This instrument meets the design criteria specified by the United States Environmental Protection Agency, Method 180.1.

**4. Range of Measurement**

The instrument measures turbidity from 0.01 to 1000 NTU in automatic range mode with automatic decimal point placement. The manual range mode measures turbidity in three ranges: 0.01 to 9.99, 10 to 99.9 and 100 to 1000 NTU. The instrument has an accuracy within 2 percent of reading plus stray light from 0-1000 NTU.

**5. Calibration**

Calibration of the 2100P Turbidimeter is based on formazin, the primary standard for turbidity. The initial calibration is done at the factory. A formazin recalibration

should be done at least once every three months. The equipment should be recalibrated (as required) and its batteries checked before shipping it to the field. Recalibration should be done according to the procedure described in the instrument manual (Section 3.6).

6. **Sample Handling**

To ensure a representative sample, mix every sample thoroughly before aliquots are taken. It is recommended to collect at least one liter sample in a clean container and thoroughly mix before measurement. Do not allow the sample to settle. When sampling from a tap, allow the water to run for at least five minutes before sampling.

7. **Turbidity Measurement Procedure**

Follow the instrument manual (Section 2) for turbidity measurement. The following general steps should be used to measure turbidity:

- A. Collect a representative sample in a clean container. Fill a sample cell to the line (about 15 mL), taking care to handle the sample cell by the top. Cap the cell.
- B. Wipe the cell with a soft, lint-free cloth to remove moisture and fingerprints.
- C. Apply a thin film of silicone oil on the sample cell surface. Wipe with a soft cloth to obtain an even film over the entire surface.
- D. Place the instrument on a flat, sturdy surface. Do not hold the instrument while making measurements. Press: I/O.
- E. Put the sample cell in the instrument cell compartment so the diamond or orientation mark aligns with the raised orientation mark in front of the cell compartment. Close the cover.
- F. Select manual or automatic range selection by pressing the "RANGE" key. Using automatic range selection is recommended. When the instrument is turned on, the instrument defaults to the range mode and measurement range

which was used during the last measurement. The display will show "AUTO RNG" when the instrument is in automatic range selection. If the instrument defaults to automatic range mode, the first "RANGE" key stroke brings the selection into manual range mode. The second, third, and fourth key strokes put the instrument in the 0.00-9.99, 10 to 99.9 or 100-1000 NTU range respectively. Another key stroke brings the selection back to automatic range mode.

- G. Turn signal averaging mode on or off by pressing the "SIGNAL AVERAGE" key. The instrument defaults to the last operating mode selected. The display will show "SIG AVG" when the instrument is using signal averaging. Use signal average mode only if the sample causes an unstable reading.
- H. Press: "READ". The display will show " — NTU" then the turbidity in NTU. Record the turbidity after the lamp symbol turns off.

## 8. Trouble Shooting

The detailed trouble shooting procedures are described in Section 5 of the instrument manual. Enter the diagnostic mode by pressing the "DIAG" key. The diagnostic mode allows access to information about instrument function which may be useful for servicing and troubleshooting. Pressing and holding the I/O key turns on all the display icons and elements to determine if all the elements and icons are functioning. Error messages indicate sample interferences and/or instrument malfunction. The probable cause and corrective action for each diagnostic code and error message are described in Section 5 of the instrument manual.

## 9. Maintenance

Keep the turbidimeter and accessories as clean as possible and store the instrument in the carrying case when not in use. Avoid prolonged exposure to sunlight and ultraviolet light. Wipe spills up promptly. Wash sample cells with non-abrasive laboratory detergent, rinse with distilled water, and air dry. Battery and lamp replacement should be performed according to the instructions outlined in Section 4 of the instrument manual.

10. Reference

Portable Turbidimeter Model 2100P - Instrument and Procedure Manual, HACH Company, 1993.

## FIELD MEASUREMENT OF DISSOLVED OXYGEN (DO)

### 1. Scope and Application

Dissolved oxygen (DO) levels in natural waters and wastewater depend on the physical, chemical, and biochemical activities in the waterbody. Conversely, growth of many aquatic organisms as well as the rate of corrosivity, are dependent on the DO concentration. Thus, analysis for DO is a key test in water pollution and waste treatment process control. If at all possible, DO measurements should be taken in-situ, since concentrations may show a large change in a short time if the sample is not adequately preserved.

The monitoring method discussed herein is limited to the use of dissolved oxygen meters only. Chemical methods of analysis (i.e., Winkler methods) are available, but require more equipment and greater sample manipulation. Furthermore, DO meters, using a membrane electrode, are suitable for highly polluted waters, because the probe is completely submersible, and is free from interference caused by color, turbidity, colloidal material or suspended matter.

### 2. Apparatus

The following equipment is needed to measure dissolved oxygen concentration:

- A. YSI Model 56 dissolved oxygen meter or equivalent.
- B. Dissolved oxygen/temperature probe for above meter.
- C. Sufficient cable to allow the probe to contact the sample.

### 3. Reagents

Distilled water

### 4. Calibration Procedures/Measurement Techniques

Probes differ as to specifics in use. Follow the manufacturer's instructions to obtain accurate readings. The following general steps should be used to measure the dissolved oxygen concentration:

- A. The equipment should be calibrated and its batteries checked in the laboratory before going to the field.
- B. The probe should be conditioned in a water sample for as long a period as practical before its use in the field. Long periods of dry storage followed by short periods of use in the field may result in inaccurate readings.



- C. The instrument should be calibrated in the field before each measurement or group of closely spaced measurements by placing the probe in water sample of known dissolved oxygen concentration (i.e., determined by Winkler method) or in a freshly air-saturated water sample of known temperature. DO values for air-saturated water can be determined by consulting a table listing oxygen solubilities as a function of temperature and salinity (Attachment B).
- D. Immerse the probe in the sample. Be sure to provide for sufficient flow past the membrane, either by stirring the sample, or placing the probe in a flowing stream. Probes without stirrers placed in wells can be moved up and down.
- E. Record the dissolved oxygen content and temperature of the sample in a field logbook.
- F. Recalibrate the probe when the membrane is replaced, or as needed. Follow the manufacturers' instructions. Duplicate analyses should agree within  $\pm 0.1$  mg/L.

Note than in in-situ placement of the probe is preferable, since sample handling is not involved. This however, may not always be practical. Be sure to record whether the liquid was analyzed in-situ, or if a sample was taken.

Special care should be taken during sample collection to avoid turbulence which can lead to increased oxygen solubilization and positive test interference.

ATTACHMENT B  
 VARIATION OF DISSOLVED OXYGEN CONCENTRATION  
 IN WATER AS A FUNCTION OF TEMPERATURE AND SALINITY

Temperature	Chloride Concentration in Water					Difference /100 mg Chloride
	0	5000	10000	15000	20000	
	Dissolved Oxygen mg/l					
0	14.6	13.8	13.0	12.1	11.3	0.017
1	14.2	13.4	12.6	11.8	11.0	0.016
2	13.8	13.1	12.3	11.5	10.8	0.015
3	13.5	12.7	12.0	11.2	10.5	0.015
4	13.1	12.4	11.7	11.0	10.3	0.014
5	12.8	12.1	11.4	10.7	10.0	0.014
6	12.5	11.8	11.1	10.5	9.8	0.014
7	12.2	11.5	10.9	10.2	9.6	0.013
8	11.9	11.2	10.6	10.0	9.4	0.013
9	11.6	11.0	10.4	9.8	9.2	0.012
10	11.3	10.7	10.1	9.6	9.0	0.012
11	11.1	10.5	9.9	9.4	8.8	0.011
12	10.8	10.3	9.7	9.2	8.6	0.011
13	10.6	10.1	9.5	9.0	8.5	0.011
14	10.4	9.9	9.3	8.8	8.3	0.010
15	10.2	9.7	9.1	8.6	8.1	0.010
16	10.0	9.5	9.0	8.5	8.0	0.010
17	9.7	9.3	8.8	8.3	7.8	0.010
18	9.5	9.1	8.6	8.2	7.7	0.009
19	9.4	8.9	8.5	8.0	7.6	0.009
20	9.2	8.7	8.3	7.9	7.4	0.009
21	9.0	8.6	8.1	7.7	7.3	0.009
22	8.8	8.4	8.0	7.6	7.1	0.008
23	8.7	8.3	7.9	7.4	7.0	0.008
24	8.5	8.1	7.7	7.3	6.9	0.008
25	8.4	8.0	7.6	7.2	6.7	0.008
26	8.2	7.8	7.4	7.0	6.6	0.008
27	8.1	7.7	7.3	6.9	6.5	0.008
28	7.9	7.5	7.1	6.8	6.4	0.008
29	7.8	7.4	7.0	6.6	6.3	0.008
30	7.6	7.3	6.9	6.5	6.1	0.008
31	7.5					
32	7.4					
33	7.3					
34	7.2					
35	7.1					
36	7.0					
37	6.9					
38	6.8					
39	6.7					
40	6.6					
41	6.5					
42	6.4					
43	6.3					
44	6.2					
45	6.1					
46	6.0					
47	5.9					
48	5.8					
49	5.7					
50	5.6					

**APPENDIX D**

**COMPLETED SAMPLE DOCUMENTATION EXAMPLES AND REQUIREMENTS**



United States Environmental Protection Agency  
 Contract Laboratory Program Sample Management Office  
 PO Box 818 Alexandria, VA 22313  
 703 557-2490 TIS 557-2490

**Organic Traffic Report  
 & Chain of Custody Record**  
 (For Organic CLP Analysis)

SAS No.  
 (if applicable)

Case No.

Case #

1. Project Code	Account Code	2. Region No. <b>V</b>	Sampling Co. <b>Company Name</b>	4. Date Shipped <b>Date</b>	Carrier <b>Carrier Name</b>	6. Preservative (Enter in Column D)  1. HCl 2. HNO3 3. NaHSO4 4. H2SO4 5. Other (SAS) (Specify) 6. Ice only N. Not preserved	7. Sample Description (Enter in Column A)  1. Surface Water 2. Ground Water 3. Leachate 4. Flusate 5. Soil/Sediment 6. Oil (SAS) 7. Waste (SAS) 8. Other (SAS) (Specify)																						
Regional Information		Sampler (Name) <b>Sampler Name</b>		Airbill Number <b>Airbill Number</b>																									
Non-Superfund Program		Sampler Signature <b>Sampler Signature</b>		5. Ship To <b>Laboratory Name</b>																									
Site Name <b>Site Name</b>		3. Type of Activity		Address <b>Address</b>																									
City, State <b>City, State</b>	Site Spill ID <b>Code</b>	<table border="0"> <tr> <td>Remedial</td> <td>Removal</td> <td>Removal</td> <td></td> </tr> <tr> <td>Lead</td> <td>Pic</td> <td>RIFS</td> <td><input checked="" type="checkbox"/> CLEM</td> </tr> <tr> <td>PA</td> <td>RA</td> <td>RD</td> <td>REMA</td> </tr> <tr> <td>SS</td> <td>O&amp;M</td> <td>RA</td> <td>REM</td> </tr> <tr> <td>LSI</td> <td>NPLD</td> <td>OIL</td> <td>OIL</td> </tr> <tr> <td></td> <td></td> <td>UST</td> <td>UST</td> </tr> </table>		Remedial	Removal	Removal		Lead	Pic	RIFS	<input checked="" type="checkbox"/> CLEM	PA	RA	RD	REMA	SS	O&M	RA	REM	LSI	NPLD	OIL	OIL			UST	UST	Attn: Name	
Remedial	Removal	Removal																											
Lead	Pic	RIFS	<input checked="" type="checkbox"/> CLEM																										
PA	RA	RD	REMA																										
SS	O&M	RA	REM																										
LSI	NPLD	OIL	OIL																										
		UST	UST																										

Attachment II

CLP Sample Numbers (from labels)	A Enter # from Box 7	B Conc. Low Med High	C Sample Type: Comp./ Grab	D Preservative from Box 6	E RAS Analysis				F Regional Specific Tracking Number or (tag numbers)	G Station Location Number	H Mo/Day/Year/Time Sample Collection	I Sampler Initials	J Corresp. CLP Inorg. Samp. No.	K Designated Field QC
					VOA	BNA	Pes/PCB	High ARO/TOX						
EPA01	2	L	G	1	X				5-12357-712362	MW01	Date/Time <sup>Military</sup>		MEPA01	
EPA01						X	X		5-12363-712366	MW01	Date/Time <sup>Military</sup>			
EPA02				1	X				5-12367-712368	MW02	Date/Time <sup>Military</sup>		MEPA02	
EPA02						X	X		5-12369-712370	MW02	Date/Time <sup>Military</sup>			
EPA03				1	X				5-12371-712372	MW03	Date/Time <sup>Military</sup>		MEPA03	(EPA03-EPA04)
EPA03						X	X		5-12373-712374	MW03	Date/Time <sup>Military</sup>			Field duplicate
EPA04				1	X				5-12375-712376	MW03	Date/Time <sup>Military</sup>		MEPA04	
EPA04	✓					X	X		5-12377-712378	MW03	Date/Time <sup>Military</sup>			
EPA05	3			1	X				5-12379-712380	FB01	Date/Time <sup>Military</sup>		MEPA05	Field Blank
EPA05	3	✓	✓			X	X		5-12381-712382	FB01	Date/Time <sup>Military</sup>			

Shipment for Case complete? (Y/N) Circle One	Page 1 of #	Sample used for a spike and/or duplicate <b>EPA01</b>	Additional Sampler Signatures	Chain of Custody Seal Number <b>COC Seal #s</b>
-------------------------------------------------	-------------	----------------------------------------------------------	-------------------------------	----------------------------------------------------

**CHAIN OF CUSTODY RECORD**

Relinquished by: (Signature) <b>Signature</b>	Date / Time <b>Date</b> <sup>Military</sup> Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Received by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks Is custody seal intact? Y/N/none	



United States Environmental Protection Agency  
 Contract Laboratory Program Sample Management Office  
 PO Box 818 Alexandria, VA 22313  
 703 557 2490 T 15 557 2490

**Inorganic Traffic Report  
 & Chain of Custody Record**  
 (For Inorganic CLP Analysis)

SAS No.  
 (if applicable)

Case No.

Case #

1. Project Code	Account Code	2. Region No. <b>V</b>	Sampling Co. <i>Company Name</i>	4. Date Shipped <i>Date</i>	Carrier <i>Carrier Name</i>	6. Preservative (Enter in Column D)  1. HCl 2. HNO <sub>3</sub> 3. NaOH 4. H <sub>2</sub> SO <sub>4</sub> 5. K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> 6. Ice only 7. Other (SAS) (Specify) N. Not preserved	7. Sample Description (Enter in Column A)  1. Surface Water 2. Ground Water 3. Leachate 4. Rinse 5. Soil/Sediment 6. Oil (SAS) 7. Waste (SAS) 8. Other (SAS) (Specify)
Regional Information		Sampler (Name) <i>Sampler Name</i>		Airbill Number <i>Airbill Number</i>			
Non-Superfund Program		Sampler Signature <i>Sampler Signature</i>		5. Ship To <i>Laboratory Name</i> <i>Address</i> <i>Attn: Name</i>			
Site Name <i>Site Name</i>		4. Type of Activity		Removal			
City, State <i>City, State</i>		Site Spill ID <i>Code</i>		<input checked="" type="checkbox"/> SF <input type="checkbox"/> PRP <input type="checkbox"/> ST <input type="checkbox"/> FED		<input checked="" type="checkbox"/> Lead <input type="checkbox"/> PA <input type="checkbox"/> SSI <input type="checkbox"/> LSI	
		<input type="checkbox"/> RIFS <input type="checkbox"/> RO <input type="checkbox"/> RA <input type="checkbox"/> O&M <input type="checkbox"/> NPLD		<input checked="" type="checkbox"/> CLEM <input type="checkbox"/> REMA <input type="checkbox"/> REM <input type="checkbox"/> OIL <input type="checkbox"/> UST			

CLP Sample Numbers (from labels)	A Enter # from Box 7	B Conc. Low High	C Sample Type / Comp / Grab	D Preservative from Box 6	E - RAS Analysis							F Regional Specific Tracking Number (Tag Numbers)	G Station Location Number	H Mo/Day/Year/Time Sample Collection	I Sampler Initials	J Corresp. CLP Org. Samp. No.	K Designated Field QC
					Metals		Low Conc.		High								
					Total	Observed	Cyanide	Mercury	Nitrite	Fluoride	pH						
MEPA01	2	L	G	2	X							5-12345712346	MW01	<i>Date / Military Time</i>	EPA01		
MEPA01				3		X						5-12347712348	MW01	<i>Date / Military Time</i>			
MEPA02				2	X							5-12349	MW02	<i>Date / Military Time</i>	EPA02		
MEPA02				3		X						5-12350	MW02	<i>Date / Military Time</i>			
MEPA03				2	X							5-12351	MW03	<i>Date / Military Time</i>	EPA03	MEPA03-MEPA04	
MEPA03				3		X						5-12352	MW03	<i>Date / Military Time</i>		Field duplicates	
MEPA04				2	X							5-12353	MW03	<i>Date / Military Time</i>	EPA04		
MEPA04				3		X						5-12354	MW03	<i>Date / Military Time</i>			
MEPA05	3			2	X							5-12355	FBO1	<i>Date / Military Time</i>	EPA05	Field Blank	
MEPA05	3	✓	✓	3		X						5-12356	FBO1	<i>Date / Military Time</i>		" "	

Attachment I

Shipment for Case complete? (Y/N) Circle One	Page 1 of #	Sample used for a spike and/or duplicate <b>MEPA01</b>	Additional Sampler Signatures	Chain of Custody Seal Number COC Seal #s
-------------------------------------------------	-------------	-----------------------------------------------------------	-------------------------------	---------------------------------------------

**CHAIN OF CUSTODY RECORD**

Relinquished by: (Signature) <i>Signature</i>	Date / Time <i>Date / Military Time</i>	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Received by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	Is custody seal intact? Y/N/none

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION V

DATE: 20 AUGUST 1991

SUBJECT: COMBINATION TRAFFIC REPORT/CHAIN OF CUSTODY FORMS

FROM: JAN PELS, RSCC *J. Pels*  
Laboratory Scientific Support Section, CRL

TO: ALL REGION V SAMPLERS USING THE CONTRACT LABORATORY  
PROGRAM (CLP)

The latest printing of the combination traffic report (TR) and chain of custody (COC) forms has been completed. All versions of the traffic report form prior to this printing cannot be used after August 31. Please collect all old forms you have been sent and return them to me by September 15. Note that you should keep the old chain of custody forms, which will still be used for samples shipped to the EPA Central Regional Laboratory (CRL) in Chicago.

Please note that there are certain fields that are optional to fill out, such as sampler's initials, split sample section, and account code. The new form should eliminate redundant work by having all of the information that is currently written on the chain of custody form and on the traffic report form combined on one form, so keep this in mind when using the form.

If you are tracking bottle lot numbers, cooler numbers, etc., on the current COC forms, you can use the Regional Information box. If samples are being collected for a PRP oversight project, indicate 'PRP oversight' in the Regional Information box.

Remember that we do not request dissolved metals. Also, on the organic form, we are preserving all volatiles samples, including residential well samples as of February 1991, so you need to list the preservative number (HCl) in column D.

Note that since you are listing tag numbers and preservatives, that you must put the metals (water) sample information on one line and the cyanide information on another line. This would apply for the volatiles (waters will be preserved with HCl) and the BNA and Pest/PCBs fractions (they will have no preservative). Since the metals and cyanide fractions are taken from the same soil bottle, they can be written on one line.

Since these forms must be filled out on a per cooler basis, like the current chain of custody forms, the fact that you can only list up to 10 samples shouldn't be an issue since you are limited by the size of the cooler. A second form can be filled out for additional samples in the cooler; this revision has a box to note the number of pages, i.e., forms sent in a cooler.

This revision of the forms has a box for chain of custody seal numbers (remember that we use two seals per cooler).

The inorganic form has new analytes listed (nitrate/nitrite, fluoride, pH and conductivity). The nitrate/nitrite and fluoride is planned for a new low level water (residential well) RAS SOW, and the pH and conductivity are optional tests under the current High Concentration SOW. The low level water inorganic RAS SOW is not in place yet, so these fields should not be used at this time.

Please call if you have any questions on these additional analytes. For routine inorganic analyses on water and soil samples, you still will only ask for total metals and/or cyanide.

The organic form also has an additional field for the current High Concentration SOW, the ARO/TOX. Please call if you have questions about this high concentration analysis. For routine organic analyses on water and soil, you will still only ask for VOA, BNA and/or Pest/PCB.

Note that the organic traffic report says that extra volume is required for the matrix spike/matrix spike duplicate. This only applies to the routine low/medium/water/soil RAS -SOWs. Remember that organic residential well samples (currently a RAS plus SAS) have Performance Evaluation (PE) samples sent with real samples to the lab and that you do not collect extra volume for this contract; you must list the PE samples on this form. You will not have tag numbers for these PEs, nor time/date of sampling, etc. Note which are PE ampules in the designated field QC field.

The lower right hand corner has a section for documenting whether split samples were accepted/declined by any PRPs. If you are currently using a separate form for this purpose, please let me know. The Office of Regional Counsel (ORC) will need to make a determination on whether you can use this field in place of your current form. This issue was not raised during the review that was done by the ORC.

Use the far right empty field to notate which samples are field blanks, field duplicates (i.e. which samples are duplicates of which others), PE samples, and which are blind QC samples (we rarely send double blind QC samples). This information does not transfer onto the lab's copies.

There is a field to list the sample number that should be used for laboratory QC analyses (matrix spike/matrix spike duplicate or spike/duplicate). Please be sure to always designate a sample on a one per 20 samples/per matrix basis per case. Remember that you must supply extra volume for all water samples, except for the organic residential well samples shipped to the CL as a RAS/SAS.

Note that the bottom section of the form has a box for the laboratory receiving the samples to sign and note whether the custody seal is intact; there has been some confusion on the part of some field samplers, who have occasionally filled in this box.

One major change is that the top copy of the form is submitted to the RSCC, with original signatures, to include in the evidence file. SMO receives the second copy and the lab gets the

I must remind you that if you have more than one lab performing SAS analyses under the same SAS number, you must assign different sample numbers each lab's samples. Since SAS sample numbers are not tracked in a database, the field length for SAS sample numbers is not fixed. You can have sample numbers as high as E1000, as an example.

The lower right hand corner has a section for documenting whether split samples were accepted/declined by any PRPs. If you are currently using a separate form for this purpose, please let me know. The Office of Regional Counsel will need to make a determination on whether you can use this field in place of your current form. This issue was not raised during the review that was done by the ORC.

Attached is an example of the form filled out. Please have samplers review this form carefully prior to using them in the field.

One major change is that the top copy of the form is submitted to the RSCC, with original signatures, to include in the evidence file. SMO receives the second copy and the lab gets the bottom two copies. Once the lab signs their copies, the lab returns them to SMO and the Region, so that we will have their original signature for the the evidence file. **PLEASE STRESS THIS TO ALL FIELD SAMPLERS, SINCE THIS DOCUMENT IS USED TO TRACE THE SAMPLE FROM COLLECTION TO RECEIPT AT THE LAB AND IS A VERY IMPORTANT DOCUMENT.** You may make a photocopy to keep in your files, but you must send us the original.

Please use this form as soon as you can in place of the old SAS packing lists and chain of custody forms. Once our small supply is used up, we'll go back to the old forms until the final, revised forms are printed.

Remember that for samples shipped to the CRL, the regular Chain of Custody form must be used with the CRL request forms. This combination form, as well as the TR/COCs are only for use in the CLP.

Please call if you have any questions on the use of this form.

Thank you.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION V

DATE: 21 MAY 1991

SUBJECT: COMBINATION SAS PACKING LIST/CHAIN OF CUSTODY FORM

FROM: JAN PELS, RSCC *J.P.*

TO: ALL SAMPLERS

The new combination SAS packing list and chain of custody (COC) form has been printed. A limited supply of the form is available for a trial run to work out the bugs. Please use this form for any work you have coming up in the near future so that we can get your feedback for consideration when preparing the final revision. When you use this new form, please note any problems you have filling it out and forward these comments to me by June 5, 1991. Any improvements in the form will be made then prior to the final printing. Since this form was modeled after the combination TR/COC form, any improvements that will be made to the TR/COC form will automatically be incorporated into this form.

Please note that there are certain fields that are optional to fill out, such as samplers initials, split sample section, account code, and regional information. The concept with the new form is to eliminate redundant work by having all of the information that is currently written on the chain of custody form and on the traffic report form combined on one form, so keep this in mind when using the form.

If you are tracking bottle lot numbers, cooler numbers, etc. on the current COC forms, you can use the blank space across the middle of the form or blank space above the top border to write this information in.

Note that since you are listing tag numbers and preservatives, that you must list the analytical parameters in groups; this means that if you are collecting water samples for analytes such as total organic carbon, sulfate, chemical oxygen demand, total dissolved solids, etc., each group of analytes which will be taken out of a specifically preserved bottle should be listed on one line. See the attached example form.

Since these forms must be filled out on a per cooler basis, like the current chain of custody form, the fact that you can only list up to 10 samples shouldn't be an issue since you are limited by the size of the cooler. A second form can be filled out for additional samples in the cooler.

Remember to still write in the chain of custody seal numbers across the blank space between the SAS information and the COC information. It doesn't really matter where you list these numbers on the form as long as it doesn't interfere with other information on the form. The revised form will have a box for the COC seal numbers.

bottom two copies. Once the lab signs their copies, the lab signs them and returns them to SMO and the Region, so that we will have their original signature for the the evidence file. **PLEASE STRESS THIS TO ALL FIELD SAMPLERS, SINCE THIS DOCUMENT IS USED TO TRACE THE SAMPLE FROM COLLECTION TO RECEIPT AT THE LAB AND IS A VERY IMPORTANT DOCUMENT.** You may make a photocopy to keep in your files, but you must send the RSCC the original.

Attached is an example for the forms correctly filled out. Please have samplers review this form carefully prior to using them in the field.

Also attached are instructions prepared by SMO on the use of the forms. Remember that these instructions are general instructions and do not contain Regional requirements; Region V's requirements supercede these instructions (specifically regarding the chain of custody seal numbers being listed, and tracking tag numbers). Please call if you have any questions on Region V's requirements.

Below is a list of things to remember when using these forms:

- 1) These forms are for exclusive use in the CLP. The old COC forms will still be used for samples shipped to the EPA Central Regional Laboratory (CRL).
- 2) A TR/COC form must be filled out on a per cooler basis.
- 3) The top copy with the original signatures is sent to the Region V RSCC.
- 4) All samples contained in a cooler must be listed on the form, including field blanks, field duplicates, and any performance evaluation (PE) samples sent with field samples.
- 5) The 'dissolved' metals box on the inorganic TR/COC should not be checked off. Filtered and unfiltered metals samples must be given separate EPA sample numbers, listed separately on the ITR/COC and both should have 'total' metals checked off on the form.
- 6) Extra sample volume must be sent for all organic and inorganic water samples on a one per twenty sample basis, with the exception of the organic residential well samples sent under a RAS/SAS contract.
- 7) Each TR/COC must be signed and dated properly.

Again, these forms must be used beginning September 1 and all other revisions of these forms must be returned to me by September 15.

Please call if you have any questions or comments on these forms. Another printing will be done within the next two months, so there is still time to correct problems with the forms.

Attachments



United States Environmental Protection Agency  
 Contract Laboratory Program Sample Management Office  
 PO Box 818 Alexandria, VA 22313  
 703-557-2490 FTS 557-2490

**Special Analytical Service**  
 Packing List/Chain of Custody

SAS No.

1234 E

1. Project Code	Account Code	2. Region No. <b>V</b>	Sampling Co. <b>Your Company</b>	4. Date Shipped <b>3/1/91</b>	Carrier <b>Fed Ex</b>	6. Sample Description (Enter in Column A)  1. Surface Water 2. Ground Water 3. Leachate 4. Rinse 5. Soil/Sediment 6. Oil 7. Waste 8. Other (Specify)	7. Preservative (Enter in Column C)  1. HCl 2. HNO3 3. NaHSO4 4. H2SO4 5. NaOH 6. Other (SAS) (Specify) 7. Ice only N. Not preserved																														
Regional Information		Sampler (Name) <b>Your Name</b>		Airbill Number <b>12345678</b>																																	
Non-Superfund Program		Sampler Signature <b>Your Signature</b>		5. Ship To <b>Lab Name</b> <b>Address</b>																																	
Site Name <b>Landfill</b>		3. Type of Activity		Attn: _____																																	
City, State <b>Chicago, IL</b>		<table border="0"> <tr> <td>Lead</td> <td>Pro.</td> <td>RIFS</td> <td>Remedial</td> <td>CLEM</td> <td>Removal</td> </tr> <tr> <td>SF</td> <td>PA</td> <td>RD</td> <td><input checked="" type="checkbox"/></td> <td>REMA</td> <td></td> </tr> <tr> <td>PRP</td> <td>SS</td> <td>RA</td> <td></td> <td>REM</td> <td></td> </tr> <tr> <td>ST</td> <td>SSI</td> <td>O&amp;M</td> <td></td> <td>OIL</td> <td></td> </tr> <tr> <td>FED</td> <td>LSI</td> <td>NPLD</td> <td></td> <td>UST</td> <td></td> </tr> </table>				Lead	Pro.	RIFS	Remedial	CLEM	Removal	SF	PA	RD	<input checked="" type="checkbox"/>	REMA		PRP	SS	RA		REM		ST	SSI	O&M		OIL		FED	LSI	NPLD		UST		Site Spill ID <b>ZZ</b>	
Lead	Pro.	RIFS	Remedial			CLEM	Removal																														
SF	PA	RD	<input checked="" type="checkbox"/>	REMA																																	
PRP	SS	RA		REM																																	
ST	SSI	O&M		OIL																																	
FED	LSI	NPLD		UST																																	

Sample Numbers	A Matrix Enter from Box 6	B Conc Low Med High	C Preservative Used from Box 7	D Analysis	E Sample used for spike and/or duplicate	F Regional Specific Tracking Number or Tag Number	G Station Location Identifier	H Mo/Day/Year/Time Sample Collection	I Sampler Initials	J Designated Field QC
1. E01	2	L	4	TOC, Nitr., COD		5-12345	FB-01	3/1/91 9:00		Blank
2. E02	2	L	4	↓ ↓ ↓		5-12347	MW-02	3/1/91 10:00		
3. E03	2	L	4	↓ ↓ ↓		5-12348	MW-03	3/1/91 11:00		
4. E04	2	L	4	↓ ↓ ↓	X	5-12349-12350	MW-04	3/1/91 13:00		
5. E01	2	L	7	SO4, TSS, TDS		5-12351	FB-01	3/1/91 9:00		Blank
6. E02	2	L	7	↓ ↓ ↓		5-12352	MW-02	3/1/91 10:00		
7. E03	2	L	7	↓ ↓ ↓		5-12353	MW-03	3/1/91 11:00		
8. E04	2	L	7	↓ ↓ ↓	X	5-12354-12355	MW04	3/1/91 13:00		
9.										
10.										

Shipment for SAS complete? (Y/N) **(Y)**

COC Seal #s 45678-4567

**CHAIN OF CUSTODY RECORD**

Relinquished by: (Signature) <b>Signature</b>	Date / Time <b>3/1/91 18:00</b>	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Received by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	Is custody seal intact? Y/N/none

Instructions summarizing CLP sample volumes, packaging and shipment reporting requirements are printed on the back of the TRs.

**SAMPLER INSTRUCTIONS FOR USE OF  
MULTI-SAMPLE ORGANIC AND INORGANIC  
TRAFFIC REPORTS/CHAIN-OF-CUSTODY FORMS  
EPA FORM #9110-1 (INORGANICS) AND  
FORM 9110-2 (ORGANICS)**

1/20/89  
REV. 2/91  
REV. 7/91

**A. Introduction - Samples and Sample Numbers**

The Contract Laboratory Program (CLP) Organic and Inorganic Multi-Sample Traffic Reports/Chain-of-Custody Forms (TRs) document samples shipped to CLP laboratories. They also enable SMO and the Region to track samples and ensure that the samples are shipped to the appropriate contract laboratory. You must use TRs each time you ship Routine Analytical Services (RAS) samples to a CLP laboratory. The TRs may document up to 10 samples shipped to one CLP laboratory under one Case Number and RAS analytical program.

Please note that the TR includes a chain-of-custody record which is located at the bottom of the form. The form is used as physical evidence of sample custody. According to EPA enforcement requirements, official custody of samples must be maintained and documented from the time of collection until the time the samples are introduced as evidence in the event of litigation. You are responsible for the care and custody of the sample until sample shipment.

A sample is considered to be in your custody if any of the following criteria are met:

1. The sample is in your possession or is in your view after being in your possession,
2. The sample was in your possession and then locked up or sealed to prevent tampering, or
3. The sample is in a secured area.

CLP sample types are defined by the RAS analytical program. There are currently three organic/inorganic programs: Low/medium concentration inorganic, low/medium concentration organic, and high concentration organic. Low/medium inorganic samples may be analyzed for Total Metals, Cyanide or both. Low/medium organic samples may be analyzed for Volatile Organics (VOAs), Base/Neutral/Acid (BNAs), Pesticide/PCBs, or any combination of these. High concentration organic samples may be analyzed for VOAs, BNA/Pesticide/PCBs, and Aroclors/toxaphenes. Inorganic samples are documented on Inorganic TRs. Organic and high concentration samples are documented on Organic TRs.

A CLP sample is one matrix - water or soil - never both. The CLP sample is further defined as consisting of all the sample aliquots from one station location, for each matrix and RAS analytical program. For example, let's say you were sampling at Pond A. You plan to collect one water sample and one soil/sediment sample, each to be analyzed for VOAs, BNAs, Pesticide/PCBs, Total Metals and Cyanide. All the bottles for the organic water analyses at this station - VOA vials, BNA jars, and Pesticide/PCB

jars - make up one organic CLP sample, not three. All of the bottles for the organic soil analysis make up the second organic CLP sample. The bottle for inorganic soil analysis makes up the second inorganic CLP sample from Pond A. Even though you have collected a water and a soil for five different analyses from Pond A, you've collected four CLP samples - an organic water, organic soil, inorganic water, and an inorganic soil.

The CLP generates unique Sample Numbers that must be assigned to each organic, and inorganic sample. The unique CLP Sample Numbers are printed at SMO on adhesive labels and distributed to the Regional RSCC as requested. It is your responsibility to assign this critical Sample Number correctly and to transcribe it accurately on the TR.

Organic Sample Numbers are in the format XX123, and have ten labels per strip: four for extractables, two for VOAs, and four blank (extra). (See Attachment 1.) **DESTROY THE UNUSED LABELS** to prevent duplication of Sample Numbers.

Inorganic Sample Numbers are in the format MXX123 and have seven labels per strip: two for Total Metals, two for Cyanide and three extra (see Attachment 1). Remember that the unique Sample Number must only be used once. **DESTROY THE EXTRA LABELS.**

Use only the labels provided to the Region in which you are sampling. CLP Sample Numbers are alphabetically coded to correspond with each Region as follows:

Letter Code		Region	Letter Code		Region
<u>Organic</u>	<u>Inorganic</u>		<u>Organic</u>	<u>Inorganic</u>	
A	MA	I	F	MF	VI
B	MB	II	G	MG	VII
C	MC	III	H	MH	VIII
D	MD	IV	Y	MY	IX
E	ME	V	J	MJ	X

**REMEMBER:**

- o TRs must be used for each Case No. with every shipment of samples to each CLP laboratory.
- o Organic samples, high concentration samples, and inorganic samples are assigned separate, unique Sample Numbers. Each sample consists of all the sample aliquots from a sample station location for analysis in one of the three analytical programs.
- o A CLP RAS sample will be analyzed as either a water or a soil sample.
- o Prevent accidental duplication of Sample Numbers by destroying unused labels.
- o Use the Sample Numbers specific to your Region.
- o Call SMO (telephone number 703/557-2490 or 703/684-5678) if you have any questions about using TRs.

**B. Completing the Form - Case Documentation**

Enter the SAS No. (if applicable) and Case No. at the top right of the form. Complete the boxes in the header.

Box No. 1

**Project Code/Site Information**

Enter the Project Code; Account Code; Regional Information; Non-Superfund Program; Site Name; City, State, and Site Spill Identifier in the designated spaces.

If sampling is not under the Superfund program, enter the name of program, e.g., RCRA, in the box titled "Non-Superfund program".

Box No. 2

**Regional Information:**

Enter the Region number, the name of your sampling company, and your name and signature in the designated spaces.

Box No. 3

**Type of Activity:**

Check Funding Level of sampling. Next check the code which describes the task of the sampling mission:

Funding Level

SF	-	Superfund
PRP	-	Potential Responsible Party
ST	-	State
FED	-	Federal

Pre-Remedial

PA	-	Preliminary Assessment
SSI	-	Screening Site Investigation
LSI	-	Listing Site Investigation

Remedial

RIFS	-	Remedial Investigation Feasibility Study
RD	-	Remedial Design
O&M	-	Operations and Maintenance
NPLD	-	National Priorities List
Delete		

Removal

CLEM	-	Classic Emergency
REMA	-	Removal Assessment
REM	-	Removal
OIL	-	Oil Response
UST	-	Underground Storage Tank Response

Box No. 4

**Shipping Information:**

Enter the date shipped, the carrier for example; Federal Express, Purolator, or Airborne and the airbill number in the appropriate spaces.

Box No. 5

**Ship To:**

Enter the name of the CLP Laboratory contact (Sample Custodian), laboratory and its full address in the box.

Box No. 6

**Preservative**

Box provides a list of commonly used preservatives. Please enter the appropriate preservative used in Column D.

Box No. 7

**Sample Description**

Box provides a list of the description/matrices of samples that are collected. Please enter appropriate description in Column A.

**C. Completing the Form - Sample Documentation**

Carefully transcribe the CLP Sample No. from the printed sample labels on the TR in the space provided.

Complete columns A through G to describe the sample:

Column A. Sample Description:

Enter the appropriate sample description code from Box 7.

**NOTE:** Describe BLANKS as #3 "Leachate" in Column A.

**Note:** Item #6 "Oil" and Item #7 "Waste" are for RAS PLUS SAS projects only. Do not ship oily samples or waste samples without making prior arrangements with SMO.



Column B. Concentration:

Organic - If sample is estimated to be low or medium concentration, enter "L". When shipping RAS Plus SAS High Concentration samples (previously arranged with SMO), enter "H".

Inorganic - Enter "L" for low concentration, "M" for medium concentration, and "H" for high concentration (under previous RAS Plus SAS arrangement).

NOTE: Ship medium and high concentration organic and inorganic samples in metal cans.

Column C. Sample Type Composite/Grab

Please enter which type of sample you collected.

Column D. Preservative Used

Please enter preservation used (i.e., HCL, NAOH, HNO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>) refer to Box 6 or the reference number of the preservation (1-7,N).

Column E. RAS Analysis:

Check the analytical fractions requested for each sample, for example, VOAs, SVs, and Pesticides are for low/medium concentration organics. Total metals and cyanide are for low/medium concentration inorganics. VOAS, SV/Pesticides and Aroclors are for high concentration organics. Metals, Cyanide, pH/conductivity are for high concentration inorganic samples.

Note: Either total or dissolved metals can be requested for each individual inorganic sample assigned a unique sample number, but not both analyses. ARO/TOX analyses can only be requested for high concentration samples.

Column F. Regional Specific Tracking Number or Tag Numbers.

Enter the Region Specific tracking number or tag number in the space provided.

Column G. Station Location Number.

Enter the station location in the space provided.

Column H. Mo/Day/Year/Time of Sample Collection:

Record the month, day, year, and time in military time (e.g. 1600 hours = 4:00 pm), of sample collection.

Column I. Sampler Initials

Enter your initials

Column J. Corresponding CLP Organic/Inorganic Sample No.:

Enter the corresponding CLP Sample No. for organic or inorganic analysis.

**Column K: Designated Field QC**

Enter the appropriate qualifier for "Blind" Field QC samples in this column.

Please note that all samples must have a qualifier.

<b><u>Blind Field QC</u></b>	<b><u>Qualifier</u></b>
Blind Blanks	B
Blind Field Duplicates	D
Blind Field Spikes	S
Blind PE Samples	PE
Not a QC Sample	—

**Box Titled "Shipment for Case Complete (Y/N)":**

This should reflect the status of the samples scheduled at a lab for a specific Case. When ALL samples scheduled/collected for shipment to a lab for a specific Case have been shipped the Case is complete.

**Box Titled "Page 1 of "**

Please enter the number of TRs per shipment.

**Box Titled "Sample used for Spike and /or Duplicate"**

Please enter sample used for spike and or duplicate sample.

**Box Titled "Additional Sampler Signatures"**

Please record any additional sampler signatures you are unable to record in Box 2.

**Box Titled "Chain of Custody Seal Number"**

Sampler should enter the Chain of Custody Seal Number if applicable.

**Box Titled "Split Samples Accepted/Declined":**

Sampler should ask sight owner, PRP, etc. whether they want split samples taken. The split samples are either accepted or declined. Sampler should record their signature and check the appropriate box.

**How and when to separate and send Traffic Report/Chain of Custody form copies:**

When all paper work has been completed by the sampler and samples are ready to be shipped the bottom two copies of the Traffic Report/Chain of Custody forms should be placed in a plastic bag and taped to the inside of the cooler. The second copy of the Traffic Report/Chain of Custody form must be returned to the SMO within five days of the sample shipment. The top copy is the Regions' copy for their records.

**D. Instructions on the Reverse**

**APPENDIX E**

**SPECIFICATIONS AND GUIDANCE FOR OBTAINING  
CONTAMINANT FREE SAMPLE CONTAINERS**

United States  
Environmental Protection  
Agency

Office of  
Solid Waste and  
Emergency Response  
Washington, DC 20460

Publication 9240.0-05A  
EPA540/R-93/051  
P993-963316  
December 1992

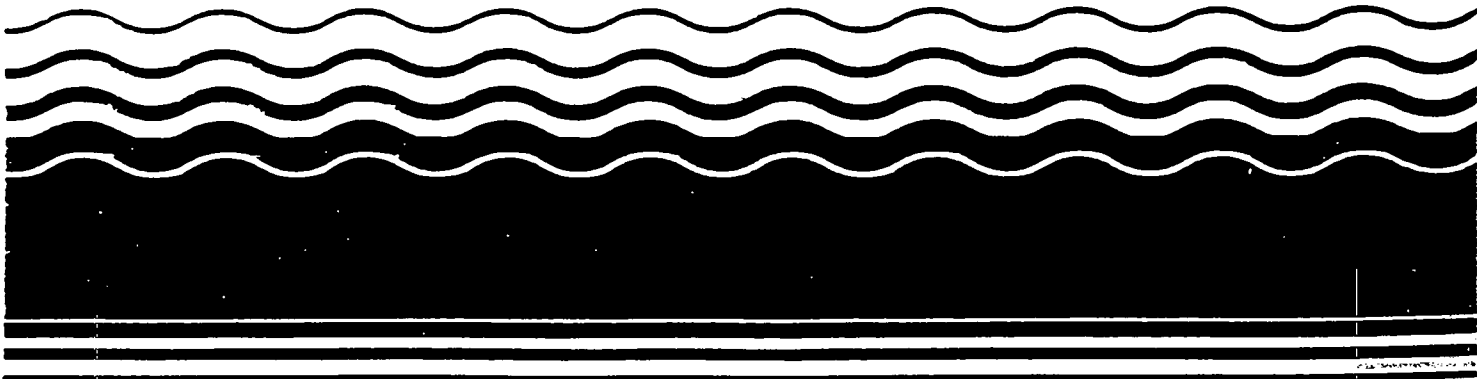
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Supplement

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# Specifications and Guidance for Contaminant-Free Sample Containers



OSWER Directive # 9240.0-05A  
December 1992

**SPECIFICATIONS AND GUIDANCE**  
**FOR**  
**CONTAMINANT-FREE SAMPLE CONTAINERS**

Office of Emergency and Remedial Response  
Office of Solid Waste and Emergency Response  
U.S. Environmental Protection Agency  
Washington, DC 20460

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**SECTION I**  
**INTRODUCTION**

In August 1989, the Environmental Protection Agency's (EPA) Office of Emergency and Remedial Response (OERR) decentralized Superfund's Sample Container Repository program (OSWER Directive #9240.0-05). In conjunction with the decentralization of Superfund's bottle program, OERR issued specifications and guidance for preparing contaminant-free sample containers to assist the Regions in obtaining appropriate sample containers from commercially available suppliers.

The December 1992 version of "Specifications and Guidance for Contaminant-Free Sample Containers" revises the specifications and provides a single source of standardized specifications and guidance on appropriate cleaning procedures for preparing contaminant-free sample containers that meet all Contract Laboratory Program (CLP) detection/quantitation limits, including those for low concentration analyses.<sup>1</sup> Although the specifications and guidance procedures contained in this document are based on CLP low concentration requirements, they also are suitable for use in other analytical programs.

Specifications and guidance for preparing contaminant-free sample containers are provided in the sections that follow and are intended to describe one approach for obtaining cleaned, contaminant-free sample containers for use by groups performing sample collection activities under Superfund and other hazardous waste programs. Although other cleaning procedures may be used, sample containers must meet the criteria specified in Section II. In certain instances, the user of the sample containers may require exact adherence to the cleaning procedures and/or quality control analysis described in this document. In other instances, the user may require additional or different cleaning procedures and/or quality control analysis of the sample containers. The specific needs of the bottle user will determine the requirements for the cleaning and quality control analysis of the sample containers as long as the minimum criteria are met. It is the responsibility of the bottle user to define the sample container preparation, cleaning, and quality control requirements.

The document has been extensively reviewed and revised since the August 1989 iteration, and important enhancements have been incorporated, including:

- Removing references to the color of the closures;
- Allowing the use of polypropylene closures as an alternative to phenolic closures;
- Referencing CLP Low Concentration Organics and Inorganics Statements of Work for the analysis of calibration verification solutions and blanks;
- Including cleaning and quality control procedures for fluoride and nitrate/nitrite;
- Removing the hexane rinse from the cleaning procedure for container types A, E, F, G, H, J, and K (semivolatile organics, pesticides, metals, cyanide, and fluoride in soils and water);

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<sup>1</sup> Because this document does not address the procurement of contaminant-free sample containers, the title was changed from "Specifications and Guidance for Obtaining Contaminant-Free Sample Containers" to "Specifications and Guidance for Contaminant-Free Sample Containers."

- Adding the recommendation that the bottle vendor establish and submit a Quality Assurance Plan (QAP);
- Changing the QA/QC documentation requirements so that copies of the raw data from the analyses of the QC containers are available upon request and not automatically sent to the bottle purchaser;
- Changing the permanent lot number assignment to a nine-digit number from an eight-digit number, where the extra digit represents the analysis parameter;
- Adding Chemical Abstract Services (CAS) registry number for the inorganic analytes in Table I; and
- Recommending an annual demonstration of the bottle vendor's ability to meet detection limits and establish reproducibility of the cleaning techniques.

OERR and the EPA Regions decided to use the most stringent CLP requirements available to set the specifications for obtaining contaminant-free sample containers. As a result, the CLP Inorganics and Organics Low Concentration Statement of Work (SOW) requirements were selected as the basis for these specifications. Major factors in this decision included the desire to have a set of bottle cleaning specifications that met or exceeded all analytical requirements and the related need to avoid potential misuse of cleaned bottles (e.g., using a container cleaned by a multi-concentration procedure for a low concentration sample). OERR will reevaluate this decision if the low concentration requirements are deemed to be too stringent.

Most environmental sampling and analytical applications offer numerous opportunities for sample contamination. For this reason, contamination is a common source of error in environmental measurements. The sample container itself represents one such source of sample contamination. Hence, it is vital that sample containers used within the Superfund program meet strict specifications established to minimize contamination which could affect subsequent analytical determinations. Superfund sampling and analysis activities require all component materials (caps, liners, septa, packaging materials, etc.) provided by the bottle preparer to meet the criteria limits of the bottle specifications listed within Section II.

Section III provides guidance on cleaning procedures for preparing contaminant-free sample containers that meet the specifications contained in Section II. The procedures provided in this section are intended to provide sample containers that meet all current CLP Low Concentration Inorganics and Organics detection/quantitation levels.

In selecting cleaning procedures for sample containers, it is important to consider all of the parameters of interest. Although a given cleaning procedure may be effective for one parameter or type of analysis, it may be ineffective for another. When multiple determinations are performed on a single sample or on a subsample from a single container, a cleaning procedure may actually be a source of contamination for some analytes while minimizing contamination in others. It should be the responsibility of the bottle supplier to verify that the cleaning procedures actually used satisfy the quality control requirements set forth in Section IV.



Two aspects of quality assurance (i.e., quality control and quality assessment) must be applied to sample containers as well as to the analytical measurements. Quality control includes the application of good laboratory practices and standard operating procedures especially designed for the cleaning of sample containers. The cleaning operation should be based on protocols especially designed for specific contaminant problems. Strict adherence to these cleaning protocols is imperative. Quality assessment of the cleaning process depends largely on monitoring for adherence to the respective protocols. Because of their critical role in the quality assessment of the cleaning operation, protocols must be carefully designed and followed. Guidance is provided in Section IV on design and implementation of quality assurance and quality control protocols.

## SECTION II

### SAMPLE CONTAINER AND COMPONENT MATERIAL SPECIFICATIONS

This Section identifies sample containers commonly used in the Superfund program and provides specifications for contaminant-free sample containers for each bottle type.

#### A. CONTAINER MATERIAL

A variety of factors affect the choice of containers and cap material. These include resistance to breakage, size, weight, interferences with analytes of interest, cost, and availability.

Container types A through L (Figure 1, pages 6-7) are designated as the type of sample containers that have been used successfully in the past. Kimax or Pyrex brand borosilicate glass is inert to most materials and is recommended where glass containers are used (i.e., pesticides and other organics). Conventional polyethylene is recommended when plastic is acceptable because of its lower cost and lower adsorption of metal ions. The specific sampling situation will determine the use of plastic or glass.

While the sample containers shown in Figure 1 are utilized primarily for Superfund sampling activities, they also may be used for sampling activities under other programs, such as the Resource Conservation and Recovery Act (RCRA).

#### B. MAXIMUM CONTAMINANT LEVEL SPECIFICATIONS FOR SAMPLE CONTAINERS

The CLP, through a series of technical caucuses, has established inorganic Contract Required Detection Limits (CRDL) and organic Contract Required Quantitation Limits (CRQL) which represent the minimum quantities needed to support the hazardous substance identification and monitoring requirements necessary for remedial and other actions at hazardous waste sites.

For inorganic sample containers, the CRDLs listed in Table 1, page 8, are the specifications for maximum trace metal contamination. Concentration at or above these limits on any parameter should preclude these containers from use in collecting inorganic samples.

The CRQL specifications for organic sample containers are listed in Table 2, pages 9-13. When the CRQL in Table 2 is multiplied by the appropriate factor listed below, the resulting value then represents the maximum concentration allowed for particular sample containers based on organic CLP sample sizes for routine analyses.

<u>Container type</u>	<u>Multiple of CRQL</u>
A	1.0
B	0.5
D	10.0
E	8.0
F	4.0
G	2.0
H	0.5
J	0.5
K	2.0

The philosophy used for determining the maximum permissible amount of contamination in a sample container was to consider the number of aliquots of sample that are available in the container and assume that the contamination present would be uniformly distributed in all of the aliquots. This assumption, and the assumption that there should be no more than one-half the CRQL contributed by the container, resulted in the establishment of contamination limits by container type. For example, the volume of container type D is sufficient to allow 20 volatile determinations. Therefore, if 10 times the CRQL of contaminant is present in the cleaned bottle, each aliquot tested will contain one-half of the CRQL of contaminant due to the contribution from the bottle.

### C. GROSS CONTAMINATION

Gross contamination is defined as greater than two hundred times the acceptable concentration values in Tables 1 or 2 (multiplied by the appropriate factor), unless the cleaning procedure is successful in reducing the amount of contamination to within specifications. If this is not achieved, the grossly contaminated materials should be discarded and replaced to prevent cross contamination with other batches of containers. The bottle preparer should inspect all materials to ensure conformance with the required specifications.

**FIGURE 1**  
**SAMPLE CONTAINER**  
**SPECIFICATIONS**

Container Type	Specifications
A	<p><u>Container:</u> 80-oz amber glass, ring handle bottle/jug, 38-mm neck finish.</p> <p><u>Closure:</u> polypropylene or phenolic cap, 38-430 size; 0.015-in Teflon liner.</p> <p><u>Total Weight:</u> 2.45 lbs.</p>
B	<p><u>Container:</u> 40-mL glass vial, 24-mm neck finish.</p> <p><u>Closure:</u> polypropylene or phenolic, open-top, screw cap, 15-cm opening, 24-400 size.</p> <p><u>Septum:</u> 24-mm disc of 0.005-in Teflon bonded to 0.120-in silicon for total thickness of 0.125-in.</p> <p><u>Total Weight:</u> 0.72 oz.</p>
C	<p><u>Container:</u> 1-L high-density polyethylene, cylinder-round bottle, 28-mm neck finish.</p> <p><u>Closure:</u> polyethylene cap, ribbed, 28-410 size; F217 polyethylene liner.</p> <p><u>Total Weight:</u> 1.89 oz.</p>
D	<p><u>Container:</u> 120-mL wide mouth, glass vial, 48-mm neck finish.</p> <p><u>Closure:</u> polypropylene cap, 48-400 size; 0.015-in Teflon liner.</p> <p><u>Total Weight:</u> 4.41 oz.</p>
E	<p><u>Container:</u> 16-oz tall, wide mouth, straight-sided, flint glass jar, 63-mm neck finish.</p> <p><u>Closure:</u> polypropylene or phenolic cap, 63-400 size; 0.015-in Teflon liner.</p> <p><u>Total Weight:</u> 9.95 oz.</p>
F	<p><u>Container:</u> 8-oz short, wide mouth, straight-sided, flint glass jar, 70-mm neck finish.</p> <p><u>Closure:</u> polypropylene or phenolic cap, 70-400 size; 0.015-in Teflon liner.</p> <p><u>Total Weight:</u> 7.55 oz.</p>

**FIGURE 1**  
**SAMPLE CONTAINER**  
**SPECIFICATIONS**  
(Continued)

Container Type	Specifications
G	<p><u>Container:</u> 4-oz tall, wide mouth, straight-sided, flint glass jar, 48-mm neck finish.</p> <p><u>Closure:</u> polypropylene or phenolic cap, 48-400 size; 0.015-in Teflon liner.</p> <p><u>Total Weight:</u> 4.70 oz.</p>
H	<p><u>Container:</u> 1-L amber, Boston round, glass bottle, 33-mm pour-out neck finish.</p> <p><u>Closure:</u> polypropylene or phenolic cap, 33-430 size; 0.015-in Teflon liner.</p> <p><u>Total Weight:</u> 1.11 lbs.</p>
J	<p><u>Container:</u> 32-oz tall, wide mouth, straight-sided, flint glass jar, 89-mm neck finish.</p> <p><u>Closure:</u> polypropylene or phenolic cap, 39-400 size; 0.015-in Teflon liner.</p> <p><u>Total Weight:</u> 1.06 lbs.</p>
K	<p><u>Container:</u> 4-L amber glass, ring handle bottle/jug, 38-mm neck finish.</p> <p><u>Closure:</u> polypropylene or phenolic cap, 38-430 size; 0.015-in Teflon liner.</p> <p><u>Total Weight:</u> 2.88 lbs.</p>
L	<p><u>Container:</u> 500-mL high-density polyethylene, cylinder-round bottle, 28-mm neck finish.</p> <p><u>Closure:</u> polypropylene cap, ribbed, 28-410 size; F217 polyethylene liner.</p> <p><u>Total Weight:</u> 1.20 oz.</p>

**TABLE 1**  
**INORGANIC ANALYTE**  
**SPECIFICATIONS**

	Analyte	CAS Number	CRDL <sup>1</sup> (µg/L)
1.	Aluminum	7429-90-5	100
2.	Antimony	7440-36-0	5
3.	Arsenic	7440-38-2	2
4.	Barium	7440-39-3	20
5.	Beryllium	7440-41-7	1
6.	Cadmium	7440-43-9	1
7.	Calcium	7440-70-2	500
8.	Chromium	7440-47-3	10
9.	Cobalt	7440-48-4	10
10.	Copper	7440-50-8	10
11.	Iron	7439-89-6	500
12.	Lead	7439-92-1	2
13.	Magnesium	7439-95-4	500
14.	Manganese	7439-96-5	10
15.	Mercury	7439-97-6	0.2
16.	Nickel	7440-02-0	20
17.	Potassium	7440-09-7	750
18.	Selenium	7782-49-2	3
19.	Silver	7440-22-4	10
20.	Sodium	7440-23-5	500
21.	Thallium	7440-28-0	10
22.	Vanadium	7440-62-2	10
23.	Zinc	7440-66-6	20
24.	Cyanide	57-12-5	10
25.	Fluoride	16984-48-8	200
26.	Nitrate/Nitrite	1-005	100

<sup>1</sup> CRDLs are based on the CLP Inorganics Low Concentration SOW

**TABLE 2**  
**ORGANIC COMPOUND**  
**SPECIFICATIONS**

	Volatiles	CAS Number	CRQL <sup>1</sup> (µg/L)
1.	Chloromethane	74-87-3	1
2.	Bromomethane	74-83-9	1
3.	Vinyl Chloride	75-01-4	1
4.	Chloroethane	75-00-3	1
5.	Methylene Chloride	75-09-2	2
6.	Acetone	67-64-1	5
7.	Carbon Disulfide	75-15-0	1
8.	1,1-Dichloroethene	75-35-4	1
9.	1,1-Dichloroethane	75-34-3	1
10.	cis-1,2-Dichloroethene	156-59-4	1
11.	trans-1,2-Dichloroethene	156-60-5	1
12.	Chloroform	67-66-3	1
13.	1,2-Dichloroethane	107-06-2	1
14.	2-Butanone	78-93-3	5
15.	Bromochloromethane	74-97-5	1
16.	1,1,1-Trichloroethane	71-55-6	1
17.	Carbon Tetrachloride	56-23-5	1
18.	Bromodichloromethane	75-27-4	1
19.	1,2-Dichloropropane	78-87-5	1
20.	cis-1,3-Dichloropropene	10061-01-5	1
21.	Trichloroethene	79-01-6	1
22.	Dibromochloromethane	124-48-1	1
23.	1,1,2-Trichloroethane	79-00-5	1
24.	Benzene	71-43-2	1
25.	trans-1,3-Dichloropropene	10061-02-6	1
26.	Bromoform	75-25-2	1
27.	4-Methyl-2-pentanone	108-10-1	5
28.	2-Hexanone	591-78-6	5
29.	Tetrachloroethene	127-18-4	1
30.	1,1,2,2-Tetrachloroethane	79-34-5	1

<sup>1</sup> CRQLs are based on the CLP Organics Low Concentration SOW

**TABLE 2 (cont.)**  
**ORGANIC COMPOUND**  
**SPECIFICATIONS**

	Volatiles	CAS Number	CRQL <sup>1</sup> (µg/L)
31.	1,2-Dibromoethane	106-93-4	1
32.	Toluene	108-88-3	1
33.	Chlorobenzene	108-90-7	1
34.	Ethylbenzene	100-41-4	1
35.	Styrene	100-42-5	1
36.	Xylenes (total)	1330-20-7	1
37.	1,3-Dichlorobenzene	541-73-1	1
38.	1,4-Dichlorobenzene	106-46-7	1
39.	1,2-Dichlorobenzene	95-50-1	1
40.	1,2-Dibromo-3-chloropropane	96-12-8	1

<sup>1</sup> CRQLs are based on the CLP Organics Low Concentration SOW



TABLE 2 (cont.)  
ORGANIC COMPOUND  
SPECIFICATIONS

	Semivolatiles	CAS Number	CRQL <sup>1</sup> (µg/L)
1.	Phenol	108-95-2	5
2.	bis-(2-Chlorethyl)ether	111-44-4	5
3.	2-Chlorophenol	95-57-8	5
4.	2-Methylphenol	95-48-7	5
5.	2,2'-oxybis-(1-Chloropropane)	108-60-1	5
6.	4-Methylphenol	106-44-5	5
7.	N-Nitroso-di-n-dipropylamine	621-64-7	5
8.	Hexachloroethane	67-72-1	5
9.	Nitrobenzene	98-95-3	5
10.	Isophorone	78-59-1	5
11.	2-Nitrophenol	88-75-5	5
12.	2,4-Dimethylphenol	105-67-9	5
13.	bis-(2-Chloroethoxy)methane	111-91-1	5
14.	2,4-Dichlorophenol	120-83-2	5
15.	1,2,4-Trichlorobenzene	120-82-1	5
16.	Naphthalene	91-20-3	5
17.	4-Chloroaniline	106-47-8	5
18.	Hexachlorobutadiene	87-68-3	5
19.	4-Chloro-3-methylphenol	59-50-7	5
20.	2-Methylnaphthalene	91-57-6	5
21.	Hexachlorocyclopentadiene	77-47-4	5
22.	2,4,6-Trichlorophenol	88-06-2	5
23.	2,4,5-Trichlorophenol	95-95-4	20
24.	2-Chloronaphthalene	91-58-7	5
25.	2-Nitroaniline	88-74-4	20
26.	Dimethylphthalate	131-11-3	5
27.	Acenaphthylene	208-96-8	5
28.	2,6-Dinitrotoluene	606-20-2	5
29.	3-Nitroaniline	99-09-2	20
30.	Acenaphthene	83-32-9	5

<sup>1</sup> CRQLs are based on the CLP Organics Low Concentration SOW

TABLE 2 (cont.)  
 ORGANIC COMPOUND  
 SPECIFICATIONS

	Semivolatiles	CAS Number	CRQL <sup>1</sup> (µg/L)
31.	2,4-Dinitrophenol	51-28-5	20
32.	4-Nitrophenol	100-02-7	20
33.	Dibenzofuran	132-64-9	5
34.	2,4-Dinitrotoluene	121-14-2	5
35.	Diethylphthalate	84-66-2	5
36.	4-Chlorophenyl-phenylether	7005-72-3	5
37.	Fluorene	86-73-7	5
38.	4-Nitroaniline	100-01-6	20
39.	4,6-Dinitro-2-methylphenol	534-52-1	20
40.	N-Nitrosodiphenylamine	86-30-6	5
41.	4-Bromophenyl-phenylether	101-55-3	5
42.	Hexachlorobenzene	118-74-1	5
43.	Pentachlorophenol	87-86-5	20
44.	Phenanthrene	85-01-8	5
45.	Anthracene	120-12-7	5
46.	Di-n-butylphthalate	84-74-2	5
47.	Fluoranthene	206-44-0	5
48.	Pyrene	129-00-0	5
49.	Butylbenzylphthalate	85-68-7	5
50.	3,3'-Dichlorobenzidine	91-94-1	5
51.	Benz[a]anthracene	56-55-3	5
52.	Chrysene	218-01-9	5
53.	bis-(2-Ethylhexyl)phthalate	117-81-7	5
54.	Di-n-octylphthalate	117-84-0	5
55.	Benzo[b]fluoranthene	205-99-2	5
56.	Benzo[k]fluoranthene	207-08-9	5
57.	Benzo[a]pyrene	50-32-8	5
58.	Indeno(1,2,3-cd)pyrene	193-39-5	5
59.	Dibenz[a,h]anthracene	53-70-3	5
60.	Benzo[g,h,i]perylene	191-24-2	5

<sup>1</sup> CRQLs are based on the CLP Organics Low Concentration SOW

TABLE 2 (cont.)  
 ORGANIC COMPOUND  
 SPECIFICATIONS

Pesticides/PCBs	CAS Number	CRQL <sup>1</sup> (µg/L)
alpha-BHC	319-84-6	0.01
beta-BHC	319-85-7	0.01
delta-BHC	319-86-8	0.01
gamma-BHC (Lindane)	58-89-9	0.01
Heptachlor	76-44-8	0.01
Aldrin	309-00-2	0.01
Heptachlor epoxide	1024-57-3	0.01
Endosulfan I	959-98-8	0.01
Dieldrin	60-57-1	0.02
4,4'-DDE	72-55-9	0.02
Endrin	72-20-8	0.02
Endosulfan II	33213-65-9	0.02
4,4'-DDD	72-54-8	0.02
Endosulfan sulfate	1031-07-8	0.02
4,4'-DDT	50-29-3	0.02
Methoxychlor	72-43-5	0.10
Endrin ketone	53494-70-5	0.02
Endrin aldehyde	7421-36-3	0.02
alpha-Chlordane	5103-71-9	0.01
gamma-Chlordane	5103-74-2	0.01
Toxaphene	8001-35-2	1.0
Aroclor-1016	12674-11-2	0.20
Aroclor-1221	11104-28-2	0.20
Aroclor-1232	11141-16-5	0.40
Aroclor-1242	53469-21-9	0.20
Aroclor-1248	12672-29-6	0.20
Aroclor-1254	11097-69-1	0.20
Aroclor-1260	11096-82-5	0.20

<sup>1</sup>QLs are based on the CLP Organics Low Concentration SOW

## SECTION III

### SAMPLE CONTAINER PREPARATION AND CLEANING PROCEDURES

This Section is provided as guidance for the preparation of sample containers that meet the contaminant-free specifications contained in Section II. There are various procedures for cleaning sample containers depending upon the analyses to be performed on the sample. The following cleaning procedures are modeled after those specified for the Superfund Sample Container Repository program. Other suitable cleaning procedures exist and may be used as long as the sample containers meet the criteria established in Section II. In some instances, the specific needs of the bottle user may dictate exact adherence to the sample container preparation and cleaning procedures that follow; while in other instances, modifications may be required. It is the responsibility of the bottle user to define the sample container preparation, cleaning, and quality control requirements.

- A. Cleaning Procedure for Container Types: A, E, F, G, H, J, and K
  - 1. Sample Type: Semivolatile Organics, Pesticides, Metals, Cyanide, and Fluoride in Soils and Water.
    - a. Wash glass bottles, Teflon liners, and caps with hot tap water using laboratory grade nonphosphate detergent.
    - b. Rinse three times with copious amounts of tap water to remove detergent.
    - c. Rinse with 1:1 nitric acid (reagent grade  $\text{HNO}_3$ , diluted with ASTM Type I deionized water).
    - d. Rinse three times with ASTM Type I organic free water.
    - e. Oven dry bottles, liners, and caps at 105-125°C for one hour.
    - f. Allow bottles, liners, and caps to cool to room temperature in an enclosed contaminant-free environment.
    - g. Rinse bottles with pesticide grade methylene chloride (or other suitable solvents specified by the bottle user) using 20 mL for 1/2-gallon containers; 10 mL for 32-oz and 16-oz containers; and 5 mL for 8-oz and 4-oz containers.
    - h. Oven dry bottles, liners, and caps at 105-125°C for one hour.
    - i. Allow bottles, liners, and caps to cool to room temperature in an enclosed contaminant-free environment.
    - j. Place liners in lids and cap containers.
    - k. Label each container with the lot number and pack in a case.
    - l. Label exterior of each case with the lot number.
    - m. Store in a contaminant-free area.

h. Label exterior of each case with the lot number.

i. Store in a contaminant-free area.

2. Sample Type: Nitrate/Nitrite in Soils and Water.

a. Substitute reagent grade sulfuric acid ( $H_2SO_4$ ) for nitric acid in step C.1.c.

b. Follow all other steps in the cleaning procedure described in part C.1 above.

## SECTION IV

### SAMPLE CONTAINER QUALITY ASSURANCE AND QUALITY CONTROL REQUIREMENTS

#### A. Quality Assurance

The objectives of this Section are to: (1) present procedures for evaluating quality assurance (QA) information to ensure that specifications identified in Section II have been met; and (2) discuss techniques for the quality control (QC) analysis of sample containers to be used in conjunction with the cleaning procedures contained in Section III.

The bottle vendor should establish a Quality Assurance Plan (QAP) with the objective of providing sound analytical chemical measurements, production procedures, and tracking systems. The QAP should incorporate procedures for the inspection of incoming raw materials; preparation, cleaning, and labeling of container lots; quality control analyses of cleaned container lots; document control, including all documentation required for analysis, packing, shipping, and tracking of container lots; any necessary corrective actions; and any quality assessment measures implemented by management to ensure acceptable performance. The QAP should be available and provided to the bottle purchaser upon request.

Major QA/QC activities should include the inspection of all incoming materials, QC analysis of cleaned lots of containers, and monitoring of the container storage area. Complete documentation of all QC inspection results (acknowledging acceptance or rejection) should be kept as part of the permanent bottle preparation files. QA/QC records (e.g., preparation/QC logs, analytical data, data tapes, storage log) also should be stored in a central location within the facility.

Documentation indicating that the container lot has passed all QA/QC requirements should be provided by the bottle vendor to the bottle purchaser with each container lot. Documentation should include a signed and dated cover statement affirming that all QA/QC criteria were met. Copies of raw data from applicable analyses of the QC containers, laboratory standards, check samples, and blanks should be available and provided upon request. Original documentation should be retained for at least 10 years. Minimum documentation that should be available, if applicable, for each lot of containers includes:

- A statement that "Sample container lot \_\_\_\_ meets or exceeds all QA/QC criteria established in 'Specifications and Guidance for Contaminant-Free Sample Containers;'"
- Reconstructed Ion Chromatographs (RICs) from volatile and semivolatile organics determinations, including calibration verification standards, check samples, and blanks;
- GC chromatographs from pesticides determinations, including calibration verification standards, check samples, and blanks;
- ICP, hydride-ICP, or ICP-MS instrument readouts from metals determinations, including calibration verification standards, check samples, and blanks;
- AA raw data sheets and instrument readouts from metals determinations, including calibration verification standards, check samples, and blanks; and
- Cyanide, fluoride, and nitrate/nitrite raw data sheets and instrument readouts from these determinations, including calibration verification standards, check samples, and blanks.

Prior to the first shipment of containers, and at least annually thereafter, the bottle vendor should demonstrate its ability to meet the CRDLs and CRQLs, and establish the reproducibility of the cleaning techniques for each bottle type. The ability to meet the CRDLs and CRQLs is accomplished through the determination of instrument detection limits (IDLs). The bottle vendor should use the procedures in the current CLP Low Concentration Inorganics and Organics SOWs to determine IDLs. IDLs should be below the CRDLs or CRQLs. To establish the reproducibility for each bottle type, the bottle vendor should randomly pick seven containers from a cleaned lot and analyze as described in the Quality Control Analysis part of this Section. Parameter concentrations should be at or below the CRDL or CRQL for each bottle type. Documentation from these analyses should be available and provided upon request.

1. **Incoming Materials Inspection:**

A representative item from each case of containers should be checked for conformance with specifications provided in Section II. Any deviation should be considered unacceptable. A log of incoming shipments should be maintained to identify material type, purchase order number, and delivery date. The date of incoming inspection and acceptance or rejection of the material should also be recorded on this log.

2. **Quality Control Inspection of Cleaned Lots of Containers:**

Following container cleaning and labeling, containers should be randomly selected from each container lot to be used for QC purposes. The two categories of QC containers should be as follows:

a. **Analysis QC Containers:**

One percent of the total number of containers in each lot should be designated as the analysis QC container(s). For lots of less than 100 containers, one container should be designated as the analysis QC container. The sample container preparer should analyze the analysis QC container(s) to check for contamination prior to releasing the associated container lot for shipment. The QC analyses procedures specified in the Quality Control Analysis part of this Section for determining the presence of semivolatile and volatile organics, pesticides, metals, cyanide, fluoride, and nitrate/nitrite should be utilized.

For each analysis QC container(s), an appropriate QC number should be assigned that cross-references the QC container to the related lot of containers. For example, the QC number could be a seven-digit number sequentially assigned to each lot that has undergone QC analysis. Under this numbering scheme, the first alphabetical character would be the container type letter from Figure 1, the next four digits would be assigned sequentially in numerical order starting with "0001" for the first lot to undergo QC analyses, the sixth character would indicate the number of QC container for the lot, (e.g., "1" for the first QC container in the lot, "2" for the second, etc.) and the last character would be either a "C" to indicate clearance or an "R" to indicate rejection.

If the representative analysis QC container(s) passes QC inspection, the related lot of containers should be released, and the appropriate QC number should be entered in the preparation/QC log to indicate clearance of the lot for shipment.

If the analysis QC container(s) are found to be contaminated per the specified QC analysis procedures, the appropriate QC rejection number should be assigned and entered in the preparation/QC log. Any container labels should be removed and the entire lot returned for reprocessing under a new lot number. Excessive QC rejection for a particular container type should be noted for future reference.

A laboratory standard, check sample, and a blank should be run with each QC analysis. A calibration verification standard should be analyzed once every 12 hours. All QC analysis results should be kept in chronological order by QC report number in a central QC file. The QC numbers assigned should be documented in the preparation/QC log, indicating acceptance or rejection and date of analysis.

A container lot should not be released for shipment prior to QC analysis and clearance. Once the containers have passed QC inspection, the containers should be stored in a contaminant-free area until packaging and shipment.

**b. Storage QC Containers:**

One QC container per lot should be designated as the storage QC container. The storage QC container should be separated from the lot after cleaning and labeling and should be stored in a designated contaminant-free area for one year. The date the container is placed in the storage area should be recorded in the storage QC container log.

If contamination of the particular container lot comes into question at any time following shipment, the storage QC container should be removed from the storage area and analyzed using the QC analysis procedures for that container type (see Quality Control Analysis, this Section). Upon removal, containers should be logged out of the storage area.

The designated storage area should be monitored continuously for volatile contaminants in the following manner. A precleaned, 40-mL vial that has passed a QC inspection should be filled with ASTM Type I organic-free water and be placed in the storage area. This vial should be changed at one-week intervals. The removed vial should be subjected to analysis for volatile organics as described in the Quality Control Analysis part of this Section. Any peaks indicate contamination. Identify contaminants, if present, and include the results in a report to all clients who purchased bottles from the affected lot(s).

**B. Quality Control Analysis**

The types of QC analyses correlate with the types of containers being analyzed and their future use in sample collection. The QC analyses are intended for the determination of:

- Semivolatile organics and pesticides;
- Volatile organics;
- Metals;
- Cyanide;
- Fluoride; and
- Nitrate/Nitrite.

QC analyses should be performed according to the container type and related sample type and utilize the specific method(s) described below.



1. **Determination of Semivolatile Organics and Pesticides:**

**Container Types: A, E, F, G, H, J, and K**

**a. Sample Preparation:**

- Add 60 mL of pesticide-grade methylene chloride to the container and shake for two minutes.
- Transfer the solvent to a Kuderna-Danish (KD) apparatus equipped with a three-ball Snyder column. Concentrate to less than 10 mL on a steam bath. Split the solvent into two 5 mL fractions for semivolatile and pesticide determinations.
- Add 50 mL of pesticide-grade hexane (for pesticide determinations only) to the KD apparatus by slowly pouring down through the Snyder column. Concentrate to less than 10 mL to effect solvent replacement of hexane for methylene chloride.
- Concentrate the solvent to 1 mL using a micro-Snyder column.
- Prepare a solvent blank by adding 60 mL of the rinse solvent used in step "g" of the cleaning procedure for container types A, E, F, G, H, J, and K (Section III page 14) directly to a KD apparatus, and proceed as above.

**b. Semivolatile Organics Sample Analysis:**

- Instrument calibration should be performed as described in the most recent CLP Low Concentration Organics SOW with the following exceptions:
  - (1) If problems are encountered meeting the %RSD criteria on the initial calibration for semivolatiles, the high concentration point should be deleted and a four-point calibration used.
  - (2) The low concentration standard should be used for the continuing calibration standard for semivolatile analyses.
  - (3) The percent difference window should be widened to  $\pm 30$  percent for all compounds.
- Inject 1  $\mu$ L of solvent into a gas chromatograph/mass spectrometer (GC/MS).
- Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Organics SOW.
- Blanks should be run as described in the most recent CLP Low Concentration Organics SOW.
- If compounds other than those listed in Table 2 are found in the container blank that are not in the solvent blank at a peak height or peak area greater than 20 percent of the nearest internal standard, the containers should be rejected (See Section II, Table 2 for compound specifications).
- Identify and quantitate any contaminant(s) that cause rejection of a container lot.

- A standard mixture of the nine semivolatile organic compounds listed in Table 3 (page 26) with concentrations in the 5-20 ppb range should be analyzed to ensure that sensitivities are achieved that will meet contract required quantitation limits. This standard should be prepared from a different source from the calibration standards.

c. Pesticides Sample Analysis:

- Instrument calibration should be performed as described in the most recent CLP Low Concentration Organics SOW.
- Inject 1  $\mu$ L of solvent into a gas chromatograph (GC) equipped with an electron capture detector (ECD).
- Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Organics SOW.
- Blanks should be run as described in the most recent CLP Low Concentration Organics SOW.
- If compound peaks other than those listed in Table 2 are at a peak height or peak area greater than 5 percent of the peak height or peak area of tetra chloro-m-xylene, the containers should be rejected (See Section II, Table 2).
- Identify and quantitate any contaminant(s) that cause rejection of a container lot.
- A standard mixture of the seven pesticide compounds listed in Table 3 (page 26) with concentrations in the 0.01 to 1 ppb range should be analyzed to ensure that sensitivities are achieved that will meet contract required quantitation limits. This standard should be prepared from a different source from the calibration standards.

2. Determination of Volatile Organics:

Container Types: B and D

a. Sample Preparation:

- Fill the container with ASTM Type I organic-free water.
- Cap the container and let stand for 48 hours.

b. Sample Analysis:

- Instrument calibration should be performed as described in the most recent CLP Low Concentration Organics SOW with the following exceptions:
  - (1) If problems are encountered meeting the %RSD criteria on the initial calibration for volatiles, the high concentration point should be deleted and a four-point calibration used.
  - (2) The low concentration standard should be used for the continuing calibration standard for volatile analyses.
  - (3) The percent difference window should be widened to  $\pm$  30 percent.

- Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Organics SOW.
- Blanks should be run as described in the most recent CLP Low Concentration Organics SOW. The blank should consist of an aliquot of the ASTM Type I water used in the sample preparation.
- If compounds other than those listed in Table 2 are found in the container blank that are not in the solvent blank at a peak height or peak area greater than 20 percent of the nearest internal standard, the containers should be rejected (See Section II. Table 2 for compound specifications).
- Identify and quantitate any contaminant(s) that cause rejection of a container lot.
- A standard mixture of the five volatile organic compounds listed in Table 3 (page 26) with concentrations in the 1-5 ppb range should be analyzed to ensure that sensitivities are achieved that will meet contract required quantitation limits. This standard should be prepared from a different source from the calibration standards.

3. Determination of Metals:

Container Types: A, C, E, F, G, H, J, K and L

a. Sample Preparation:

- Add 100 mL of ASTM Type I deionized water to the container, and acidify with 1.0 mL of reagent-grade HNO<sub>3</sub>. Cap and shake for three to five minutes.
- Cap the container and let stand for 48 hours.
- Treat the sample as a dissolved metals sample. Analyze the undigested water using the most recent CLP Low Concentration Inorganics SOW.

b. Sample Analysis:

- Instruments used for the analysis of the samples should meet the contract required detection limits in Table 1.
- The ASTM Type I deionized water should be analyzed before use on the bottles that are designated for analysis to ensure that contaminated water is not used for rinsing the bottles.
- Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Inorganics SOW.
- Blanks should be analyzed as described in the most recent CLP Low Concentration Inorganics SOW. A calibration blank is a solution made up exactly like the sample preparation solution. The calibration blank should be less than the values contained in Table 1.
- A set of standards in the expected working range should be analyzed with each analytical run. The acid matrix of the standards, blank, and quality control samples should match that of the samples.

- Concentrations at or above the detection limit for each parameter (listed in Table 1) should be cause for rejection of the lot of containers. NOTE: The sodium detection limit for container types A, E, F, G, H, J, and K is 5000  $\mu\text{g/L}$  unless the containers will be used for low concentration analyses, then the detection limit is 500  $\mu\text{g/L}$ .

4. Determination of Cyanide:

Container Types: A, C, E, F, G, H, J, K and L

a. Sample Preparation:

- Place 250 mL of ASTM Type I deionized water in the container. Add 1.25 mL of 6N NaOH (for container types F and G use 100 mL of ASTM Type I deionized water and 0.5 mL of 6N NaOH). Cap the container and shake vigorously for two minutes.

b. Sample Analysis:

- Analyze an aliquot as described in the most recent CLP Low Concentration Inorganics SOW.
- The detection limit should be 10  $\mu\text{g/L}$  or lower.
- Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Inorganics SOW.
- Blanks should be run as described in the most recent CLP Low Concentration Inorganics SOW. The calibration blank should consist of an aliquot of the ASTM Type I water used above.
- A set of standards in the expected working range, a check sample, and blank should be prepared exactly as the sample was prepared.
- The detection of 10  $\mu\text{g/L}$  cyanide (or greater) should be cause for rejection of the lot of containers. NOTE: Contamination could be due to the container, the cap, or the NaOH.

5. Determination of Fluoride:

Container Types: A, C, E, F, G, H, J, K and L

a. Sample Preparation:

- Place 250 mL of ASTM Type I deionized water in the container (for container types F and G use 100 mL of ASTM Type I deionized water). Cap the container and shake vigorously for two minutes.

b. Sample Analysis:

- Analyze an aliquot as described in the most recent CLP Low Concentration Inorganics SOW.
- The detection limit should be 200  $\mu\text{g/L}$  or lower.

- Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Inorganics SOW.
- Blanks should be run as described in the most recent CLP Low Concentration Inorganics SOW. The calibration blank should consist of an aliquot of the ASTM Type I water used above.
- A set of standards in the expected working range, a check sample, and blank should be prepared exactly as the sample was prepared.
- The detection of 200  $\mu\text{g/L}$  (or greater) of fluoride should be cause for rejection of the lot of containers. NOTE: Contamination could be due to the container or the cap.

6. Determination of Nitrate/Nitrite:

Container Types: A, C, E, F, G, H, J, K and L

a. Sample Preparation:

- Place 250 mL of ASTM Type I deionized water in the container (for container types F and G use 100 mL of ASTM Type I deionized water). Cap the container and shake vigorously for two minutes.

b. Sample Analysis:

- Analyze an aliquot as described in the most recent CLP Low Concentration Inorganics SOW.
- The detection limit should be 100  $\mu\text{g/L}$  or lower.
- Calibration verification standards should be analyzed as described in the most recent CLP Low Concentration Inorganics SOW.
- Blanks should be run as described in the most recent CLP Low Concentration Inorganics SOW. The calibration blank should consist of an aliquot of the ASTM Type I water used above.
- A set of standards in the expected working range, a quality control sample, and blank should be prepared exactly as the sample was prepared.
- The detection of 100  $\mu\text{g/L}$  (or greater) of nitrate/nitrite should be cause for rejection of the lot of containers. NOTE: Contamination could be due to the container or the cap.

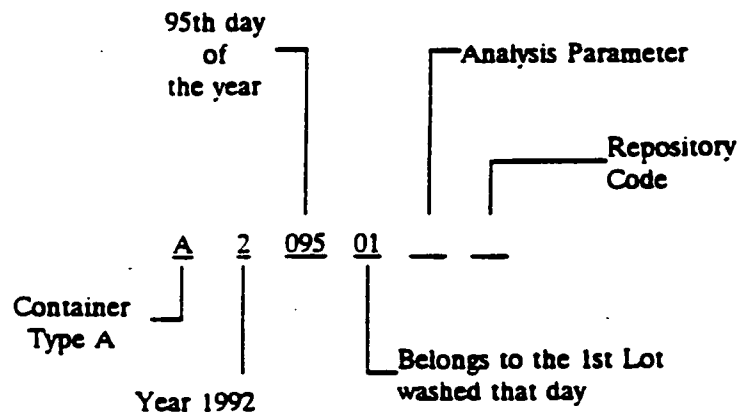
C. Preparation and Labeling

Sampling for environmental specimens requires that sample containers be transported to field sites prior to sample collection. As a result, considerable time may elapse between the receipt of sample containers and collection of the samples. Because of the large number of samples taken at any one site, accounting for all sample containers can become extremely difficult. The following guidance on the identification and tracking of sample containers is based on procedures that have been used successfully in the CLP bottle program.

1. Each shipment should be inspected to verify that the requested number of cleaned and prepared sample containers have been supplied and meet the requirements specified in Section II (Tables 1 and 2). If any shipment fails to meet the required specifications, it should be discarded and replaced with a supply of sample containers that meet the required criteria.
2. The sample containers should be removed and prepared in accordance with the methods designated below.
3. A permanent nine-digit lot number should be assigned to each lot of sample containers for identification and tracking purposes throughout the life of the containers. Figure 2 provides an example of a lot number sequence.

**FIGURE 2**

**LOT NUMBER SEQUENCE**



- a. The first digit represents the container type in Section II (Figure 1).
- b. The second digit represents the last digit of the calendar year.
- c. The next three digits represents the day of the year on which the sample containers were washed.
- d. The sixth and seventh digits represent the daily lot number.
- e. The eighth digit represents the analysis parameter where:
  - A = Semivolatile organics, pesticides, metals, cyanide, and fluoride;
  - B = Metals, cyanide, and fluoride;
  - V = Volatile organics;
  - S = Semivolatile organics and/or pesticides;
  - M = Metals;
  - C = Cyanide;
  - F = Fluoride; and
  - N = Nitrate/nitrite.
- f. The final digit represents the identification of the person who prepared the lot.

4. The lot number for each container should be entered, along with the date of washing, type of container, and number of containers per lot, into the preparation/QC log book.
5. Lot numbers printed with solvent resistant ink on a nonremovable label should remain with the corresponding containers throughout the cleaning procedure.
6. After sample container cleaning and drying, the label should be affixed to the containers in a permanent manner.
7. At least one face should be clearly marked, excluding the top and bottom faces, of each case of sample containers with the assigned lot numbers.

TABLE 3

STANDARD MIXTURES OF ORGANIC COMPOUNDS TO VERIFY SENSITIVITY

Volatiles	Semivolatiles	Pesticides
Methylene Chloride	Nitrobenzene	Gamma-BHC
Acetone	4-Chloroaniline	Heptachlor
2-Butanone	2,6-Dinitrotoluene	Aldrin
Trichloroethene	Diethylphthalate	Dieldrin
Toluene	4-Bromophenyl-phenylether	Endrin
	Hexachlorobenzene	4,4'-DDT
	Pentachlorophenol	Aroclor 1260
	Di-n-butylphthalate	
	bis(2-Ethylhexyl)phthalate	